

LDS Preparedness Manual

*The prudent see danger and take refuge,
but the simple keep going and suffer for it. Proverbs 27:12*

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**The degree of our preparation
will be equal to the extent of our obedience,
which will determine the measure of our peace of mind.**

“Neil H. Leash”

*This manual has been prepared for,
and is intended to be read primarily by,
the active members of
The Church of Jesus Christ of Latter-day Saints.*

Please Note:

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Preface

The Lord Warns and Forewarns

“In mercy the Lord warns and forewarns. He sees the coming storm, knows the forces operating to produce it, and calls aloud through His prophets, advises, counsels, exhorts, even commands—that we prepare for what is about to befall and take shelter while yet there is time. But we go our several ways, feasting and making merry, consoling conscience with the easy fancy of ‘time enough’ and in idle hope that the tempest will pass us by, or that, when it begins to gather thick and black about us we can turn back and find shelter.”

- James E Talmage, *The Parables of James E. Talmage*, p. 50

The Lord Holds Us Accountable

“Then whosoever heareth the sound of the trumpet, and taketh not warning; if the sword come, and take him away, his blood shall be upon his own head. He heard the sound of the trumpet, and took not warning; his blood shall be upon him. But he that taketh warning shall deliver his soul. ***But if the watchman see the sword come, and blow not the trumpet, and the people be not warned; if the sword come, and take [any] person from among them, he is taken away in his iniquity; but his blood will I require at the watchman's hand.***” Ezekiel 33:4

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It wasn't raining when Noah built the Ark

BOOK OF GOMER PARABLE

These are the generations of Gomer, son of Homer, son of Omer. And in the days of Gomer, Noah, the Prophet, went unto the people saying, "Prepare ye for the flood which is to come, yea, build yourselves a boat, that ye may not perish."

Now, Gomer was a member of the Church, and taught Sunday School and played, yea, even on the ward softball team. And Gomer's wife said unto him, "Come, let us build unto ourselves a boat as the Prophet commandeth, that we may not perish in the flood." But behold, Gomer saith unto his wife, "Worry not, dear wife, for if the flood comes the government will provide boats for us."

And Gomer did not build a boat. And Gomer's wife went unto Noah and she returned saying, "Behold, Honey, the Prophet saith unto us, "Build a boat, that we may preserve ourselves, for the government pays men not to grow trees, wherefore the government hath not the lumber to build for you a boat."

And Gomer answered saying, "Fear not, oh wife, for am I not the star pitcher on the ward softball team? Wherefore, the Church will provide for us a boat, that we will perish not."

And Gomer's wife went again unto Noah, and she returned unto Gomer, saying, "Behold, mine husband, the Prophet saith that the Church hath not enough lumber to build a boat for everyone, wherefore, mine husband, build for us a boat that we might not perish in the flood." And Gomer answered her saying, "Behold, if we build a boat, when the flood cometh, will not our neighbors overpower us and take from us our boat; wherefore, what doth it profit a man to build a boat?"

And Gomer's wife went again unto Noah and she returned, saying, "Behold, the Prophet saith, build unto yourselves a boat, and have faith, for if ye do the Lord's bidding, He will preserve your boat for you." But Gomer answered his wife, saying, "Behold, with this inflation, the price of wood has gone sky high, and if we wait awhile, perhaps the price will go down again. And then I will build for us a boat."

And Gomer's wife went again unto Noah, and she returned saying, "Thus saith the Prophet, build for yourselves a boat **RIGHT NOW**, for the price of wood will not go down, but will continue to go up. Wherefore, oh husband, build for ourselves a boat, that we may perish not." But Gomer answered his wife, saying, "Behold, for 120 years Noah hath told us to build a boat, to preserve us from the flood, but hath the flood come? Yea, I say, nay. Wherefore, perhaps the flood will not come for another hundred and twenty years."

And Gomer's wife went again unto Noah and returned saying, "The Prophet saith, he knows it has been 120 years, but nevertheless, the flood will come, wherefore, build unto yourselves a boat."

And Gomer answered her saying, "Wherewith shall we get the money to build ourselves a boat, for are we not now making monthly payments on our snazzy new four horsepower chariot? Wherefore, when our payments end, perhaps we shall build ourselves a boat."

And Gomer's wife went again unto Noah and returned saying, "Behold, the Prophet saith that we should cut down on our recreation, and our vacations, and even give each other lumber for Christmas, that we might thereby get enough lumber to build a boat."

But Gomer saith unto her, "What a drag! Are we to cease enjoying life, just because we must build a boat?"

Wherefore, Gomer built not a boat. But behold, one afternoon Gomer heard thunder in the sky, and he feared exceedingly and he ran, yea, even to the lumber yard to buy lumber. But behold, the lumber store was crowded with great multitudes, all seeking to buy lumber, and there was not enough lumber to be found for the multitudes.

And on the same day were all the fountains of the deep opened, and the windows of heaven were broken up, and the floods came -- and behold, Gomer had no boat. And as the water rose above Gomer's waist, his wife saith unto him, "Behold, Honey, I told thee so!"

— Author Unknown

GETTING SET FOR A POSSIBLE MODERN DAY REPEAT OF HAUN'S MILL

We all know the tragic story of Haun's mill.

Joseph Smith had counseled all of the Church members living around Far West to drop everything and come into Far West for safety. It wasn't a commandment...it was simply a request and counsel. Almost all the members of the Church immediately followed the counsel of the prophet. However, brother Jacob Haun, upon hearing this counsel, came and argued with the Prophet about the counsel at least 3 times during one day. Brother Haun's point was that he did not see the reason for it and he felt that he and his people could defend themselves if necessary. According to John Lee who was present for the conversations, on 26 October 1838 The Prophet said,

“Move in, by all means, if you wish to save your lives.” Haun replied that if the settlers left their homes all of their property would be lost and the Gentiles would burn their houses and other buildings. Joseph replied, “You had better lose your property than your lives, but there is no danger of losing either if you will do as you are commanded.”

Again, brother Haun thought he and his neighbors could protect and defend themselves, and Smith finally gave them permission to remain, and is recorded as saying;

“they would consider him a tyrant if he forced them to leave and abandon their property and come to Far West.”

Years later, on 8 June 1867 John Lee reaffirmed in his diary that;

“Jos. permitted Haun to gather the Brethren and defend their Mill but stated at the same time that they would be massacred & sure enough it was done.”¹

Four years later after the incident Joseph himself recounted:

“Up to this day God had given me wisdom to save the people who took Council. None had ever been killed who abode by my Council. At Haun's Mill the brethren went contrary to my Council; if they had not, their lives would have been spared.”²

The lesson here for us to learn from is that brother Haun, the righteous local leader of a group of good saints...felt he knew better than to obey all of the counsel of the living prophet. After all, Joseph hadn't made it an enforced commandment...he phrased it as counsel and advice. In fact, it is important to note that Joseph **REFUSED** to make it a **COMMANDMENT** and force the people to gather, even though he knew it would save their lives. Many of the good and righteous people who trusted in their own wisdom and their local leader and refused to give full heed to the words of the prophet, sadly, paid the terrible price four days later. That they were good people who were righteous and had great faith is not disputed as some of them performed miracles later even in the very day of their distress. But it was to help alleviate some of the suffering their disobedient actions had brought down upon them. The problem was they thought it was a little more important to try and save their material positions in the world, than to obey the suggestions of a living prophet. This brings up another point of discussion.

LABORING UNDER A FALSE DOCTRINE

Does personal spiritual righteousness and gospel zeal guarantee the temporal protection of the Lord and excuse an individual from obeying counsel of the Prophets and Apostles?

On the face of it the answer would seem obvious...absolutely not. We must obey all of the counsel of the Lord's anointed...all of the time. We can't pick and choose without facing the resulting consequences. But throughout history and even today many of the saints and their local leaders believe, work under and teach this false doctrine in an important aspect of their lives.

Let me rephrase this question in another way. Can a member or a leader be trying so hard in so many areas and be doing a tremendous amount of good while yet at the same time ignore counsel given again and again by prophets...and then suffer terrible consequences because of his lack of obedience in something very small he personally did not see the benefit of?

The answer is of course...yes. Let me use one more famous historical example of this very issue. The Martin and Willey handcart experience is again, like Haun's mill, a story of a group of good, righteous individuals and their local leaders ignoring counsel from Prophets and Apostles and suffering the consequences. They specifically, and falsely, applied the idea that their personal righteousness would protect them in their disregard for following the counsel of the Apostles. In fact they actually used as an excuse their gospel enthusiasm, zeal, faith and obedience as some of the primary reasons in their arguments to disobey the advice of the brethren.³ After all, it wasn't a commandment that was enforced...it was just counsel. Again, history proved them to be tragically wrong.

"The decision to send out the Willie and Martin companies so late in the season was extremely reckless and based upon false doctrine. That decision cost the lives of nearly one-fourth of the entire group; about 220 people died before the rescue party sent by President Young could reach them."⁴

Of course we have the story of those who survived the Willie and Martin experience who drew closer to the Lord. But, according to Brigham Young, it wasn't what the Lord wanted:

"In mid-November President Brigham Young angrily reproved those who had authorized the late start or who had not ordered the several parties back to Florence when they still had the opportunity, charging "ignorance," "mismanagement," and "misconduct." Though terrible, the suffering could have been far worse. Had the rescue effort not been launched immediately—well before the storm struck—the handcart companies would probably have been totally destroyed."⁵

SETTING UP A MODERN DAY REPEAT

Are too many of us as members and local leaders setting ourselves up for another Haun's Mill and Willie and Martin handcart disaster...only on a tremendously much larger scale?

I can't tell you how many times I have talked with people who are wonderful, faithful members of the Church, some even who are ward and stake leaders, who don't have enough food storage to last more than a week or so. Often this is because they have been well blessed in material possessions and income. In our discussions about how the counsel for food storage has been repeated by every prophet for over 60 years they commonly respond that with all of the other issues that they are dealing with, it just isn't very high on the priority list. Temple work, family history, missionary work are all much more important than food storage. However, some explain that if the Prophet made it a commandment, like they did with the Word of Wisdom by including it on the temple recommend interview, instead of just counsel, then they would move it up on the priority list.

These people, and I am convinced they represent a very large portion of the membership of the Church, believe the very same false doctrines as did the members of the two ill fated groups mentioned above. First, they falsely believe that their personal righteousness will save them. After all, they are busy going to the temple, fulfilling Church callings, sending missionaries out, etc. in other words...doing the works of the righteous. Surely, the Lord will be merciful to them and take care of them despite their lack of attention to this small item. They discount what president Benson taught on this point:

“Should the Lord decide at this time to cleanse the Church—and the need for that cleansing seems to be increasing—a famine in this land of one year’s duration could wipe out a large percentage of slothful members, including some ward and stake officers. Yet we cannot say we have not been warned.”⁶

Additionally, they commonly believe and have heard it actually taught over the pulpit by others that those terrible things that have been prophesied won’t happen to the righteous and so they need not prepare for them. Many prophets, including President Lee and President Kimball addressed this terribly false notion, but President Benson said it best in his “Rue The Day” statement:

“Too often we bask in our comfortable complacency and rationalize that the ravages of war, economic disaster, famine, and earthquake cannot happen here. Those who believe this are either not acquainted with the revelations of the Lord, or they do not believe them. ***Those who smugly think these calamities will not happen, that they somehow will be set aside because of the righteousness of the Saints, are deceived and will rue the day they harbored such a delusion.*** The Lord has warned and forewarned us against a day of great tribulation and given us counsel, through His servants, on how we can be prepared for these difficult times. Have we heeded His counsel?⁷

It is hard for me to understand why or how so many good and wonderful people can discount what the prophets have said, again, and again, and again, and again concerning what will suddenly happen to the world in the future. President Benson said:

“The revelation to produce and store food may be as essential to our temporal welfare today as boarding the ark was to the people in the days of Noah.”⁸

It is important to note that the people who didn’t get on the ark, suffered and died by the very calamity that for 300 years had been prophesied would come upon them. People, including members of the Church, have always had a habit of believing that things won’t change drastically, or that terrible things could happen to them. It is a part of human nature.

However, the scriptures are very clear that these terrible cataclysmic events, some perhaps 20-30 years prior to the actual return of the Savior in power and great glory, will come suddenly upon the heart of the Church, and then be poured out upon the rest of the world.

“Behold, vengeance cometh speedily upon the inhabitants of the earth, a day of wrath, a day of burning, a day of desolation, of weeping, of mourning, and of lamentation; and as a whirlwind it shall come upon all the face of the earth, saith the Lord.

“And upon my house shall it begin, and from my house shall it go forth, saith the Lord;

“First among those among you, saith the Lord, who have professed to know my name and have not known me, and have blasphemed against me in the midst of my house, saith the Lord.”⁹

It is noteworthy that President Hinckley quoted from this scripture in his famous Sunday morning talk given in General conference following the September 11, 2001 terrorist attack and subsequent beginning of the war in Iraq.

Additionally, this scripture was supposed to have been discussed in great detail recently throughout the Church as it was contained in the Priesthood/Relief Society manuals when we studied Joseph F. Smith. A few quotes from that lesson:

“The many eruptions, earthquakes and tidal waves which have occurred...are signs which the Savior declared would foreshadow his second coming, although he said his advent should be as thief in the night...The wise and prudent will heed the warning and prepare themselves that they be not taken unawares.”

“I...testify, that [the Latter-Day Saints]...will be the first to fall beneath the judgments of the Almighty, for his judgments will begin at his own house.”¹⁰

Wilford Woodruff commented that he believed that the dreadful calamities described in the second half of the third Chapter of Isaiah is a direct description of some of the aftermath of this and other unpleasant prophetic fulfillments specifically upon the Church members because of their participation in the fashions of Babylon which showed where their hearts really were:

“There are some prophecies pertaining to these latter days that are unpleasant to contemplate. President Young has been calling upon the daughters of Zion day after day, now, for years, to lay aside these Babylonish fashions. I have been reading the third chapter of Isaiah, and I have been hoping, all the days of my ministry, that the sayings contained in that chapter would never apply to the daughters of Zion in our day; but I believe they will, and inasmuch as they will not listen to President Young and to the prophets, apostles and elders of Israel with regard to throwing off these nonsensical things, I hope they will hasten the lengthening out of their skirts and drag them in the streets; that they will increase their round tires like the moon, increase their hoops, and their headbands, increase their Grecian bends at once and carry it out until they get through with it, so that we can turn to the Lord as a people. Some of the daughters of Zion do not seem willing to forsake the fashions of Babylon. I to such would say hasten it, and let the woe that is threatened on this account come, that we may get through with it, then we can go on and build up the Zion of God on the earth.”¹¹

Imagine what he would say if he saw the fashions of today that include the nose rings, the leg ornaments, the tinkling ornaments about the feet that were not present during his day, but are now very prevalent in ours, even among many of our members?

BUT WHAT ABOUT A YEARS SUPPLY OF BASIC FOOD STORAGE?

I believe that every prophet over the last 60 years has talked about having the Church members get a bare minimum of at least a one year's supply of basic food items. Though it is not addressed directly in every conference, it is published in a tremendous amount of Church literature, pamphlets, Church handbook of instructions, monthly messages for home teachers and visiting teachers, instruction manuals, etc.

Again, after 9/11, in the following October General Conference, President Hinckley talked about food storage.

“We cannot provide against every contingency. But we can provide against many contingencies. Let the present situation remind us that this we should do. As we have been continuously counseled for more than 60 years, let us have some food set aside that would sustain us for a time in case of need. But let us not panic nor go to extremes. Let us be prudent in every respect.”¹²

Three months later, the First Presidency then took the unprecedented step of issuing a special letter (January 20, 2002) clarifying his remarks so that there would be no misunderstanding, asking that food storage preparation, specifically concerning having minimally a one year supply for every member in the world where ever possible, be taught in every branch, ward, district and stake in the Church. In it, for the first time, it outlined the minimum of basic food items to be included in such storage. Unfortunately, it is estimated that 25% of the membership in North America, still have never even heard of the letter because it was not taught to them by their local leaders. Quoting from the letter (underlining is mine):

“Priesthood and Relief Society leaders should teach the importance of home storage and securing a financial reserve. These principles may be taught in ward councils or on a fifth Sunday in priesthood and Relief Society meetings.

“Church members can begin their home storage by storing the basic foods that would be required to keep them alive if they did not have anything else to eat. Depending on where members live, those basics might include water, wheat or other grains, legumes, salt, honey or sugar, powdered milk, and cooking oil. ... When members have stored enough of these essentials to meet the needs of their family for one year, they may decide to add other items that they are accustomed to using day to day.

“Some members do not have the money or space for such storage, and some are prohibited by law from storing a year’s supply of food. These members should store as much as their circumstances allow. Families who do not have the resources to acquire a year’s supply can begin their storage by obtaining supplies to last for a few months. Members should be prudent and not panic or go to extremes in this effort. Through careful planning, most Church members can, over time, establish both a financial reserve and a year’s supply of essentials.”¹³

Following this, the Church made a major change at the Bishops storehouses, creating monthly survival food storage boxes for one person at tremendously low prices. A person could purchase 12 of these boxes and have a years supply of food storage...allowing the step by step completion of President Hinckley’s counsel by almost any member.

The preparedness message was also echoed by other Church leaders as well. In a Jan 31, 2002 letter by President Packer, acting President of the Quorum of the Twelve, to General Authorities, Area Authority Seventies, Stake, Mission and District Presidents part of the emphasis for 2002 stake conference training was “please instruct members of the importance of reducing debt, living within their means, and storing food and other essentials that enable them to remain self-reliant in times of need.”

A year later to reemphasize the importance of obtaining a years supply of food storage, it was the main topic for the visiting teaching message for January 2003, “If ye are prepared ye shall not fear.”

And so we get to the heart of the matter:

ARE TOO MANY MEMBERS, INCLUDING LOCAL AND STAKE LEADERS, IGNORING THE COUNSEL TO TEACH AND ENCOURAGE THAT EVERY MEMBER SHOULD HAVE AT LEAST A 1 YEAR SUPPLY OF BASICS?

Is there a chance that because of their lack of attention in this one small area...that they and their trusting members might one day in the future suffer terrible consequences such as watching their families and friends slowly starve to death? President Kimball said:

“How often do Church members arise early in the morning to do the will of the Lord?... How often do we say, “Yes, I will obey the commandment to store food and to help others, but just now I have neither the time nor the money to spare; I will obey later””? Oh, foolish people! While we procrastinate, the harvest will be over and we will not be saved. Now is the time to follow Abraham’s example; now is the time to repent; now is the time for prompt obedience to God’s will.”¹⁴

It is important to note that many of the prophets, including President Kimball in the preceding quote, call it THE COMMANDMENT to store food.

As one reads the scriptures, the talks, the manuals and all that has been said upon the subject, it isn’t a matter of IF the famine comes, it is a matter of only WHEN the famine comes. President Benson stated:

“Not only should we have strong spiritual homes, but we should have strong temporal homes. We should avoid bondage by getting out of debt as soon as we can, pay as we go, and live within our incomes. There is wisdom in having on hand a year’s supply of food, clothing, fuel (if possible),

and in being prepared to defend our families and our possessions and to take care of ourselves. I believe a man should prepare for the worst while working for the best. Some people prepare and don't work, while others work but don't prepare. Both are needed if we would be of maximum service to our God, our family, and our country."

"We must do more to get our people prepared for the difficult days we face in the future. Our major concern should be their spiritual preparation so they will respond with faith and not fear. "If ye are prepared, ye shall not fear" (D&C 38:21). Our next concern should be for their temporal preparation. When the economies of nations fail, when famine and other disasters prevent people from buying food in stores, the Saints must be prepared to handle these emergencies. This is a matter of concern for area, region, and stake councils."¹⁵

What do we do after we have a basic year's supply of food for ourselves and our family? Simply, we have been counseled to think about going beyond just the basics of food and extend the principle to clothing, fuel, seeds, tools, shelters (tents) and other items necessary to sustain ourselves and our families for a year.

"A man should not only be prepared to protect himself physically, but he should also have on hand sufficient supplies to sustain himself and his family in an emergency. For many years the leaders of the Mormon Church have recommended, with instructions, that every family have on hand at least a year's supply of basic food, clothing, fuel (where possible), and provisions for shelter. This has been most helpful to families suffering temporary reverses. It can and will be useful in many circumstances in the days ahead. We also need to get out of financial bondage, to be debt-free."¹⁶

Some believe falsely that when things get bad...the Church has stored enough for all of the members. The Church leadership has been very clear on this issue:

"Our bishop's storehouses are not intended to stock enough commodities to care for all the members of the Church. Storehouses are only established to care for the poor and the needy. For this reason, members of the Church have been instructed to personally store a year's supply of food, clothing, and, where possible, fuel. By following this counsel, most members will be prepared and able to care for themselves and their family members, and be able to share with others as may be needed."¹⁷

Finally, in summary:

"You do not need to go into debt to obtain a year's supply. Plan to build up your food supply just as you would a savings account. Save a little for storage each paycheck. Can or bottle fruit and vegetables from your gardens and orchards. Learn how to preserve food through drying and possibly freezing. Make your storage a part of your budget. Store seeds and have sufficient tools on hand to do the job. If you are saving and planning for a second car or a television set or some item which merely adds to your comfort or pleasure, you may need to change your priorities. We urge you to do this prayerfully and do it now. I speak with a feeling of great urgency."¹⁸

"When we really get into hard times," said President J. Reuben Clark, Jr., "where food is scarce or there is none at all, and so with clothing and shelter, money may be no good for there may be nothing to buy, and you cannot eat money, you cannot get enough of it together to burn to keep warm, and you cannot wear it."¹⁹

"For more than a hundred years, Church leaders have taught the members to store grain and other essentials that would sustain life in times of drought or famine. The current guidelines for home storage are

intended to apply internationally. They include having a supply of food, clothing, and, where possible, the fuel necessary to sustain life for one year. Church guidance states, “We have never laid down an exact formula for what anybody should store. Perhaps if we think not in terms of a year’s supply of what we ordinarily would use, and think more in terms of what it would take to keep us alive in case we didn’t have anything else to eat, that last would be very easy to put in storage for a year”.²⁰

President Joseph Fielding Smith said:

“The distress and perplexity, bloodshed and terror, selfish ambition of despotic rulers, such as the world has never before seen, all indicate that the great and dreadful day of the Lord is very near, even at our doors. We have been warned by the prophets from the beginning of time. They have declared, by revelation from the Lord, that in this present day, confusion, bloodshed, misery, plague, famine, earthquake, and other calamities, would cover the face of the earth. The Lord told his disciples of these dreadful scenes and said men’s hearts would fail them because of these things coming upon the earth. . . .”²¹

“President Wilford Woodruff and the Prophet Joseph Smith declare that it was their duty and should be the duty of every righteous man to raise the warning voice and proclaim the fact that these calamities are at our doors, and I have been condemned because I have done that. I heard one good man say, “There are too many good things to think about without talking about these troubles, these plagues, or worrying about the coming of the Lord.” Here is what the Lord says in Section 45 of the Doctrine and Covenants, verses 39 to 43.

“And it shall come to pass that he that feareth me shall be looking forth for the great day of the Lord to come, even for the signs of the coming of the Son of Man.

“And they shall see signs and wonders, for they shall be shown forth in the heavens above, and in the earth beneath.

“And they shall behold blood, and fire, and vapors of smoke.”

“Now, when the Lord says that, don’t you think I am justified in raising my voice and do you think I am doing wrong when I am...watching the signs of the times and these calamities and troubles that are coming? Am I doing wrong? And yet one good brother said that. Too many things to do. We haven’t time to worry about the coming of Christ. I hope he is here. Now, here is something from President Brigham Young.

“Do you think there is calamity abroad now among the people? . . . All we have yet heard and all we have experienced is scarcely a preface to the sermon that is going to be preached. When the testimony of the Elders ceases to be given, and the Lord says to them, ‘come home; I will now preach My own sermons to the nations of the earth,’ all you now know can scarcely be called a preface to the sermon that will be preached with fire and sword, tempests, earthquakes, hail, rain, thunders, and lightnings and fearful destruction. What matters the destruction of a few railway cars? You will hear of magnificent cities, now idolized by the people, sinking in the earth, entombing the inhabitants. The sea will heave itself beyond its bounds, engulfing mighty cities. Famine will spread over the nations, and nation will rise up against nation, kingdom against kingdom, and states against states, in our own country and in foreign lands; and they will destroy each other, caring not for the blood and lives of their neighbors, of their families, or for their own lives. They will be like the Jaredites who preceded the Nephites upon this continent, and will destroy each other to the last man, through the anger that the devil will place in their hearts, because they have rejected the words of life and are given over to Satan to do whatever he listeth to do with them. You may think that the little you hear of now is grievous; yet the faithful of God’s people will see days that will cause them to close their eyes because of the sorrow that will come upon the wicked nations. The hearts of the faithful will be filled with pain and anguish for them.”

“Why is the Lord angry? Why are all these things coming upon the world? President Young said in this article that I read and the Lord says in the revelations I have read to you, it is because they have turned away from the Gospel of Jesus Christ, because they have rebelled against God, and because they have refused to hear the testimony of those who have been sent to preach the Gospel to them. That is why. They have rejected the message. The nations are full of iniquity.”

“Now, there is our danger. We must not forsake God. If we are not on His side, you may be sure He is not going to be on our side. He will leave us to ourselves. Now, these calamities are here. They are upon us. The whole world is in commotion. I have had to leave unsaid about two-thirds of what I have prepared to say, but next week, which will be the concluding talk, I am going to turn to these Scriptures and show you what the old prophets have said in regard to our day. I have told you now what the Lord said and what the prophets of our own day have said. I have shown you the fulfillment of the prediction by President Wilford Woodruff, that the angels are sent forth to reap the earth. They are on that mission. This I have presented to you tonight, and we will get the other things next time.”²²

“If ye are prepared ye shall not fear.”²³

(Footnotes)

¹ Regional Studies, Missouri, Benson—Haun’s Mill, p.107

²Ehat & Cook, Words, Manuscript History of the Church: 29 August 1842 (Monday Morning), p.127–129

³ See B. H. Roberts, Comprehensive History of the Church, Vol.4, Ch.98, p.91

⁴Encyclopedia of Mormonism, Vol.2, HANDCART COMPANIES

⁵Ibid

⁶Teachings of Ezra Taft Benson, p.265

⁷Teachings of Ezra Taft Benson, p.706

⁸ (CR October 1980, Ensign 10 [November 1980]: 33.) Teachings of Ezra Taft Benson, p.266

⁹ D&C 112:24-26

¹⁰ President Joseph F. Smith quotes from Lesson 44 Preparing For The Second Coming of Christ, page 393

¹¹The Discourses of Wilford Woodruff, p.226 - p.227

¹² Oct 6, 2002 Sunday morning Session, President Hinckley

¹³Jan 20, 2002 First Presidency Letter

¹⁴The Teachings of Spencer W. Kimball, p.174

¹⁵ Teachings of Ezra Taft Benson, p.264

¹⁶ President Benson, God, Family, Country, p. 331.)

¹⁷Teachings of Ezra Taft Benson, p.263-264, 267

¹⁸ President Benson, CR October 1980, Ensign 10 [November 1980]: 33.)

¹⁹Teachings of Ezra Taft Benson, p.268

²⁰Encyclopedia of Mormonism, Vol.2, EMERGENCY PREPAREDNESS

²¹Joseph Fielding Smith Jr., Doctrines of Salvation, Vol.3, p.19

²² Joseph Fielding Smith, The Signs of the Times, p.124-137

²³D&C 38:30

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PREPAREDNESS TEST

1. Has your family rehearsed fire escape routes from your home? YES - NO
2. Does your family know what to do before, during, and after an earthquake or other emergency situation? YES - NO
3. Do you have heavy objects hanging over beds that can fall during an earthquake? YES - NO
4. Do you have access to an operational flashlight in every occupied bedroom?
(use of candles is not recommended unless you are sure there is no leaking gas) YES - NO
5. Do you keep shoes near your bed to protect your feet against broken glass? YES - NO
6. If a water line was ruptured during an earthquake, do you know how to shut off the main water line to your house? YES - NO
7. Can this water valve be turned off by hand without the use of a tool?
Do you have a tool if one is needed? YES - NO
8. Do you know where the main gas shut-off valve to your house is located? YES - NO
9. If you smell gas, do you know how and would you be able to shut off this valve? YES - NO
10. Gas valves usually cannot be turned off by hand. Is there a tool near your valve? YES - NO
11. Would you be able to safely restart your furnace when gas is safely available? YES - NO
12. Do you have working smoke alarms in the proper places to warn you of fire? YES - NO
13. In case of a minor fire, do you have a fire extinguisher that you know how to use? YES - NO
14. Do you have duplicate keys and copies of important insurance and other papers stored outside your home? YES - No
15. Do you have a functional emergency radio to receive emergency information? YES - NO
16. If your family had to evacuate your home, have you identified a meeting place? YES - NO

IF AN EMERGENCY LASTED FOR THREE DAYS (72 HOURS) BEFORE HELP WAS AVAILABLE TO YOU AND YOUR FAMILY.....

17. Would you have sufficient food? YES - NO
18. Would you have the means to cook food without gas and electricity? YES - NO
19. Would you have sufficient water for drinking, cooking, and sanitary needs? YES - NO
20. Do you have access to a 72 hour evacuation kit? YES - NO
21. Would you be able to carry or transport these kits? YES - NO
22. Have you established an out-of-state contact? YES - NO
23. Do you have a first aid kit in your home and in each car? YES - NO
24. Do you have work gloves and some tools for minor rescue and clean up? YES - NO
25. Do you have emergency cash on hand? (During emergencies banks and ATMs are closed) YES - NO
26. Without electricity and gas do you have a way to heat at least part of your house? YES - NO
27. If you need medications, do you have a month's supply on hand? YES - NO
28. Do you have a plan for toilet facilities if there is an extended water shortage? YES - NO
29. Do you have a supply of food, clothing, and fuel where appropriate:
For 6 months? For a year? YES - NO

These are all questions that need answers if you are to be safe in an emergency.
If you answered 'No' to any of them, its now time to work on getting those items done.

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DELUXE “96” HOUR KIT



In emergency preparedness, a 72 hour kit is widely considered the first step in becoming prepared. Sitting in a closet or some other area close to the front door, it can be grabbed in a moment's notice, should you have to depart your home with little or no warning. Two days ago, only a block from my house, a neighbor's home caught fire at 3 AM. After getting everyone out, the fire hastily spread and quickly destroyed this family's home. Everything inside it was totally destroyed. What did they have left? Only the pajamas on their backs. They lost literally everything. They didn't even have shoes on their feet. They wish they'd had a good 96 hour kit. Fortunately, the whole community is pulling together for them. But not everyone is this lucky. Sometimes, whole communities are affected at the same time. This same tiny farming village back in 1978 had to be immediately evacuated for several days because of derailed and leaking butane cars. Before that, everyone here thought this was a place where disasters 'never happened.' Seventy-two hour kits would have been really handy then as well. It's not necessary that you live in a tornado or hurricane alley to need a 96 hour kit. Every family needs one for the unexpected.

A deluxe “96” hour kit should contain all the essential things your family would need to take you through 4 days of being on your own. There's a reason behind the length of time the kit's contents should last. It generally takes the disaster relief agencies at least 3-4 days to move in and set up before offering assistance. Generally speaking, you're on your own during this time. Depending on how bad the situation is, it could even be longer. Whether you start with our kit or put one together yourself from scratch, it's important for your family's welfare to have one. In any type of disaster things will be bad. Not having the necessities to sustain your life and the lives of your family members could turn an otherwise manageable problem into a personal cataclysm you could never recover from. Prepare now for life's surprises.

First Aid

- Personal First Aid Kit
- Family First Aid Kit

Preventative Aid

- Foot powder
- Body powder, medicated

Light, Heat, Fire making

- Pack lantern
- Spare lantern mantles
- Flash light
- Spare bulb, batteries
- Candle lantern
- Spare plumbers candles
- Glow sticks
- Match safe & matches
- Magnesium block
- Magnifying glass
- Lighter
- Spare flints

Navigation

- Map case
- Maps
- Map measure
- Pedometer
- Compass
- Altimeter
- Global positioning system (GPS)

Tools and Repair Kits

- Leatherman.Gerber tool
- Sven saw
- Hatchet/Boys axe w/sheath
- 8 inch mill file
- Spare parts: pack, stove, lantern
- Tent/ Pack patch kit: ripstop tape
- Copper wire, spool

Fishing Equipment

- Pack rod case
- Pack rod, spin -fly combination
- Ultra lite spinning reel
- Ultra lite fly reel
- 15 lb test Spiderwire monofilament
- 7DTF fly line
- Fly line leaders, various lb test
- Tackle boxes, small double sided (2)
- Hooks, size 8, 10, 12
- Fly assortment
- Sinkers, split shot
- Spinners
- Spoons
- Small plugs, poppers, bugs
- Fanny Pack.

Cooking Equipment

- Frying pan, folding
- Cook set, nesting
- Can opener, P-38
- Eating utensil set
- Book matches, water proof
- Pack stove
- Windscreen
- Fuel bottles
- Condiments
- Salt & Pepper
- Sugar
- Flour
- Honey
- Milk, dry, instant

Personal Hygiene & Sanitation

- Toilet trowel
- Toilet tissue, biodegradable
- Feminine hygiene items
- Shampoo
- Comb and brush
- Eye drops
- Tooth brush & tooth paste
- Shaving gear
- Deodorant
- Soap & soap dish
- Bath towel

Personal Items

- Camera, lenses, flash and film
- Binoculars
- Swiss Pocket knife
- Sharpening stones and oil
- Wallet
- Extra house and car keys
- Copy of important papers such as titles etc.
- Handkerchief
- Watch
- Sun & prescription glasses
- Pencil and note pad
- Scriptures
- Chigger powder
- Mosquito repellent
- Lip balm
- Sun block
- Body powder, medicated
- Corn starch
- Hand lotion

Emergency Gear

- Signal flares, night
- Signal smoke, day
- Signal die, water
- Signal mirror
- Strobe light
- Whistle
- Space blanket
- Hand warmers

Clothing Maintenance and Repair

- Sewing Kit
- Spare shoelaces
- Biodegradable detergent
- Woolite
- Small scrub brush
- Clothes pins

Cash

- \$100 in small bills
- \$10 in Quarters
- Credit Cards
- Debit Card
- A few blank Checks

Communication

- Pocket radio, battery/solar power
- Cell phone ... or
- Two way radio: CB, GMRS, FRS
- Spare NiCad batteries
- Solar battery charger

Bedding

- Foam pad, closed cell
- Sleeping bag
- Air pillow

Water

- Poly canteens, 1 quart
- Sierra cup
- Water purification tablets
- Water purifier & extra filters
- Water bag, nylon
- Water bag liners, plastic
- Solar still
- Rubber surgical tubing

Clean Up

- Scouring pads, soap filled
- Sanitary tablets & dunking bag
- Dish towel

Pack and Pack Frame

- Pack
- Frame
- Clevis pins
- Stuff bags
- Compression straps
- Plastic garbage bags
- Twist ties

Food

- Personal daily rations
- Energy bars, tablets
- Trail snacks

Shelter

- Tent
- Tent fly
- Tent poles
- Tent pegs
- Ground cloth
- Ultra light weight tarp
- Visk clamps
- Nylon line, 50 ft. 2 ea

Clothing

- Hiking boots
- Trail sneakers
- Socks
- Underclothing
- Thermal underwear
- Shirts, short sleeve
- Shirts, long sleeve
- Shorts, hiking
- Trousers, long
- Belt and buckle
- Sweater
- Vest
- Jacket
- Parka
- Poncho
- Gloves, leather
- Mittens, wool
- Scarf
- Balaclava
- Bandanna, large
- Hat
- Moleskins
- Swimsuit

Food Storage

*“...and he will have his eyes fixed on the signs of the times,
and that day will not overtake him unawares.” - JD 7:189.*

We do seem to be undergoing a **quickenning of the times** and that may be an important indication for each of us to evaluate our personal and family storage needs again.

As members of the Church we have been counseled for many many years to prepare and keep on hand at least a **one-year supply of food**. In the early days of our church the Saints were admonished to have a **7 year** food supply. Then, for many years there was a time when a two-year supply was recommended, (and it undoubtedly would be a good idea for each of us to still keep a two-year supply if at all possible as this will allow us to share with others). But in the meantime it is imperative that we heed the current counsel to **obtain and maintain at least a one-year minimum emergency food supply**.

According to figures gathered by one of the food storage manufacturing firms, less than 6% of the members of the Church have an adequate emergency program.
Where do you fit into this figure?

Let's enjoy life as much as we can - but let's also **be prepared**. As we have recently seen, an unexpected disaster or loss of income can strike every s-o-o quickly.

***“When the emergency is upon us,
the time of preparation has passed.”***



Our food supply is fragile

Grocery stores don't stock weeks of food anymore. Most keep only 72 hours of food on the shelves. They re-stock based on just-in-time delivery of food supplies. If the trucks stop rolling in your part of the country during a crisis, the store shelves will be emptied almost immediately. In fact, expect a shortage of mainstay items like milk and bread to occur similar to what happens before an approaching hurricane hits. Those who are aware of the problem but who haven't already made preparations will engage in a last-minute rush to buy a few extra supplies.

Transportation is the key to food

Without transportation, farmers can't get their crops to the wholesalers or food processing facilities. Food is heavy, generally speaking, and it requires trucks and trains to move it around — a literal ARMY of trucks and trains, weaving their way from city to city, optimized and prioritized by computers. If the computers freeze, the whole transportation infrastructure will shut down.

Transportation also depends heavily on fuel, which means the oil-producing countries in the Middle East have to be able to produce the oil that gets refined into diesel fuel here in America. So, in other words, **your food supply depends on Saudi Arabia being alive and well**. Do you trust the people in charge in Saudi Arabia, Iraq, Iran, and Kuwait with your life? If you don't **make preparations now**, you're trusting them by default.

Cities depend entirely on rural land

Did you know cities would be ghost towns without the supporting imports of food from the country? We should all thank the farmers a little more, because they literally keep us all alive. Cities are like concrete islands. You might think a city is self-sustaining until you really think about it, but underneath it all, that city is a ghost town without the people in the country supporting it.

You may already know that city people and country people have very different views on politics and life in general. Country people tend to be more religious and more conservative. City people tend to be more liberal. So there's more than a little animosity between country people and city people. When a crisis hits, and the country people find they are without electricity and fuel, they will still survive, for the most part, because they're used to surviving. But do you think they will really put "saving city people" high on their list of priorities? I don't think so. Any food that's harvested from the fields will be kept and stored by the farmers themselves. They will NOT be shipping this stuff to the cities unless they have excess goods and can find a transportation method that still works (and has fuel). Unfortunately, if some emergency powers acts are signed into place by the President, the Federal Emergency Management Association will have the legal power to actually confiscate and redistribute food. This makes it all the more likely that farmers will harvest it and HIDE IT in order to keep it. And that means even less food making it to the cities. Bottom line? Cities where food can't be delivered will eventually be gutted, looted, evacuated and likely burned to the ground.

You need to start stocking food

You can do a lot if you start early. Unfortunately, "early" might have been yesterday. Now we're way past early, and you need a reasonable plan to get food supplies that will store well and don't cost too much.

You've probably already realized that buying up extra cans of soup at the grocery store is a really stupid way to spend your preparedness money. You need a better plan. Every \$10 you spend at the store might feed a person for a few days. You need more leverage, where you can spend \$10 and feed a person for a few weeks.

Buy extra, use FIFO

Go ahead and buy more food than normal when you're out shopping, and set it aside. Use the "first in, first out" rule to eat your older supplies first. Keep rotating your supplies so you never abandon food "way in the back."

Buy ingredients, not prepared foods

Ingredients such as salt, honey, oatmeal and wheat will last a lot longer than prepared foods like TV dinners, cereals, and food mixes. Naturally, as you purchase food ingredients, you'll want to practice actually using them! And remember the basics. For example, if you purchase a bag of wheat, how exactly do you plan to make flour out of it? I've personally seen plans in a survival book that described throwing some wheat in a coffee can and pounding it into flour with a blunt stick. You can make a few cups of flour after ten or fifteen minutes of noisemaking.

BARE-MINIMUM LDS Church Food storage requirements for

1 adult male for 1 year Appx. 2,300 calories per day. (only 695lbs total)

This will keep you fed, but leave you hungry. **TOTAL FOOD PER DAY = 24.65 Ounces**

Grains (400lbs)

Unless your family already eats 100% whole wheat homemade bread, white flour should be used in the transition process to whole wheat. Adding rye flour (10%) helps make wheat bread a more complete protein. Dent corn is used to make tortillas.

Beans & Legumes (90lbs) {minimum reduced to only 60lbs in 2002}

Black beans cook quickly, make a good salad complement with a vinaigrette dressing over them. Soybeans can be used to make soy milk and tofu, a protein food you should be prepared to make. Familiarize yourself with sprouting techniques. Learn how to make wheat grass juice - the best vitamin supplement you can use.

Milk-Dair products (75lbs) {minimum reduced to only 16lbs in 2002}

Milk powder can be used to make cottage cheese, cream cheese and hard cheeses. Ideally your milk should be fortified with Vitamins A & D. When reconstituting aerate to improve flavor (special mixing pitchers can accomplish this). Whole eggs are the best all-purpose egg product. Powdered sour cream has a limited shelf life unless frozen.

Meats / Meat substitute (20lbs) {minimum reduced to only 0lbs in 2002}

Use meat in soups, stews and beans for flavor. Freeze dried is the best option for real meat. Textured Vegetable protein is the main alternative to freeze dried meats.

Fats / Oils (20lbs)

This group can boost the calories one is getting from food storage products, and supply essential fatty acids.

Sugars (60lbs)

Store your honey in 5 gallon pails. Candy and other sweets can help with appetite fatigue.

Fruits / Vegetables (90lbs) {minimum reduced to only zero lbs in 2002}

Some fruits and vegetables are best dehydrated, others freeze dried (strawberries & blueberries). Fruits are a nice addition to hot cereal, muffins, pancakes and breads.

Auxiliary foods (weight varies)

Vanilla extract improves the flavor of powdered milk. The production of tofu requires a precipitator such as nigari, epsom salt, calcium chloride or calcium sulfide (good calcium source). Learn how to make and use wheat gluten (liquid smoke adds good flavor). Chocolate syrup and powdered drink mixes help with appetite fatigue. Vitamins and protein powders will boost the nutrition levels of foods that may have suffered losses during processing.

Note:

For an average adult Female - multiply the weight by 0.75

For children ages 1-3 multiply by 0.3, 4-6 multiply by 0.5, 7-9 multiply by 0.75

For adults engaged in manual labor multiply by 1.25-1.50

Do you REALLY have a year's supply?

Just how big is a Year's Supply of food? As explained on the previous page, our Church is suggesting the following minimums for each adult:

400 lbs.	Grains	(17.5oz / day)
60 lbs.	Beans	(2.6oz / day)
10 quarts	Cooking oil	(0.87oz / day)
60 lbs.	Honey	(2.63oz / day)
8 lbs.	Salt	(0.35oz / day)
16 lbs	Powdered milk	(0.70oz / day)
14 gallons	of drinking water (for 2 weeks)	

So, just how much is this?

Two 5 gallon buckets will hold about 75lbs of wheat, rice or other grains. This means you need 11 buckets of grain for each person in your family.

If you store all your grains in #10 cans...

Wheat, Rice, Corn, etc..

You would need 64 cans or 10.5 cases per person.

Pasta

You would need 32 cans or 5.25 cases per person.

Rolled oats

These are lighter but bulkier, so they require more storage containers and space. You would need 124 cans or 21 cases person.

Beans

A 25 lb bag of beans will about fit in a single 5 gallon bucket, with a little space over, so 2 buckets would hold a one person supply, or 12 -13 # 10 cans or about 2 cases.

Daily Food

Dividing 400lbs by 365days, equals out to 1.09589lbs, or just over 1 lb of grain, per person, per day. That is approximately 2 cups of unground grain to cover your breakfast lunch and dinner.

Dividing 60lbs by 365, this works out to 0.16 lbs of beans per day, or 2.6 oz—approximately 3/4 cup.

The other foods listed would also need to be used in limited amounts.

This is not much food, folks. Get the basics, then immediately begin to add more kinds of grain, soup mix, canned and/or dehydrated vegetables and fruit, etc to add variety and provide more than the minimal survival diet.

As an example, the minimum recommended amount of grain, when ground and prepared will yield about 6 small biscuits or a plateful of pancakes. Its enough to keep you alive, but a far cry from being satisfied and not hungry.

Basic Food Storage List

GRAINS = 400 lbs per adult

- _____ Barley
- _____ Cereal
- _____ Corn (meal or Dent)
- _____ Cous Cous
- _____ **Flour** (4lb/can)
- _____ Millet
- _____ **Multi grain soup mix**(5lb/can)
- _____ **Oats, rolled quick**(3lb/can)
- _____ **Oats, rolled regular**(3lb/can)
- _____ Popcorn
- _____ Rye
- _____ Sprouting Seeds
- _____ **Wheat**(6lb/can)
- _____ **White Rice**(6lb/can)

Pastas

- _____ **Macaroni**(3lb/can)
- _____ Noodles
- _____ **Spaghetti**(4lb/can)

MILK / DAIRY = 75 lbs per adult

- _____ Brick cheese
- _____ Canned Milk
- _____ Canned sour cream
- _____ Cheese spreads
- _____ Condensed milk
- _____ Dried cheese
- _____ Dried eggs
- _____ Infant formula
- _____ Non-dairy creamer
- _____ **Non-fat dry milk**(4lb/can)
- _____ Powdered cheese
- _____ Powdered sour cream

JUICES/BEVERAGES = 25 lbs

- _____ Apple juice
- _____ Apricot nectar
- _____ Baby strained juices
- _____ **Cocoa drink mix**(4lb/can)
- _____ Cranberry juice
- _____ **Dried juice mix**(6lb/can)
- _____ Grapefruit juice
- _____ Grape juice
- _____ Kool-aid
- _____ Lemonaid
- _____ Orange juice
- _____ Pineapple juice
- _____ Plum juice
- _____ Prune juice
- _____ Punch crystals
- _____ Soft drink mixes
- _____ Soft drinks
- _____ Tomato juice
- _____ V-8 juice

FATS / OILS = 20 lbs per adult

- _____ Butter
- _____ Cooking oil
- _____ Lard
- _____ Margarine
- _____ Mayonnaise
- _____ Olive Oil (extra virgin)
- _____ Peanut butter
- _____ Powdered butter
- _____ Powdered margarine
- _____ Powdered shortening
- _____ Salad dressing
- _____ Shortening

BOLD ITALIC items are generally available from the LDS cannery

CANNED or DRIED MEATS

(20 lbs per adult)

_____ Bacon
_____ Beef
_____ Beef jerky
_____ Chicken
_____ Clams
_____ Corned beef
_____ Crabmeat
_____ Deviled meats
_____ Fish
_____ Ham
_____ Hamburger
_____ Lamb
_____ Lunch meats
_____ Mutton
_____ Pepperoni
_____ Pork
_____ Tuna
_____ Salmon
_____ Sandwich spreads
_____ Sardines
_____ Sausage
_____ Shrimp
_____ Spam
_____ Treet
_____ Turkey
_____ TVP- Textured vegi Protein
_____ Veal
_____ Venison jerky
_____ Vienna sausage

AUXILIARY FOODS

_____ Baking powder
_____ Baking soda
_____ Cake mixes
_____ Calcium supplement
_____ Casserole mixes
_____ Chow mein noodles
_____ Cookies
_____ Cookie mixes
_____ Cornstarch
_____ Crackers
_____ Cream of tartar
_____ Hot roll mixes
_____ Hydrated lime (for tortillas)
_____ Instant breakfast
_____ Instant yeast
_____ Iron supplement
_____ Marshmallows
_____ MREs
_____ Muffin mixes
_____ Non perishable pet foods
_____ Pancake mixes
_____ Pastry mixes
_____ Pectin
_____ Pie crust mixes
_____ Pie fillings
_____ Pizza mixes
_____ Plain gelatin
_____ Rennin tablets
_____ Salt
_____ Sourdough starter
_____ Survival bars
_____ Tofu Solidifier
_____ Vitamins and minerals
_____ Whipped topping mixes

BOLD ITALIC items are available from the LDS cannery

FRUITS and VEGETABLES

90 lbs Dried, 370qts canned, 370Lbs fresh

Fruits

- _____ **Apples** (2lb/can)
- _____ Applesauce
- _____ Apricots
- _____ Peaches
- _____ Berries
- _____ Cherries
- _____ Coconut
- _____ Currants
- _____ Figs
- _____ Fruit cocktail
- _____ Grapefruit
- _____ Grapes
- _____ Mandarin oranges
- _____ Nectarines
- _____ Olives
- _____ Pears
- _____ Peaches
- _____ Pineapples
- _____ Plums
- _____ Prunes
- _____ Raisins
- _____ Tomatoes

BEANS & LEGUMES

(90 lbs per adult)

- _____ **Beans, pink**(5lb/can)
- _____ **Beans, pinto**(5lb/can)
- _____ **Beans, white**(5lb/can)
- _____ Lentils
- _____ Nuts
- _____ Peas
- _____ Sprouting beans and seeds
- _____ Soybeans

Vegetables

- _____ Artichoke hearts
- _____ Asparagus
- _____ Beans
- _____ Beets
- _____ Broccoli
- _____ Brussels sprouts
- _____ **Carrots** (3lb/can)
- _____ Cauliflower
- _____ Celery
- _____ Corn-sweet
- _____ Green beans
- _____ Hominy
- _____ Mushrooms
- _____ Okra
- _____ **Onions** (2lb/can)
- _____ Parsnips
- _____ Peas
- _____ Peppers
- _____ Pickles
- _____ **Potatoes, flakes** (1.5lb/can)
- _____ **Potatoes, pearls** (3lb/can)
- _____ Pumpkins
- _____ Rhubarb
- _____ Rutabagas
- _____ Salsify
- _____ Sauerkraut
- _____ Soups
- _____ Spinach
- _____ Squash
- _____ Sweet potatoes (yams)
- _____ Tomatos
- _____ Tomato powder
- _____ Turnips
- _____ Water chestnuts

BOLD ITALIC items are available from the LDS cannery

SPICES / CONDIMENTS

_____ Almond extract
_____ Allspice
_____ Baking chocolate
_____ Basil
_____ BBQ sauce
_____ Bouillon cubes / granules
Beef, chicken, onion, vegetable flavors
_____ Cayenne pepper
_____ Celery salt
_____ Chili powder
_____ Chives
_____ Chocolate chips
_____ Chocolate syrup
_____ Cinnamon
_____ Cloves
_____ Cocoa
_____ Coriander
_____ Cumin
_____ Curry
_____ Dill weed
_____ Garlic salt
_____ Ginger
_____ Gravy mixes
_____ Herbs
_____ Ketchup
_____ Lemon extract
_____ Lemon / lime juice
_____ Liquid smoke
_____ Majoram
_____ Maple extract
_____ Nutmeg
_____ Onion flakes
_____ Onion salt
_____ Orange peel

_____ Oregano
_____ Paprika
_____ Pepper
_____ Poultry Seasoning
_____ protein supplement
_____ Sage
_____ Salad dressings
_____ Salt (**5 lbs per adult**)
_____ Sauce mixes
_____ Seasoned salt
_____ Spaghetti sauce
_____ Soy sauce
_____ Steak sauce
_____ Tarragon
_____ Thyme
_____ Turmeric
_____ Vanilla extract
_____ Vinegar
_____ Worcestershire sauce

SUGARS = 60 lbs per adult

_____ Corn syrup
_____ Hard candy
_____ Honey
_____ Jello
_____ Jelly or jam
_____ Maple syrup
_____ Molasses
_____ ***Pudding, chocolate (5lb/can)***
_____ ***Pudding, vanilla (5lb/can)***
_____ ***Sugar (6lb/can)***

BOLD ITALIC items are available from the LDS cannery

Monthly Food Storage Purchasing Calendar

Compiled by Andrea Chapman

If you are just starting out, this calendar can be used any year.
Just start with the current month's items.

We have tried to keep the costs down to between \$25 and \$35 per week. This might seem rather costly, but if you want to build a good food storage in only one year, it will cost you more each week than if you spread out acquiring it over several years. Be certain to buy only items your family will use, and rotate and use the items in your storage throughout the year. Milk is an expensive item and prices keep soaring, so you might need to invest in a bit higher food storage bill to buy it right now.

* The items in the first few months are basic essentials and are the most important to purchase and store.

It is vital to get **WATER - STORAGE** . If you don't have water, you will not be able to use many of the foods you have that are dehydrated or require water to cook. Many times in natural disasters, the electricity goes down and you will not be able to access your water. Sometimes the water is contaminated from flooding and cross-contamination from sewage. You will need water, at very least, you will need 3 days worth.

January

Week #1	1 case canned fruit 2 #10 cans instant potatoes
Week #2	3 #10 cans dry milk
Week #3	3 #10 cans dry milk
Week #4	9 pounds yeast
Week #5	Anything you have missed from above

February

Week #1

Water Storage Containers-buy either 55 gallon drums, 5 gallon water containers (available at all emergency preparedness stores and some super markets) and spigot, or start to save water in pop bottles and plastic juice containers. Also purchase 100 lbs. hard white wheat and three plastic storage buckets with tight fitting lids. Check out the local mills in your area for best prices.

Week #2	25 lbs of sugar or 20 lbs of honey 5 lbs salt per person bucket opener
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Week #3	4 #10 cans shortening or 4 - 48 oz bottles oil 2 #10 cans of dry instant milk
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Week #4	2 case canned beans (like refried pinto, black, kidney, white, pink etc.) or 25 lbs dry beans (preferable) and bucket to store them in. 50 lbs dried corn or popcorn (about \$10.00 from a mill or food storage company) and a bucket to store it in. (Can be ground into cornmeal as well as for popcorn.)
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(All grains and beans can be put into #10 cans at the LDS cannery.)
(If not, the buckets work well.)

March

(please note that many of these items are repeats because we want to be SURE you have enough of the essentials!)

Week #1	Enough water containers for 14 gallons per person in the family. (This was mentioned last month-but we want to be sure you have this) (<i>Water is your most important item!</i>) If you didn't get enough containers last month, you can get them this month. White Rice , at least 15 pounds per person in the family and if possible buckets to store it. (<i>Brown Rice goes rancid faster.</i>)
Week #2	2 jars mayonnaise 1 gallon oil 2 tubs shortening
Week #3	25 pounds sugar 1- 25 pound bag of legumes (pinto, lentils, white, pink etc.)
Week #4	Salt 5 more lbs 2 bottles of bleach 1 #10 can or 1 box of dry milk .
Week #5	Check your list for the last 8 weeks and purchase any items you fell short on. These items are essential ones and you will need to be sure you have enough.

April

Week #1	100 pounds wheat 10 lbs. brown sugar
Week #2	2 #10 size cans dried fruit or 1 case canned fruit 1 pound yeast
Week #3	1 case tuna or salmon 2 #10 cans milk 3 lbs sprouting seeds 1 80 oz can Rumsford baking powder
Week #4	2 large jars peanut butter or 1 #10 can peanut butter powder (last longer) 2 cans dried whole egg (keep in a cool dry place)

May

Week #1	2 to 3 bottles of multi-vitamins 2 #10 cans of rolled oats (if #10 cans are not available in your area, buy the largest packages available) (in your local store, and also purchase a small bucket to store it in.)
Week #2	100 lbs. of wheat 3 buckets
Week #3	#10 can margarine powder - or shortening if marg. powder is unavailable 2 #10 cans rolled oats (or equivalent, and a storage bucket)
Week #4	4 #10 cans instant potatoes 1 bottle black pepper

June

Week #1	2 cans dry milk , 2 boxes of Rennet (used for making cottage cheese and other dairy products from dry milk.) 1 bottle lemon juice , 1 bottle vinegar . (also used in making dairy products from dry milk)
Week #2	100 lbs wheat 25 lbs. white flour
Week #3	Baking soda (try to buy in bulk in places like Sam's Club or Cosco) Buy about 10 lbs. 25 lbs. or legumes (choose those you are willing to eat. Remember you can sprout legumes and almost quadruple the nutritional value of them. Buy one large box Knox or other gelatin to be used in place of eggs in baking.
Week #4	Tomato products (try to buy them by the case in normal size cans. Spaghetti sauce, tomato sauce, and whole and chopped tomatoes. Buy a combination of flavored and not flavored tomatoes. Buy paste if you can get a good deal on it. It is less expensive to add water to paste to make sauce than it is just to buy sauce sometimes. <i>Buy three cases if possible.</i>)
Week #5	Be on the look out for garden seeds that are NON- Hybrid. That way you can use the seeds from the plants you grow to grow a garden the next season. A good price for them is about \$18-20 per can with about 10 varieties per can.

July

Week #1	200# wheat (buckets to store it in if needed) [keep filling pop bottles, Gallon syrup containers, etc. with water - basically no cost to this)
Week #2	20 lbs. Peanut butter [keep filling those water containers]
Week #3	4 #10 cans shortening 2 # 10 cans dry milk [keep filling water containers - make this a habit - when you empty something worthy of water storage, wash it and fill it right away]
Week #4	6 #10 cans dry milk [more water!]

August

Week #1	25# rice 25# sugar 1 # 10 can instant potatoes 5 lbs. salt
Week #2	1 case tuna or salmon or other meat 2 # 10 cans dry milk
Week #3	2 #10 cans dry milk 2 cans shortening 1 #10 can instant potatoes
Week #4	Note* In late August and early September, many stores have sales on canned fruits and vegetables. Ask your local store when these sales will be, and switch the weeks of this calendar as needed. 2 cases fruit 5 lbs. salt

Week #5 2 cases **canned fruit**
1 case misc. **vegetables** (green beans, peas, carrots, etc.)

September

Week # 1 2 cases **canned fruit**
1 case misc. **vegetables**

Week # 2 2 cases **canned fruit**
2 cans **shortening**

Week #3 2 cases **fruit**
1 case **vegetables**

Week #4 2 cans **shortening**
25# **rice**
buckets to store rice if it did not come in #10 cans

October

Week #1 100 lbs. **wheat** and 3 buckets

Week #2 1 case **tuna** or other **meat**

Week #3 25 lbs. **Sugar**
2 large cans **fruit juice powder**

Week #4 3 #10 cans **dry milk**

Week #5 9 #10 cans **potato flakes**

November

Week #1 4 large jars **peanut butter**

Week #2 1 case **canned fruit**
15 pounds **rice**

Week #3 7 #10 cans **shortening**

Week #4 50 pounds **rice** and buckets to store

December

Week #1 100 lbs. **wheat** and 3 buckets

Week #2 1 large can **fruit juice powder**
3 large jars **peanut butter**

Week #3 3 #10 cans **dry milk**

Week #4 50 pounds of **rice, oats, or barley**
buckets to store

The Seven Major Mistakes in Food Storage

By Vickie Tate

A month or two ago I met a cute little gal who was talking to me about her newly begun food storage. “You know,” she began, “I’ve dreaded doing my food storage for years, it seems so blah, but the way national events are going my husband and I decided we couldn’t put it off anymore. And, do you know, it really hasn’t been hard. We just bought 20 bags of wheat, my husband found a place to get 60 pound cans of honey, and now all we have to do is get a couple of cases of powdered milk. Could you tell me where to get the milk?” After I suggested several distributors, I asked, “Do you know how to cook with your wheat?” “Oh,” she laughed, “if we ever need it I’ll learn how. My kids only like white bread and I don’t have a wheat grinder.” She had just made every major mistake in storing food (other than not storing anything at all.) But she’s not alone. Through 14 years of helping people prepare, I found most people’s storage starts out looking just like hers. So what’s wrong with this storage plan? **There are seven serious problems that may occur trying to live on these basics:**

1.) VARIETY -

Most people don’t have enough variety in their storage. 95% of the people I’ve worked with only stored the 4 basic items we mentioned earlier: *wheat, milk, honey, and salt*. Statistics show most of us won’t survive on such a diet for several reasons. a.) **Many people are allergic to wheat** and may not be aware of it until they are eating it meal after meal. b.) **Wheat is too harsh for young children.** They can tolerate it in small amounts but not as their main staple. c.) **We get tired of eating the same foods** over and over and many times prefer not to eat than to sample that particular food again. This is called *appetite fatigue*. Young children and older people are particularly susceptible to it. Store *less* wheat than is generally suggest and put the difference into a variety of other grains, particularly ones your family likes to eat. Also store a variety of beans. This will add variety of color, texture and flavor. **Variety is the key to a successful storage program.** It is essential that you *store flavorings* such as tomato, bouillion, cheese, and onion.

Also, *include a good supply of the spices* you like to cook with. These flavorings and spices allow you to do many creative things with your grains and beans. Without them you are

severely limited. One of the best suggestions I can give you is **buy a good food storage cookbook**. Go through it and see what your family would really eat. Notice the ingredients as you do it. This will help you more than anything else to know what items to store.

2.) EXTENDED STAPLES -

Few people get beyond storing the four basic items, but it is extremely important that you do so. *Never put all your eggs in one basket*. Store **dehydrated and/or freeze-dried foods** as well as home canned and store bought canned goods. Make sure you add cooking oil, shortening, baking powder, soda, yeast and powdered eggs. You can’t cook even the most basic recipes without these items. Because of limited space I won’t list all the items that should be included in a well-balanced storage program. They are all included in the *The New Cookin With Home Storage* cookbook, as well as information on how much to store, and where to purchase it.

3.) VITAMINS -

Vitamins are important, especially if you have children, since children do not store body reserves of nutrients as adults do. *A good quality multi-vitamin and vitamin C* are the most vital. Others may be added as your budget permits.

4.) QUICK AND EASY AND PSYCHOLOGICAL FOODS -

Quick and easy foods help you through times when you are psychologically or physically unable to prepare your basic storage items. **No cook foods such as freeze-dried** are wonderful since they require little preparation. **MRE’s** (Meals Ready to Eat), such as many preparedness outlets carry, canned goods, etc. are also very good. Psychological Foods are the goodies - Jello, pudding, candy, etc. - you should add to your storage.

These may sound frivolous, but through the years I’ve talked with many people who have lived entirely on their storage for extended periods of time. Nearly all of them say these were the most helpful items in their storage to

normalize their situations and make it more bearable. These are especially important if you have children.

5.) **BALANCE -**

Time and time again I've seen families buy all of their wheat, then buy all of another item, and so on. Don't do that. It's important to **keep well-balanced as you build your storage**. Buy several items, rather than a large quantity of one item. If something happens and you have to live on your present storage, you'll fare much better having a one-month supply of a variety of items than a year's supply of two to three items.

6.) **CONTAINERS -**

Always store your bulk foods in food storage containers. I have seen literally tons and tons of food thrown away because they were left in sacks, where they became highly susceptible to moisture, insects and rodents. If you are using plastic buckets make sure they are lined with a food grade plastic liner available from companies that carry packaging supplies. **Never use trash can liners** as these are treated with pesticides. Don't stack them too high. In an earthquake they may topple, the lids pop open, or they may crack. A better container is the #10 tin can which most preparedness companies use when they package their foods.

7.) **USE YOUR STORAGE -**

In all the years I've worked with preparedness one of the biggest problems I've seen is people storing food and not knowing what to do with it. It's vital that you and your family become familiar with the things you are storing. You need to know how to prepare these foods. This is not something you want to learn under stress. Your family needs to be used to eating these foods. A stressful period is not a good time to totally change your diet. Get a food storage cookbook and learn to use these foods!

It's easy to solve these food storage problems once you know what they are. The lady I talked about at the first of the article left realizing what she had stored was a good beginning, but not enough. As she said, "It's better to find out the mistakes I've made now while there's still time to make corrections." This makes a lot more sense.

If you're one who needs to make some adjustments, that's okay. Look at these suggestions and add the things you're missing. It's easy to take a basic storage and add the es-

entials to make it liveable, but it needs to be done. As I did the research for my cookbook I wanted to include recipes that gave help to families no matter what they had stored. As I put the material together it was fascinating to discover what the pioneers ate is the type of things we store. But if you have stored only the 4 basics, there's very, very little you can do with it. By adding even just a few things it greatly increases your options, and the prospect of your family surviving on it. As I studied how the pioneers lived and ate, my whole feeling for food changed. I realized our storage is what most of the world has always lived on. If it's put together the right way we'll be returning to good basic living with a few goodies thrown in.

COMMON STORAGE FOODS

Herein is covered a range of foods suited for incorporation into home storage programs.

As you review them there are several considerations you should keep in mind when deciding on what foods you want to include.

The first is *variety in the diet*. This is of great importance but many do not give it adequate thought. Some simply buy however much wheat, corn, rice, or beans they think is necessary to meet their needs and leave it at that. Others rely on prepackaged decisions made for them by their storage food retailer who put together a “year’s supply of food” to buy all at once. Either decision could possibly be a mistake.

There are many food storage plans one may use as a guide. Some are based on the so-called “Mormon Four” of wheat, milk, honey and salt, with as many additional foods as the planner found desirable. This plan was developed in the 1930’s and we’ve learned a great deal about workable food storage in the decades hence. Among which are the food allergies that an unfortunate number of people in our society develop.

One of the more common food allergens is wheat. Even more unfortunate is the fact that many who have such an allergy are unaware of it. They won’t become aware until they try to live with whole grain wheat as a large part of their diet and their latent allergy reveals itself. Another thing we have learned is that many adults suffer from an intolerance to the milk sugar lactose, especially those of certain ethnic backgrounds. For these reasons and more you should always make it a practice to **store what you eat** AND TO **eat what you store**, so that ugly surprises such as these do not arise after it’s too late to easily avoid them.

A second reason to think about storing a wide variety of foods is *appetite fatigue*. There are those who think providing variety in the diet is relatively unimportant and that if and when the time comes they’ll eat what they’ve got and that will be that. For healthy, well adjusted adults under ordinary circumstances or for those who have the vital *survival mindset* this might be possible without too much difficulty. However, the reason for having a home food storage program in the first place is for when circumstances aren’t ordinary.

Times of crisis produce stress - possibly physical, but always mental. If you are suddenly forced to eat a diet both alien and monotonous, it is going to add that much more stress on top of what you are already dealing with. If your planning includes the elderly, young children, and/or infants there is a significant risk they will quit eating or refuse to eat sufficient amounts of the right foods leaving them unable to survive. *This is not a trivial problem and should be given serious consideration.* When it’s wheat, day in and day out, wheat’s going to start becoming unpopular fast. Far better to have a variety of foods on hand to forestall appetite fatigue and, more importantly, *to use those storable foods in your everyday diet so that you’ll be accustomed to eating them.* In his book, ***Making the Best of Basics***, James Stevens mentions a post-WWII study by Dr. Norman Wright, of the British Food Ministry, which found the people of England and Europe were more likely to reject unfamiliar or distasteful foods during times of stress than under normal conditions. *Consider the positive aspects of adding variety and comfort foods to your storage program.*

A last thought that I want to give for ALL foods you might put into your program. Unless you are already familiar with **and** eating a particular type and brand of food do not put large quantities of it into your pantry until you – preferably everyone who will be depending on that food – have eaten some of it first. It’s not always as easy to pick up a new food as it may first appear. Differences between brands of foods alone can sometimes be enough to disappoint you when consumed. You’d hate to discover that you cannot abide a particular food item after you’ve brought home a case of Brand X. Seriously relying on any food that you are not already familiar with is making a fools bet.

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GRAINS AND LEGUMES

ABOUT GLUTEN:

As you read through the grain descriptions below you will come across frequent mention of “gluten”. Gluten is a combination of proteins found in some grains which enables the dough made from them to rise by trapping the gases produced by yeast fermentation or chemical reaction of baking powder or soda. The amount of these proteins varies depending on the species of grain and varieties within a species. Some grains such as rice have virtually no gluten at all and will not produce a raised loaf by itself while others like hard winter wheat have a great deal and make excellent raised bread. As a general rule yeast raised breads need a fair amount of gluten to attain good dough volumes while non-yeast raised breads may need little or none at all. Whether gluten content is of importance to you will depend upon the end uses you intend for your grain.

Some of the common and relatively uncommon types of grains are listed below.

AMARANTH:

Amaranth is not a true cereal grain at all, but is a relative of the pigweeds and the ornamental flowers we call “cock-scomb”. It’s grown not only for its seed, but for its leaves that can be cooked and eaten as greens. The seed is high in protein, particularly the amino acid lysine which is limited in the true cereal grains. It can be milled as-is, or toasted to provide more flavor. The flour lacks gluten, so is not suited for raised breads by itself, but can be made into any of a number of flat breads. Some varieties can be popped like popcorn, boiled and eaten as a cereal, used in soups, granolas, and the like. Toasted or untoasted, it blends well with other grain flours.

NOTE: *Like some other edible seeds, raw amaranth contains biological factors that can inhibit proper absorption of some nutrients. For this reason amaranth seeds or flour should always be cooked before consumption, whether for human food or animal feed.*

BARLEY:

Barley is thought by some to be the first grain intentionally cultivated by man. It has short, stubby kernels with a hull that is difficult to remove. Excluding barley intended for malting or animal feed, this grain is generally consumed directly by humans in two forms. Most common is the white, highly processed pearl barley with much of its bran and germ milled off

along with its hull. It is the least nutritious form of barley. The second offering is called pot or hulled barley and it has been subjected to the same milling process as pearled, but with fewer trips through the polisher. Because of this, it retains more of the nutritious germ and bran, but does not keep as well as the more refined product without special packaging. Unless you are prepared to try to get the hulls off I don’t recommend buying unhulled barley. Although it can be milled into flour, barley’s low gluten content will not make a good loaf of raised bread. It can be combined with other flours that do have sufficient gluten to make leavened bread or used in flat breads. Barley flour and flakes have a light nutty flavor that is enhanced by toasting. Whole barley is commonly used to add thickness to soups and stews.

Recently, a hull-less form has become available on the market through a few suppliers. This is whole grain barley with all of its bran and germ intact and should have the most nutrients of any form of this grain available. I don’t know yet how suitable it is for long term storage.

BUCKWHEAT:

Buckwheat is another of those seeds commonly considered to be a grain, but which is not a true cereal. It is, in fact, a close relative to the docks and sorrels. The “grain” itself is a dark, three cornered seed resembling a tiny beechnut. It has a hard, fibrous hull requiring a special buckwheat huller to remove. Here in the U.S., buckwheat is most often used in pancakes, biscuits and muffins. In Eastern Europe and Russia it is known in its toasted form as kasha. In the Far East, it’s often made into soba or noodles. It’s also a good bee plant, producing a dark, strongly flavored honey. The flour is light or dark depending on how much of the hull has been removed before grinding. Dark flour is much more strongly flavored than lighter flour, but because of the high fiber and tannin content of its hull, which can interfere with nutrient absorption, it is not necessarily more nutritious. Buckwheat is one of those foods with no middle ground in peoples opinions — they either love it or they hate it. Like amaranth, it’s high in lysine, an amino acid commonly lacking in the true cereal grains.

CORN (maize):

Corn is the largest grain crop in the U.S., but is mostly

consumed indirectly as animal feed or even industrial feedstock rather than directly as food. As one of the Three Sisters (maize, squash and beans) corn was the staple grain of nearly all of the indigenous peoples of the American continents before the advent of European colonization. This American grain has an amazing variety of forms. Major classes are the flint, dent, flour, and popcorns. To a certain extent, they're all interchangeable for milling into meal (sometimes known as polenta meal) or flour (very finely ground corn, not cornstarch). The varieties intended to be eaten as sweet corn (fresh green corn) are high in sugar content so do not dry or store well relative to the other corns but instead are usually preserved as a vegetable. There are a number of lesser corn varieties with specialized uses that do not lend themselves to direct food use, but these are seldom found in the open market.

As a general rule of thumb, the flint varieties make better meal as they have a grittier texture than most other corns. If meal, hominy and hominy grits (commonly called just "grits") are what you are interested in then use the flint type if you can find a source. If you intend to make corn masa for tortillas and tamales, then the flour corns are what you want, but these are fairly uncommon on the commercial market so the dent corns are next best. Yellow dent seems to be the most commonly available and will work for almost any purpose except popping.

Popcorn is for snacks or used as a cold cereal after popping or can be ground into quite acceptable meal. In my experience I have found it difficult to hull popcorn with alkali treatment for making hominy (posolé, nixtamal) though your mileage may vary. Popcorn is one form of a whole grain available to nearly everyone in the U.S. It is so common a snack food, particularly at movie theaters, fairs, and ball games, that the smallest of towns will often have at least one business selling it cleaned, dried, and ready to pop in twenty-five or fifty pound bags. Popcorn is harder than other varieties of corn so if your mill is not of the heavy duty sort you may want to consider cracking the kernels into coarse pieces first then grinding into finer textured meal. The Family Grain Mill states that it should not be used to mill popcorn at all and the Back To Basics mill should not be used for any great quantity. All other manual and electric mills that I am aware of will mill popcorn without problem.

Once you've decided on your preferred corn type you may also be able to choose your preferred color. There

are yellow, white, blue, red, and multicolored varieties. The yellow and whites are the most common by far with the blues, reds, and parti-colored varieties mostly being relegated to curiosities, though the blue and red corns have been gaining in popularity these last few years. These would be worth investigating if you can find a good source. It should be kept in mind that white corn does not have the carotene content (converts into vitamin A) of yellow corn. As vitamin A is one of the major limiting nutrients in long term food storage, any possible source of it should be utilized. For this reason I suggest storing yellow rather than white corn. Additionally, much of the niacin content of corn is chemically bound up in a form not available for human nutrition unless it has been treated with an alkali. This is really of importance only if most of your sustained daily calorie intake will come from corn, but grits, hominy (posolé) or corn masa (for tortillas and tamales) are traditional uses of this grain and can go a long way toward increasing the number of recipes you can make with corn. Give them a try, they're quite good.

Any grain as widely grown as corn is naturally going to be processed into many products. Here are a few suited for use in home storage programs.

Corn Meal (polenta meal): This is simply dry corn ground into a meal. Corn meal intended for polenta may be found in either a coarse or a fine grind. In the U.S. corn meal for making corn bread and most other uses is typically ground to a fairly fine meal. Very finely milled corn is often used for bread-ing foods to be fried and is known as corn flour to distinguish it from coarser meals. This sometimes causes confusion because corn starch (see below) is also known as corn flour in Great Britain - a very different product and not really interchangeable.

The germ of the corn kernel contains about twice the oil content of wheat and is highly susceptible to rancidity once the kernel is broken in the milling process. Because of this most commercially available corn meal will have had the germ and hull removed to extend shelf-life then nutritionally enriched to make up for some of the vitamins and minerals lost with the grain germ. This is desirable for the miller and the grocer, but for the diner it comes at a cost of flavor and some of the nutrition of the whole grain. Some grocers may offer a whole grain corn meal that keeps the grain germ and bran which gives a superior flavored product and retains the full nutrition of the grain but makes for a more perishable commodity. If you go this route be sure of your product's freshness then store it in your refrigerator or freezer.

The grocer's corn meal is mostly milled from yellow or white corn, but some suppliers are now offering blue or even red corn meals. The flavor of the degerminated yellow and white meals are largely indistinguishable from each other, but blue and red corns are interestingly different. Might be worth investigating if you can find them.

Storage life of degerminated corn meal is about one year in average conditions in store packaging and a good deal longer if you repackage it for long term storage. Whole grain meal is good for about four weeks on the shelf, months in the refrigerator, and several years in the freezer or if carefully put up in oxygen free packaging. If you have a grain mill I recommend storing your corn meal in the form of whole corn and milling it as needed. This is what we do, milling a few weeks worth of meal at a time then keeping it in the freezer until needed. The fresh whole grain meal has a much fuller corn flavor than the degerminated meal from the grocery store.

Hominy (posolé’): This is corn with the hull, and possibly the germ, removed. Hominy cooks faster than unhulled whole corn, is easier to digest, and in some circumstances the alkali peeled varieties can present a superior nutritional profile to whole corn. There are two methods of producing hominy: Mechanical dehulling in a wet milling process or by treating with one of a number of various alkalis such as industrial lye (sodium hydroxide), wood ash lye (mostly potassium hydroxides) or by using some form of lime (calcium hydroxide).

Dry lye peeled hominy is now seldom found for sale, but canned white or yellow hominy is still common across the Southern U.S. and many other areas as well as in Latin American groceries. Generally speaking hominy produced using lime is known by its Spanish name – posole’ – but this will not always be clear on labels. I have seen can labels of lime peeled hominy simply called hominy. Whether this is important to you depends on the particular flavor you are trying to achieve in the dish you are preparing. Freshly hulled corn using the lime process that is to be ground to make masa (dough) for corn tortillas is called nixtamal. Dry posole’ can be found in Latin American groceries or ordered from the Internet in nearly any color that corn offers. There's a world of things that can be done with hominy other than simply heating it up and serving with butter and salt. A few minutes spent searching the Internet will produce dozens of recipes using hominy as a major ingredient. It's an excellent ingredient in hearty soups and stews.

Hominy Grits: Usually just called “grits” this coarsely ground meal can be either simple whole corn ground coarse or corn

that has been hulled in a process using a form of lye to make hominy then dried and coarsely ground. Grits produced from lye peeled corn typically cook faster, have a longer shelf life, and presents a different, possibly superior, nutritional profile than the whole grain product. Grits produced from whole corn take much longer to cook, have a short shelf life if not refrigerated or put up in special packaging, a superior flavor to the lye peeled product, and retains the nutrition of the whole grain. Very coarsely ground grits is also known as samp.

Hominy grits in the U.S. must be enriched like many other refined grain products and are now typically industrially produced. They are usually what you will find at your local grocers. Whole grain grits are primarily the product of grist mills making stone ground products and are often found in living history demonstrations, heritage fairs, pioneer day celebrations, and so on. Both yellow and white corns are commonly milled for grits and which one you should buy probably depends on what you ate growing up. If you're indifferent as to the color of your grits then I suggest buying yellow corn grits as the beta carotene content of yellow corn can be converted by our bodies into Vitamin A whereas white corn has none.

Masa Harina: In Spanish “masa” means “dough” and “harina” means “flour” which is a straight forward description of what masa harina is: A lime peeled corn that has been dried and milled into meal to be made into tortilla dough. It's flavor is distinctively different from either corn meal or hominy grits and is used in making tortillas, tamales, and many other Southwestern, Mexican, Central and South American dishes. Can often be found in mainstream grocery stores and grocers catering to a Latin American trade. Will store on the shelf for about a year and even longer if refrigerated or put up in good storage packaging. If you have a mind to try making your own tortillas you will save yourself much time and effort by using a tortilla press. These can be found in some groceries catering to a Latin American clientele or ordered over the Internet.

Corn Starch: A common starch used as a thickener. Made by a roller milling process removing the hull and germ leaving behind a nearly pure starch. Storage life is indefinite if kept dry. In the United Kingdom and some other areas it is known as corn flour which occasionally causes confusion with very finely milled corn also known as corn flour here in the States. The two products are largely not interchangeable.

MILLET:

Millet is an important staple grain in North China and India, but is little known in the U.S, where we mostly use it as bird feed. The grain kernels are very small, round, and usually ivory colored or yellow, though some varieties are darker. A lack of gluten and a rather bland flavor may account for the anonymity of this cereal. Millet has a more alkaline pH (and a higher iron content) than other grains which makes it very easy to digest. A major advantage of millet is that it swells a great deal when cooked and supplies more servings per pound than any other grain. When cooked like rice millet makes an excellent breakfast cereal. It has little gluten of its own, but mixes well with other flours. Adding whole millet kernels to the dough can add a pleasant crunch to your home made breads.

OATS:

Though the Scots and the Irish have made a cuisine of oats, it is mostly thought of in the U.S. as a bland breakfast food. Seldom found as a whole grain, it's usually sold processed in one form or another. Much like barley, the oat is a difficult grain to separate from its hull. Besides its longtime role as a breakfast food, oats make an excellent thickener of soups and stews and a filler in meat loafs and casseroles. Probably the second most common use for oats in America is in cookies and granolas. A little creative thought can really increase their culinary range.

Listed below are the forms of oats found in the U.S. Rolled and cut oats retain both their bran and their germ.

Oat groats: These are whole oats with the hulls removed. They are not often found in this form, but can sometimes be had from natural food stores and some storage food dealers. Oats are not the easiest thing to obtain a consistent grind from so producing your own oat flour takes a bit of experience. If you have a roller mill or attachment you can produce your own oatmeal using whole oat groats.

Steel cut oats: Also known as Irish, pinhead or porridge oats. They are oat groats cut into chunks with steel blades. They're not rolled and look like coarse bits of grain. Steel cut oats can be found in many supermarkets and natural food stores. They take longer to cook than rolled oats, but retain more texture. They need oxygen free packaging to be kept at their best for long term storage.

Rolled oats: These are also commonly called old fashioned, thick cut or porridge oats. To produce them, oat groats are steamed and then rolled to flatten. They can

generally be found wherever oats are sold. They take slightly longer to cook than do the quick cooking oats, but they retain more flavor, texture and nutrition. This is what most people will call to mind when they think of oatmeal.

Quick cooking rolled oats: These are just steamed oat groats rolled thinner than the old fashioned kind above so that they will cook faster. They can usually be found right next to the thicker rolled oats.

Instant rolled oats: These are the "just add hot water" or microwave type of oat cereals and are not particularly suited for a storage program. They do, however, have uses in "bug out" and 72 hour food kits for short term crises.

Whole oats: This is with the hulls still on. They are sold in feed & seed stores and sometimes straight from the farmer who grew them. Unless you have some means of getting the hulls off, I don't recommend buying oats in this form. If you do buy from a seed supplier, make certain that they have not been treated with any chemicals that are toxic to humans.

QUINOA:

Quinoa is yet another of the grains that is not a true cereal. It's botanical name is *Chenopodium quinoa* (pronounced "keen-wah"), and is a relative of the common weed Lambsquarter. The individual kernels are about 1.5-2 mm in size and are shaped rather like small flattened spheres. When quinoa is cooked, the germ of the grain coils into a small "tail" that lends a pleasant crunch when eaten. Some forms of this grain have a bitter tasting water soluble component that should be removed by a thorough washing unless this was already done by the processor as most of the quinoa sold in the U.S. apparently has. There are several varieties of quinoa that have color ranging from near white to a dark brown. The larger white varieties are considered superior and are the most common.

RICE:

Rice is the most widely consumed food grain in the world with the U.S. being the leading exporter of this important staple, though we actually only produce about 1% of the global supply. The majority of the world's rice is eaten within five miles of where it was grown.

Much like wheat and corn, rice comes in a number of varieties, each with different characteristics. They are typically divided into classes by the length of their kernel grains; short, medium and long.

Short grain rice: The short grain variety is a little softer and bit moister when it cooks and tends to stick together more than the longer rices. It has a sweeter, somewhat stronger flavor than long grain rice.

Medium grain rice: The medium grain variety is not very common in the States. It has flavor like the short variety, but with a texture more like long.

Long grain rice: The long grain variety cooks up into a drier, flakier dish than the shorter types and the flavor tends to be blander. It is the most commonly found size of rice on American grocery shelves.

Each of the above may be processed into brown, white, parboiled or converted, and instant rice. Below is a short discussion of the differences between the various types.

Brown rice: This is whole grain rice with only the hull removed. It retains all of the nutrition and has a pleasant nutty flavor. From a nutritional standpoint it is by far the best, but it has one flaw: The essential oil in the germ is very susceptible to oxidation and soon goes rancid. As a result, brown rice has a shelf life of only about six months unless given special packaging or storage. Freezing or refrigeration will greatly extend this. It's possible to purchase brown rice from long term food suppliers already specially packaged in air tight containers with an inert nitrogen atmosphere or you can do it yourself. In this kind of packaging, (if properly done), the storage life can be extended for several years.

Converted rice: Converted rice starts as whole rice still in the hull which undergoes a process of soaking and steaming until it is partially cooked. It is then dried, hulled and polished to remove the bran and germ. The steaming process drives some of the vitamins and minerals from the outer layers into the white inner layers. This makes it more nutritious than polished white rice, but also makes it more expensive. Its storage life is the same as regular white rice.

White rice: This is raw rice that has had its outer layers milled off, taking with it about 10% of its protein, 85% of its fat and 70% of its mineral content. Because so much of the nutrition is lost, white rice sold in the U.S. has to be "enriched" with vitamins to partially replace what was removed. It stores very well and is generally the cheapest form of rice to be found in the market place making it a very common storage food.

Instant rice: The type of rice is fully cooked and then dehydrated needing nothing more than the addition of water to reconstitute it. In a pinch, it's not even necessary to use hot water. It's not particularly suitable for inclusion in storage pro-

grams, but may have a place in "seventy-two hour" and other short-term emergency kits. The white variety is by far the most common, but in the last few years instant brown rice has made an appearance on the market.

RYE:

Rye is well known as a bread grain in the U.S. It has dark brown kernels longer and thinner than wheat, but less gluten. Rye flours can be found in varying stages of refinement from dark whole grain flour to semi-refined medium to pale fully refined offerings. Bread made from this grain tends to be dense unless gluten is added (often in the form of a lot of wheat flour). German pumpernickels and Russian black breads, made with unrefined rye flour and molasses, are two of the darkest, densest forms of rye bread. Many sourdoughs are built upon a rye base with a resulting interesting, intense flavor.

SORGHUM:

Sorghum is probably more widely known here in the States for the syrup made from the sweet juice squeezed from the stalks of some varieties of this grain. Also known as "milo", it is one of the principle cereal grains of Africa. Its seeds are somewhat round, a little smaller than peppercorns, of an overall brown color with a bit of red and yellow mixed in. The varieties called "yellow endosperm sorghum" are considered to have a better taste. It is a major feed grain in the Southwestern U.S. and is where the vast majority of the national production goes. Like most of the other grains, sorghum is low in gluten, but the seeds can be milled into flour and mixed with higher gluten flours or made into flat breads, pancakes or cookies. In the Far East, it is cooked and eaten like rice, while in Africa it is ground into meal for porridge. It's also fermented for alcoholic beverages.

TEFF:

Easily the smallest of the grains, teff kernels are only about 1/32nd inch in diameter. The name itself means "lost" because if dropped on the ground, it's too small to recover. It's been very little known until recently, but has been a staple grain in Ethiopia for nearly five millennia. Small amounts are now being grown in South Africa and the United States. This grain ranges in color from reddish brown to near white. It has a protein content in the 10-12% range, good calcium and a useful source of iron. It is traditionally used in making the Ethiopian flat bread "injera", but has no gluten content of its own. It'll combine well with wheat flour though and has something of a sweetish flavor.

TRITICALE:

Triticale is not a creation sprung from the smooth brows of Star Trek script writers. It is, in fact, a cross between durum wheat and rye. This youngest of grains combines the productivity of wheat with the ruggedness of rye and has a high nutrition value. The kernels are gray-brown, oval shaped larger-than-wheat and plumper than rye. It can be used in much the same way as either of its two parents. It will make a raised bread like wheat does, but its gluten is a bit weak so wheat flour is frequently added to strengthen it. Because of the delicate nature of its gluten, excessive kneading must be avoided.

WHEAT:

The most widely consumed grain in the United States and along with rice and corn one of the three most widely grown in the world. Wheat is also one of the most intensively processed to turn into food of all the grains. It comes in a number of different varieties each more suitable for some purposes than others based on its particular characteristics. The most common classifications of these varieties are based on their respective growing season, hardness of kernel, and color of their bran layers - spring or winter, hard or soft, red or white.

The hard wheats have kernels that tend to be small, hard in texture, and with high protein (primarily gluten) contents. As a general rule, hard varieties have more protein than soft varieties. Yeast raised breads that need a lot of gluten are where it's at for the hard wheats.

The soft wheats have kernels tending to be larger, plumper and softer in texture than hard wheats. As their gluten content is lower they are primarily used in biscuits, pastries, quick breads, some pastas, and breakfast cereals where a higher gluten content would contribute an undesirable tougher texture. Soft wheats do not produce as fine a loaf of yeast raised bread as high gluten hard wheat, though it can still be used for yeast breads by combining with higher gluten flours or using methods suitable for its protein level. Many traditional European yeast raised breads are made with lower protein flours.

Durum wheat also has a very hard kernel and a high protein content, but of a somewhat different nature than the other hard wheats. Durum is not primarily used for breads but is instead consumed mostly in the manufacture of pasta where it lends its characteristic yellowish color to the finished product. There are some specialty breads that call

for durum/semolina flour so it can be used for bread making even if it's not best suited to the task.

Winter wheats are planted in the Fall, over winter in the field, grow through the Spring and are harvested early the next Summer. Spring wheats are planted in the early Spring and are harvested the following Fall. Red wheats comprise most of the hard varieties while white wheats comprise most of the soft. Recently, hard white wheats have been developed that are very suitable for yeast raised bread making. Some feel the hard white varieties make a better tasting whole wheat bread than the hard reds and I am inclined to agree. When milled, whole grain hard white wheat flour looks somewhat like unbleached refined white flour in appearance.

The hard red varieties, either spring or winter, are commonly chosen for storage programs because of their high protein content which should be no less than 12% with 14% or more being excellent. The hard white spring wheats are still relatively new and not yet as widespread but are steadily growing in popularity. They have the same excellent storage characteristics as the hard red wheats and should be selected with the same protein contents as well.

With so many different varieties of wheat it should come as no surprise that there are a number of different types of wheat flour offered to the home baker. Distinguishing between the array of products available through both retail grocery stores and commercial supply houses catering to bakers nearly requires the knowledge of a professional baker or a cereal chemist and would take up page after page to explain it all. Instead I will briefly cover only those flours or flour products that one can usually find in supermarkets in the U.S. and elsewhere. If you need more advanced knowledge in order to purchase through commercial or institutional food channels I recommend taking your questions to the Usenet newsgroups `rec.food.baking`, `sci.bio.food-science`, or `alt.bread.recipes` where you may be able to get answers from professionals in the field.

All Purpose Flour: Of all the flours in the retail market all-purpose flour is the one most subject to major differences between brands, regions of the U.S., and/or other nations. This refined flour is typically made from a blend of hard and soft wheats with a protein content that can range from as low as 8% to as high as 12%. The regional brands of the Southern U.S. have traditionally been on the lower end of the protein scale. This is due to the fact that historically only soft wheats were grown in the South and the resulting flour was best used in making biscuits and other types of non-yeast

raised breads that did not require high gluten levels. The regional brands of the Northern U.S., and Canada are typically at the high end of the protein scale at or approaching 12%. This is because hard wheats are primarily northern grown and are well suited to making yeast raised breads which need higher gluten levels as were customarily made there. The national brands either differ by region or are in the 10-11% range in an effort to try to satisfy all markets.

In the U.S. all-purpose flour is enriched and can be had either bleached or unbleached and may possibly have small quantities of malt added as well (see below about enrichment, bleaching and malting).

As the name implies all-purpose is meant to serve as a general all-around flour from which you can make anything from cakes and pie crusts to sandwich bread. So far as it goes you can, but it's a lot like one-size-fits-all clothing in that chances are it won't work as well for a given project as a flour milled with that particular use in mind. The lower protein all-purpose flours sold in the Southern U.S. will produce a more tender biscuit, cake, or pie crust than the higher protein all-purpose flours of the Northern U.S. and Canada, but unless you use some special techniques (like how true French bread is made) it won't produce a very satisfying loaf of yeast bread. The flours in 10-11% range try to strike a happy medium between the two, but still won't serve as well as flour produced specifically with a given end use in mind. If you want to limit the number of types of flour you put into your storage program I'd recommend going with the 10-11% flours and either plan on adding gluten as needed to make the best yeast raised breads or cornstarch to produce more tender cakes and pie crusts.

In the United Kingdom and Canada all-purpose flour is oft times labeled as "plain flour", "top patent", "general purpose", or "family flour."

Bread Flour: A refined white flour with a higher protein (gluten) content than most all-purpose flours to achieve better performance in making yeast raised breads. Protein levels should be at least 12% with 13-14% better still.

As this is a refined flour in the U.S. it will be enriched with added vitamins and iron, and can be found either bleached or unbleached. Because it is intended primarily for use in yeast raised breads this flour will usually have other additives such as small amounts of malt to improve yeast performance and vitamin C (ascorbic acid) to improve dough volume and texture. Some bread flours may also be treated with potassium

bromate to improve gluten qualities, but concerns over possible toxicity of this additive is leading to its diminished use.

A high gluten refined bread flour is commonly added to whole wheat doughs to strengthen them which can improve loaf rises and volume. Bread flour is most commonly used in the production of yeast raised breads, pizza crusts, and some specialty baked goods. In Great Britain bread flour is often labeled as "Strong Flour" meaning it has a high protein content.

Whole Wheat Flour: Real whole wheat flour should include 100% of the bran and germ so read your ingredient labels carefully to be sure this is so. This flour is mostly milled from hard red wheats, but whole grain hard white flour is available from some mills and will produce a bread that looks closer to refined white bread if that is what you are accustomed to eating. Protein contents can vary, but as most whole wheat flour is used in yeast bread making it should be at least 12% with 13-14% being better still. This is good because the bran and the germ can interfere with good gluten development as the dough is mixed and kneaded. Some do not mind this while others strengthen their flour by adding vital wheat gluten or high protein refined bread flours to achieve the rise and volume they are accustomed to in yeast breads. Approximately 90% of the total protein of a kernel of wheat is gluten with the remaining 10% other proteins being mostly found in the grain germ. Refined flours have had the germ removed so a statement of protein content can be taken as an indication of that flour's suitability for making raised yeast breads. With whole wheat flours one must remember that ten percent of non-gluten germ proteins and judge that flour's protein content accordingly. Whole wheat flour milled from lower protein soft wheats may be offered as "whole wheat pastry flour" so be sure of what you are buying. Some whole-wheat flours are also enriched.

Whole wheat flour may also be called "Graham Flour", sometimes simply "Stone Ground Wheat Flour" and in Great Britain, Canada, and Australia may be known as "Whole Meal Flour." In Britain there is also a "Brown Flour" which is midway between whole meal and white flour in that it retains about 85% of the wheat kernel rather than only the 72-75% that is typical of refined white flours.

The real disadvantage to storing whole wheat flour is that like other processed grain products that includes the oil rich germ it wants to go rancid. How fast this can happen depends upon temperature, moisture, etc, but four to six

weeks is generally enough time for rancidity to become noticeable. One can, of course, package the flour in good containers with oxygen absorbers and the like, but better still would be to buy the flour in the form of whole wheat berries and mill them yourself. This is exactly what I and many other folks with food storage programs do. Baking with fresh, whole wheat flour is something of an art so the time to get good with it is right NOW while you can toss your failures to the chickens rather than having to eat them regardless because you can't afford to waste the food.

Vital Wheat Gluten: Sometimes labeled as simply “wheat gluten.” This is the purified gluten of hard wheat extracted from flour. It is generally 75-80% protein and is used to strengthen weak or whole grain flours for making yeast raised breads or made into “seitan” a wheat protein meat substitute. Somewhat confusing the issue is “High Gluten Flour” which is available in some markets. Careful investigation is needed here because this flour can range from a mere high gluten bread flour (approx 14%) to a gluten enriched flour typically 40%+) all the way up to purified wheat gluten (75%+). Be clear as to what it is you're buying and if you're not certain contact the manufacturer. If your whole wheat bread is not rising for you as much as you'd like then an addition of a few spoonfuls of gluten or some high gluten flour may perk it up a bit.

Cake Flour: Typically the lowest protein content (6-8%) flour available to the home baker. This highly processed flour will make the tenderest cakes, cookies, and biscuits but performs poorly for yeasted breads. The flour is nearly always bleached (chlorinated) both to give it a bright whiteness and to improve its moisture holding capacity for cakes calling for a high ratio of sugars or fats. Unless you make a lot of cakes this is a rather specialized item to store.

Pastry Flour: Similar to cake flour, but generally slightly higher in protein, not chlorinated, and may be found bleached or unbleached. Used to produce tender pie crusts, biscuits, etc. Very similar to the regional all-purpose flours of the Southern U.S. Can also sometimes be found in a whole-wheat version as well. In Great Britain, Canada, and Australia may be known as “soft flour.”

Semolina/Durum: Produced from durum wheat this flour is typically high in protein, 12% or more, enriched, unbleached with a distinctive pale yellow color. Texture depends largely on brand and can range from fairly coarse to bread flour fine. Most commonly used in the production of pastas, noodles, and couscous, but some specialty

bread types call for semolina flour. May also be known as “alimentary flour”, “macaroni flour”, or “pasta flour.” Farina, a coarse meal used as a breakfast cereal, is made from durum wheat.

Self-Rising Flour: This is ordinary refined and enriched all-purpose flour to which approximately 1.5 teaspoons of baking powder and 0.5 teaspoons of salt have been added to each cup of flour. This flour has its fans, but it's not well suited to long storage as the baking powder wants to go flat over time even with special packaging. Nor is it suited to making yeast raised breads. Most self-rising flours are in the mid to low end of the protein scale (8-10%) because this is where chemically leavened quick breads perform best to achieve good rises and textures. You can make your own self-rising flour by adding in the requisite amount of double acting baking powder and salt mentioned above which is what I recommend doing rather than trying to store the ready-made product. Self-rising flour is sometimes known as phosphated flour (for the baking powder used in it) and in Great Britain, Canada, and Australia may be known as “self-raising flour” or “raising flour.”

Instant Flour: This specialized flour product is also sometimes known as “shaker flour” for the shaker can in which it's usually found. This is a low-protein flour in a granular form processed for easy and rapid dissolution into hot or cold liquids for making sauces, gravies, and batters. A fairly specialized item which any worthy cook can use ordinary flour to replace.

FLOUR TREATMENTS AND ADDITIVES

Flour milling companies (and home bakers) use a variety of additives and treatments in their flours to improve or suppress a particular quality in their product. If you read the package labels carefully you can discern quite a lot about what has and has not been done. Here are a few of the more common:

Enrichment: U.S. law (and some other nations) requires that refined flours which have had their bran and germ portions removed to be “enriched” by adding back a portion of the niacin, thiamin, riboflavin, folic acid, and iron that were lost in the refining process. Some milling companies go even further by adding vitamins A & D as well. There are various opinions about the value of this enrichment, but it's there. It has no affect on the taste, color, texture, caloric value, or baking qualities of the flour. Outside of the U.S. refined white flours

may or may not be enriched so study your package labels carefully if this concerns you.

Bleaching: White bread and white cakes come by their snowy beauty thanks to bleaching. This is a process by which the yellowish carotenoid pigments that naturally occur in wheat are bleached white in order to improve the appearance of the flour and perhaps to change some of its physical characteristics as well. This would occur naturally by itself were the refined flour allowed to sit around for several months, but it's an uneven process and time is money to the milling companies who cannot afford to have large stocks of product sitting around in their warehouses for long periods of time.

Beyond making naturally off-white flour snowy in appearance bleaching can perform several other functions which the individual baker must decide if they are important to his needs. Until fairly recently much refined flour was also "bromated" using potassium bromate both to lighten the color, and to improve the qualities of the gluten. Concerns over the toxicity of this chemical has led to its gradual decline or outright ban on its use. Other bleaching agents are now used such as chlorine gas, chlorine dioxide, benzoyl peroxide and possibly others as well. Flours treated in this fashion will often exhibit improved loaf volume, finer grain, and look better in the finished product.

Cake flour is generally chlorinated not only whiten but also to improve its moisture holding ability when used in cakes with a high ratio of sugar and fat to flour. This bleaching also further tempers the already low gluten of the flour to produce the tenderest possible texture.

For the folks who do not care to buy bleached flours, small amounts of ascorbic acid (vitamin C) are often added as a dough conditioner and yeast nutrient. Home bakers often add their own vitamin C to their breads when they make them for the same reasons. A mere 1/8 tsp of ascorbic acid per cup of flour is all that is necessary.

All bleached flours must be so labeled in the U.S.

Malting: Many bread flours and some all-purpose flours will have small amounts of malt, malted barley flour, malt flour, or diastatic malt added to them. This additive improves the performance of the yeast by providing enzymes which speed the conversion of some of the flour starches into the digestible sugars the yeast use as fuel which can improve both the rise of the dough and the flavor of the finished product. The malt can also serve to improve the appearance of the bread when

baked and lengthen its shelf life. You can add your own diastatic malt in the ratio of about 0.5-1.0 teaspoons for every three cups of flour.

Organic: This is flour produced and processed under the guidelines of the U.S. Department of Agriculture's Organic foods program. Most of the basic flour types (all-purpose, bread, pastry, etc.) can be found in organic forms though you may have to search a bit to find them.

Pre-Sifted: This is flour sifted at the mill before it was packaged. Supposedly this means you do not need to sift it again at home, but many feel that due to settling during transport and storage if the recipe calls for sifted flour it should be done again.

Other Additives: There are many other potential additives that you may potentially come across in flour which would require more space than is possible here to cover them. Most are for use within the commercial/industrial baking fields and you would need to contact the supplier to determine precisely what it is they can do for you.

STORING FLOUR PRODUCTS

As already mentioned above whole wheat flour wants to go rancid rather quickly after it has been milled. Once ground it will stay fresh for about four to six weeks sitting on your room temperature kitchen shelf. In a sealed container in the refrigerator the flour will stay good for a year or so. In the freezer it will keep for years. Personally, I think it best to store your whole wheat flour in the form of wheat berries and only mill as much flour as you will use in a week or two and keep that in the refrigerator or freezer until you do. If for some reason you cannot do this then buy the freshest product you can and package it well in Mylar bags, glass jars, or metal cans with oxygen absorbers. Due to the fine texture of flour it will not gas flush very well at all.

Even the refined white flours have limited shelf-lives. In spite of what some would have you believe they are not "dead foods." The bran and germ may have been removed, but a minute portion of the germ oils will remain as well as the naturally occurring enzymes found in the grain. Refined white flour won't noticeably go off on you the way whole wheat flour will, but given sufficient time and exposure to heat and atmospheric humidity the protein content of the flour will slowly breakdown. Your first indications of trouble may be a slowly developing musty smell or de-

graded dough performance – poor rises and bad loaf volumes. In a sealed, air tight container you should easily achieve six months to a year at room temperatures. Sealed containers in the refrigerator or freezer will last for at least several years. If you want your white flour to stay at its best for the longest possible time then package it in Mylar bags, glass jars, or metal cans air tight with oxygen absorbers. At a decent storage temperature sealed in a low oxygen environment you should easily achieve five years of shelf life or more.

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LEGUME VARIETIES

If you're willing to spend what it takes on preserved meats and dairy products it's not necessary to store legumes at all. But most people do choose to keep a selection of beans, peas, and lentils in their larders either for reasons of economy, because they like them, or both. There are few non-animal foods that contain the amount of protein to be found in legumes with the varieties commonly available in the U.S. ranging from 20%-35%. As with most non-animal proteins, they are not complete in themselves for purposes of human nutrition, but become so when they are combined with the incomplete proteins found in grains. This is why grains and legumes are so often served together the world around.

The legume family, of which all beans, peas, lentils, and peanuts are a part, is one of the largest in the plant kingdom. Because of this and the many thousands of years of cultivation and development that man has given them on several continents the variety of edible legumes available to us is huge. Both their appearance and their names are colorful and varied. They range from "adzuki beans", a type of soybean from the Orient, to "zipper peas", a common field-pea here in the Southern U.S. Their color can range from a clean white, to deep red, dull green to flat black with thousands of mixtures and patterns in between.

In spite of this incredible variety, many legumes are largely interchangeable in cooking, although some dishes just wouldn't be the same if a different type were used. Below is a partial list of common legumes.

ADZUKI BEANS:

These small, deep red beans are very popular in Japan, China and other Asian nations, but are not as well known in the U.S. They are actually a cousin of the soybean and are commonly used in producing sweet bean paste for Chinese buns and other dishes. Pressure cooking will sometimes impart a bitter flavor so they are best presoaked then boiled in the conventional fashion. Their flavor is somewhat milder than kidney or small red beans, but they can serve as an adequate substitute for either in chili and other dishes in which those beans are commonly used.

BLACK BEANS:

Also known as "turtle beans", they are small, dark brownish-black and oval-shaped. Well known in Cuban black bean soup and commonly used in Central and South America and

in China. They tend to bleed darkly when cooked so they are not well suited to being combined with other beans, lest they give the entire pot a muddy appearance. The skins of black beans also slip off easily so for this reason they are generally not recommended for pressure cooking for fear of clogging the vent. This can be lessened by not presoaking before cooking.

BLACK-EYED PEAS:

Also known as "cowpeas" or "field peas" there are many varieties these peas eaten across the Southern United States, Mexico, and Africa with black-eyed peas being the most commonly known in the U.S. The coloring of field-peas is as varied as the rest of the legume family, with black-eyed peas being small, oval shaped with an overall creamy color and, of course, their distinctive black-eye. Dried field-peas cook very quickly and combine very tastily with either rice or cornbread and are often eaten as Hoppin' John every New Years for luck. They're also reputed to produce less flatulence than many other beans.

CHICKPEAS:

Also known as the "garbanzo bean" or "cecci pea" (or bean), they tend to be a creamy or tan color, rather lumpily roundish and larger than dried garden peas. Many have eaten the nutty flavored chick-pea, even if they've never seen a whole one. They are the prime ingredient in hummus and falafel and are one of the oldest cultivated legume species known, going back as far as 5400 B.C. in the Near East. Chickpeas tend to remain firmer when cooked than other legumes and can add a pleasant texture to many foods. I like them in red spaghetti sauces in particular and they are often used in Spanish cuisine in a tomato based sauce. Roasted brown then ground they have also served as a coffee substitute.

FAVA BEANS:

Not as well known in the U.S. as in Europe and the Mediterranean favas are also known as "broad beans" or "horse beans" being broad in shape, flat and reddish brown in color. This is one of the oldest legume species in European cultivation, but it does require more effort to consume. The hull of the bean is tough and not conducive to being tenderized by cooking so is often peeled away. The skinless bean falls apart so is made into a puree. A small number of people with Mediterranean ancestry have a

genetic sensitivity to the blossom pollens and undercooked beans, a condition known as “favism” so should avoid consuming them.

GREAT NORTHERN BEANS:

A large white bean about twice the size of navy beans they are typically bean flavored and are frequently favored for soups, salads, casseroles, and baked beans. One of the more commonly eaten in the U.S. Milled into meal these mild flavored beans can be included in many baked goods as a protein booster or used to thicken soups and stews.

KIDNEY BEANS:

Like the rest of the family, kidney beans can be found in wide variety. They may be white, mottled or a light or dark red color with their distinctive kidney shape. Probably best known here in the U.S. for their use in chili and bean salads, they figure prominently in Mexican, Brazilian and Chinese cuisine.

LENTILS:

Lentils are an odd lot. They don't fit in with either the beans or the peas and occupy a place by themselves. Their shape is different from other legumes being roundish little discs with colors ranging from muddy brown, to green to a rather bright orangish-red. They cook very quickly and have a distinctive mildly peppery flavor. They are much used in Far Eastern cuisine from India to China. Next to mung beans they make excellent sprouts though their peppery flavor tends to strengthen somewhat so are best mixed with milder sprouts.

LIMA BEANS:

In the Southern U.S., they are also commonly called “butter beans”. Limas are one of the most common legumes, found in this country in all manner of preservation from the young small beans to the large fully mature type. Their flavor is pleasant, but a little bland. Their shape is rather flat and broad with colors ranging from pale green to speckled cream and purple. They combine very well with rice.

MUNG BEANS:

Best known here in the States in their sprouted form, they are quite common in Indian and other Asian cuisines and are a close relative of the field peas (cowpeas). Their shape is generally round, fairly small with color ranging from a medium green to so dark as to be nearly black. They cook quickly and presoaking is not generally needed.

NAVY BEANS:

Smaller than Great Northerns these petite sized beans are also sometimes known as pea beans. They are the stars of Navy and Senate Bean Soups, favored for many baked bean dishes, and are most often chosen for use in commercial pork and beans. They retain their shape well when cooked. Ground into meal they can be added to many soups and stews without overpowering them.

PEANUTS (Groundnuts):

The peanut is not actually a nut at all, but a legume. They are another odd species not much like the more familiar beans and peas. Peanuts have a high protein percentage and even more fat. Whatever their classification peanuts are certainly not unfamiliar to U.S. eaters. They are one of the two legume species commonly grown for oilseed in this country, and are also used for peanut butter, and boiled or roasted peanuts. Peanut butter (without excessive added sweeteners) can add body and flavor to sauces, gravies, soups, and stews. Many Central and South American, African, Chinese, and Thai dishes incorporate peanuts so they are useful for much more than just a snack food or cooking oil.

PEAS, GREEN OR YELLOW:

More often found as split peas though whole peas can sometimes be had. The yellow variety has become somewhat uncommon but has a milder flavor than the green types which well lends them to blending inconspicuously into other foods. Probably best known in split pea soup, particularly with a smoky chunk of ham added. They are also used in Indian cuisine, especially dals. Whole peas need soaking, but split peas can be cooked as is. Split peas and pea meal makes an excellent thickener for soups and stews. Because splitting damages the pea, this more processed form does not keep for as long as whole peas unless given special packaging.

PINK AND RED BEANS:

Related to the kidney bean these are smaller in size but similar in flavor. The pink bean has a more delicate flavor than the red. They are both often favored for use in chili and widely used across the American Southwest, Mexico, and Latin America. They can add nicely to the color variety in multi-bean soups.

PINTO BEANS:

Anyone who has eaten Tex-Mex food has likely had the pinto bean. It is probably the most widely consumed legume in the U.S., particularly in the Southwestern portion of the country. Stereotypically bean shaped, it has a dappled pattern of tans and browns on its shell. Pintos have a flavor that blends well

with many foods. When ground together with great northern or navy beans they make my favorite homemade version of falafel. When milled into a meal pintos will cook in mere minutes, making a near instant form of refried beans.

SOYBEANS:

The soybean is by far the legume with the highest protein content in large scale commercial production and it's amino acid profile is the most nearly complete for human nutrition. Alongside the peanut it is the other common legume oilseed. The beans themselves are small, round, and with a multitude of different shades though tan seems to be the most common that I've seen. Because of their high oil content, they are more sensitive to oxygen exposure than other legumes and precautions should be taken accordingly if they are to be kept for more than a year in storage, especially if they are to be processed for soymilk or tofu. Although the U.S. grows a large percentage of the global supply, we consume virtually none of them directly. Most go into cattle feed, are used by industry, or exported. What does get eaten directly has usually been intensively processed. Soybean products range from soymilk to tofu, to tempeh, to textured vegetable protein (TVP) and hundreds of other forms. They don't lend themselves well to merely being boiled until done then eaten the way other beans and peas do. For this reason, if you plan on keeping some as a part of your storage program you would be well served to begin to learn how to process and prepare them now while you're not under pressure to produce. This way you can throw out your failures and order pizza, rather than having to choke them down, regardless.

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AVAILABILITY OF GRAINS AND LEGUMES

Grains and legumes of all types may be purchased in a number of different ways depending largely on where you live and the time of year. The following will cover the various steps of the processing chain starting with the forms most immediately suitable for storage and progressing all the way back to the farmer.

Each type of availability has its good and bad points. As you might expect, the more processing a product receives, the higher its price is likely to be. The further back along the processing chain you go the cheaper a product should become in terms of purchase price. It will, however, cost you more in time and effort to get it ready for storage.

The easiest and simplest way to incorporate grains and legumes into your storage program is to purchase your items pre-cleaned and prepackaged. These are products that have been harvested, passed through fans and screens to remove chaff, smut balls, insect parts, mouse droppings and other debris, then put up in retail sized bags or other containers - possibly even going so far as to already be packaged for long-term storage. This would be either from your local grocer or a storage food dealer. If you don't live in the area where what you want is grown it may be your only option.

If you want to purchase in bulk then you may be able to find pre-cleaned but not yet packaged products. These sources would be commercial or institutional food suppliers, food co-ops, warehouse grocers like Sam's Club or Costco, local food companies that package their own product lines, and the like. If what you want is not already in 50-100 lb bags you may have to provide your own container and there may be minimum purchase amounts as well. If the moisture content is in the right range then nothing will need to be done other than to put it up in your own storage packaging. If you don't buy it from some sort of foods dealer then be certain read the cautionary text below.

Should you happen to live in the area where the type of grain or legume that you are interested in purchasing is grown you may be able to purchase direct from the producer or distributor.

If you are interested in doing this, it may be possible to find your product field-run which simply means that it's been harvested and sold shortly thereafter. It will not have been given any cleaning or processing and is likely to be rather

dirty depending upon the conditions under which it was grown and harvested.

A second form called field-run from storage is product that has been harvested then put into storage for a time. It will have the dirt and debris of field run grain and whatever it may have picked up from the grain elevator as well.

IMPORTANT NOTE: If you have purchased your grains and legumes from a foods dealer then you needn't worry about hidden mold infections, fungicides or insecticides that are unsafe for human consumption. In the U.S., the products will have been checked several times by Federal and State agriculture departments and probably by the major foods dealers as well, to ensure its quality.

This is not necessarily the case when you purchase your grains or legumes directly from the farmer or elevator operator as field-run or field-run from storage grain. Nor is it necessarily the case if you've made the decision to utilize grains marketed as animal feed. Inspection procedures vary from nation to nation, so if you buy outside of the U.S. inquire of your supplier.

If you are buying your grains and legumes from some place other than a foods dealer, you need to know the history of what you are buying. There is the remote possibility that field-run from storage or any grade of grain not specifically sold for human consumption may have had fumigants, fungicides or insecticides not certified as safe for human foods added while it was in the bin. It is important to know what it has been treated with before you buy it.

Straight field-run grain, other than being dirty, is not likely to have had anything added that would make it undesirable for human consumption. There is, however, the also remote possibility it may have been infected with fungi that would make it unsafe for eating.

One of these fungal infections of grain is called "ergot". This fungal disease affects the flowering parts of some members of the grass family, mostly confined to rye. Consuming the fungus causes a nervous disorder known as St. Anthony's Fire. When eaten in large quantities the ergot alkaloids may cause constriction of the blood ves-

sels, particularly in the extremities. The effects of ergot poisoning are cumulative and lead to numbness of the limbs and other, frequently serious, symptoms.

The fungus bodies are hard, spur like, purple-black structures that replace the kernel in the grain head. The ergot bodies can vary in size from the length of the kernel to as much as several times as long. They don't crush as easily as smut bodies of other funguses. When they are cracked open, the inner broken faces can be off-white, yellow, or tan. The infected grain looks very different from ordinary, healthy rye grains and can be spotted easily. Ergot only rarely affects other grains and will generally afflict rye only when the growing conditions were damp. If you purchase field run rye, you should closely examine it first for the presence of ergot bodies. If you find more than a very, very few pass up that grain and look elsewhere.

Ergot is typically not a problem in the U.S and is easily spotted when it does occur. Other grain fungi, however, are much harder to spot and also have serious consequences should they be consumed. The various species of *Aspergillus* and *Fusarium* molds can be a problem almost anywhere.

Animal feed grains or seed grain/legumes are widely available and there are those who want to consider using these sources. Keep in mind that animal feeds are typically dirtier than food grains and may have a higher contaminant level than what is permissible for human consumption. The USDA allows the sale of grain or legumes for animal feed that could not be sold for direct human food use. It may even be mixed varieties of one grain and not all one type. In the case of feed wheat it may have an acceptable protein content but still make miserable raised bread so try milling and baking with a small amount before you put a lot of it away. Seed grains, in particular, must be investigated carefully to find out what they may have been treated with. It is quite common for seed to be coated with fungicides, and possibly other chemicals as well. Once treated, they are no longer safe for human or animal consumption. Be sure to inquire of your supplier.

If you do purchase field-run grain of any sort, examine it closely for contamination and moldy grain. Ask the farmer or distributor whether it has been tested for mold or mycotoxin (fungal toxin) content. This is especially the case if you are buying field-run CORN, RYE, SOYBEANS or RICE. When you purchase direct from the field, you may be getting it before it has been checked. Be certain of

what it is that you are buying and ask questions if you choose to go this route. Know who you are dealing with. Unless you just can't find any other source, I don't recommend using animal feed or seed grains for human food use.

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MOISTURE CONTENT

The moisture content of the grain or legume you want to put by has a major impact on how long you will be able to profitably keep it in storage. Some of the available literature states that grain with a moisture content as high as 13% can be safely put up, but there is a risk to keeping it at that level that should be understood.

The outside of every kernel of grain and bean you buy or grow hosts thousands of fungi spores and bacteria. This is all perfectly natural and is not a cause for alarm. The problem is that at moisture levels between 13.5% to 15% some fungal species are able to grow and reproduce. Aerobic bacteria (needing free oxygen to survive) require moisture in the 20% range. If you have grain with a moisture content as high as 13% you are perilously close to having enough moisture to enable mold growth which could lead to the spoilage and loss of your product. For this reason, I suggest you keep all grains and legumes to a moisture content of no more than 10%. An exception to this is raw peanuts which are particularly susceptible to an *Aspergillus* mold growth that produces aflatoxin (a type of mycotoxin) so should be stored with an 8% moisture content or less.

If you do not have a clue as to what the moisture level of your grain is here are several methods to determine it. The first method is quick, simple and will usually give you a close enough idea to work with of how much moisture there is in your grain or legume. The last two require a great deal more time and effort, but give more precise results.

METHOD ONE

This is the method I use myself. It's quick and dirty requiring nothing more than crushing a kernel of grain or a bean between two solid objects like a hammer and a brick. You don't have to hit it like you're driving spikes, just give it a sharp rap. If the grain shatters nicely into powdery debris or many small bits then the moisture level ought to be in the right range and you can package as-is. If the kernel just mashes flat or only reluctantly breaks into pieces it probably has too much moisture. If you're not sure of what you're seeing try drying a small amount overnight at only a warm temperature (100° Fahrenheit) such as you'd get from the pilot light in a gas oven. The next day take another sample from the same container and rinse in warm water for a few seconds, rub dry on a towel and let sit for about ten minutes. Now try the crush test on both samples. One should give you a good result and the other should be much different. Any seed with a high fat content such as soybeans and peanuts will not work well with this method.

COMMON TO METHODS TWO AND THREE

The more precise moisture content measurements require more time and effort. Nevertheless, you can make useful determinations with home equipment and I include them here for those who find Method One to be unsatisfactory.

You'll need some way to measure weight with a fair degree of accuracy. The better the scale you use, the more reliability you'll have in your determinations. Provided that it will weigh accurately to the half-ounce or less, any scale that can be calibrated with a known check weight will do. Postal scales can be made to serve if they are carefully calibrated against a known weight. Many individuals interested in starting storage programs may have grain weight scales used in ammunition reloading that might serve well.

Also necessary is a thermometer capable of withstanding and accurately measuring oven temperatures. As many bakers can tell you, home oven thermostats are often notoriously inaccurate so it is better to rely on a decent thermometer. Most kitchen supply stores can supply one that is oven safe and will accurately measure to the degree Fahrenheit or Celsius.

Proper technique calls for preheating the oven for a half-hour or more before starting the dehydrating process so that it will be of a uniform heat throughout. The sample pan should be placed on the middle rack as close to the vertical and horizontal center of the oven as possible. The bulb or dial of the thermometer should be placed next to the pan.

METHOD TWO

This method is for measuring moisture content in whole grains and legumes. Grain flours or meals, milk powders and any

other finely textured foods should use Method Three detailed below.

To be done prior to measuring — choose a shallow heat resistant container that has a close fitting lid. Clean it thoroughly and dry completely in your oven for 10-15 minutes. Allow it to cool and then weigh it carefully. This will give you the tare weight or what your container weighs empty.

Depending on how your scale is calibrated you can use a smaller sample size than what is indicated below. Using the twenty-ounce sample mentioned in the following text will allow for fairly accurate readings with the average postal scale. A scale that will measure to the gram could use as small a sample as 20 grams. A powder scale could use even less, but the smaller your sample size becomes the more finicky care you must exercise not to allow error to creep in. Keep your sample size large enough to easily work with.

Allowing for the weight of the sample pan, measure out a weighed twenty-ounce representative sample of the grain or legumes in question. Ideally, you should thoroughly mix the entire lot immediately before removing the sample, but if this is not possible then take it from the middle center of the container. It is important that you use care in this measurement since it will affect all following determinations.

Put the sample in the container making sure it is not more than an inch deep. Place it in the oven with the lid off and allow to heat. Below is a table giving the oven temperatures and times per grain or legume type:

Time and Temperature Settings for Determining Moisture Contents of Whole Seeds

Seed	Oven Temperature ° Fahrenheit*	Oven Temperature °Celsius*	Oven Heating Time
Barley	266	130	20
Beans	217	103	72
Corn	217	103	72
Oats	266	130	22
Rye	266	130	16
Sorghum, millet	266	130	18
Soybeans, peanuts	217	103	72
Wheat, rice	266	130	19

*No home oven that I am aware of will allow for such precise temperature control. Try to keep the temperature within ten degrees either way of what is listed and you will still achieve useful results.

When the dehydration period is over place the close fitting lid on the sample pan and allow to cool in the oven with the door closed. Remove and carefully weigh the pan.

A one ounce loss in weight indicates your grain has a roughly five percent moisture content, 2 ounces indicates that it has a 10% moisture content, etc., etc. You might even be able to cut it as fine as a half-ounce loss, but I wouldn't try to take it further than that.

Obviously, this is only a rough measure, but it works and can be done with postal or dietetic scales that are available virtually everywhere. As I mentioned above, if you have a scale with a finer calibration it is possible to use a smaller sample size and achieve the same result.

DAIRY PRODUCTS

Got milk? Butter? Cheese? In the refrigerator, right? Dairy products are a great source of essential amino acids, vitamin D, and calcium, but in their usual forms found in the refrigerator case of your local supermarkets are perishable commodities. Fortunately, there are a number of dairy products that lend themselves to food storage.

DRY MILKS

Dry, powdered milk is available in nearly as many varieties as the fresh fluid product. Most can be found on the shelves of your local supermarket while a few may have to come from rather more specialized suppliers. Skillfully and knowledgeably used they can vastly improve the quality of your food storage program.

NONFAT (skim):

This is pasteurized skim milk reduced to a powdered concentrate and is found in two forms - regular and instant. They are both made from the same type of milk, but the instant variety has been given further processing to make it more easily soluble in water than regular dry milk. Both types have essentially the same nutrient composition. The regular variety is more compact, requires less storage space than the instantized variety, usually costs somewhat less, but is a little more difficult to reconstitute. Instant dry milk is commonly available in nearly any grocery store. The regular type generally has to be sought out from baking and restaurant suppliers or storage food dealers. There is a retail brand by the name of "Milkman" that has a bit of fat content that makes it similar to 1% milk. The fat content means it should be stored like whole milk, described below.

It takes 3.2 oz or about 3 tablespoons of instant nonfat dry milk added to 32 oz of water to make 1 quart of milk you can drink or cook with like fresh milk. Combining the dry milk with water at least several hours before you plan to use it gives it time to dissolve fully and to develop a fresher flavor. Shaking the fluid milk vigorously will incorporate air and will also help to improve flavor. Add the powder to baked goods, gravies, smoothies, hot cereals, casseroles and meat loaf as a nutrition booster. It can also be used to make yogurt, cheese and most any cultured dairy product that does not require a high fat content. Several of the ways that we use dry milk powder

is in making grits, oatmeal, and our favorite whole wheat bread. A few tablespoons of dry milk greatly improves the amino acid composition of any grain product.

FLAVORED NONFAT:

This may be found packaged in a variety of forms from a low calorie diet drink (artificially sweetened) to the other end of the scale, as cocoa mix or malted milk. The key ingredient is the dry milk so buy and store these products accordingly.

WHOLE MILK:

This is whole dry milk with all of its fat content (roughly 28% milkfat) and therefore has a shorter shelf life than nonfat. Other than that, it may be reconstituted and used in exactly the same way as nonfat dry milk. Dry whole milk can sometimes be found in the Hispanic foods area of grocery stores (Nido and Klim by Nestlé are the two brands I know), natural or health food stores, and some storage food suppliers carry it as well as institutional and restaurant foods businesses. It can also sometimes be found where camping and outback supplies are sold. Because of the high fat content this form of dry milk really needs to be either vacuum sealed or packaged with oxygen absorbers in gas impermeable containers such as canning jars, Mylar bags, etc. Rotate and use dry whole milk within two years, less if not packaged for long-term storage.

BUTTERMILK:

Dry buttermilk is for use in recipes calling for buttermilk. It can be reconstituted into liquid buttermilk, but it's not much like the fresh liquid product and is best used in baked goods. Since it has a slightly higher fat content than nonfat dry milk, it generally does not keep as long. If properly packaged it should keep for several years.

SOUR CREAM:

Made from cultured sweet cream like the fresh product then dried and processed into a powder. Like the real thing it has a high milkfat content (25-28%) and should be stored like whole milk using vacuum sealing and/or oxygen absorbers and kept in a cool place. Mixed with the proper amount of cold water it can be reconstituted into a rich, thick product much like fresh sour cream and can be used in a similar manner or just used as a powder to add a tangy richness to many foods. Properly stored in oxygen free packaging and kept in a cool environment it is possible to achieve about a three

year shelf life.

MILK SUBSTITUTES:

There are a number of products on the market that purport to take the place of cow or goats milk. They range from soy “milk”, rice or other grain “milks”, and beverages based on milk components such as whey. If there is not a substantial fat content they may all be stored as you would nonfat dry milk. Those products with a significant fat content (above 1% by weight) should be stored as you would whole dry milk. Do keep in mind that nearly all of these products DO NOT have the same nutritional composition as either nonfat or whole milk. In storage food programs dairy products serve as important sources of high quality complete proteins, calcium, vitamin D and possibly vitamin A. If the milk substitute you’re considering does not you’ll need to find another adequate source of these important nutrients.

BUYING DRY MILK PRODUCTS

(a) - Be sure the dry milk you are buying has been fortified with vitamins A and D. All of the whole and nonfat dry milks I’ve seen come fortified with these two vitamins. The dry buttermilk does not come this way, at least the SACO brand does not. The flavored dry milks vary by manufacturer.

(b) - There should be no artificial colors or flavors. I believe it is illegal to add preservatives to any dry milk sold in the U.S. so a claim of “no preservatives” on the label is of no consequence. Other nations may be different, however.

(c) - “Extra Grade” on the label indicates the manufacturer has held to higher processing and quality standards and the milk is somewhat lower in fat, moisture and bacterial content, is more soluble, and has fewer scorched particles.

There are still some manufacturers of dry milk that sell ordinary Grade A product, but they are becoming fewer. Every brand of instant powdered milk in my local grocery store is the Extra Grade, even the generic store brand. This, too, may vary outside of the States.

(d) - If you’ll be buying your milk in bulk from businesses such as restaurant and institutional foods suppliers be sure to specify “low-temperature spray process” dry milk. The high-temperature process dry milks will not give you a very desirable product unless you intend to use it solely for baking.

(e) - Try to buy your dried milk in containers of a size that makes sense for the level of consumption in the household. Once it is opened, powdered milk has a short shelf life before undesirable changes in flavor and nutrient content occurs. If you buy large packages and do not use much at one time, consider breaking it down and repackaging into smaller containers at the time of purchase. I vacuum seal mine in glass canning jars.

(f) - As with any storage food you buy, try to deal only with reputable dealers. It is particularly important to do this with dry milk because of its short shelf life and sensitivity to storage conditions. Check expiration dates, then date and rotate packages.

STORING DRY MILKS

Dry milk products are highly sensitive to environmental conditions, particularly temperature and moisture. Their vitamins A and D are also photosensitive and break down rapidly if exposed to light.

The area where your dry milk is stored should be kept as cool as possible. Air-conditioning or even refrigeration can greatly extend the nutrient shelf life.

If the storage container is transparent or translucent then it should be put into a second container opaque to light or stored in a dark room.

Dry milk will absorb moisture and odors from the air so storage containers should be impervious to both air and moisture. The drier it can be kept, the better it will keep which makes the use of desiccants is an excellent idea. Oxygen also speeds decomposition so vacuum sealing or oxygen absorbers will decrease the available oxygen. Because of its fine powdery texture gas flushing with nitrogen or carbon dioxide generally yields poor results.

If the dry milk you purchased was not packaged for long term storage then it should be repackaged right away.

I purchase the instant variety of dry skim, whole milk, and sometimes buttermilk powder at my local grocery and repack it at home. The method I now use is to pour the powder into clean, dry canning jars then vacuum seal them with my Tilia Foodsaver using the jar adapter then storing in the ubiquitous cool, dark place. They must be guarded against breakage, but they offer the advantage of not

holding odors, thus allowing for reuse after cleaning. Since the glass is transparent they must be protected against light.

Clean, sound plastic one and two liter soda bottles can also be used, but probably should be used just once since the plastic is somewhat permeable and will hold odors.

If you have access to a can sealer, #10 cans make wonderful storage containers for dry milk, particularly if used in conjunction with O2 absorbers.

SHELF LIFE OF DRY MILKS

From: SacoFoods@aol.com (Amy Thompson)

To: Dunross@dkeep.com (Alan Hagan)

Subj: SACO Mix'nDrink Instant Pure Skim Milk

Date: May 9, 1996

Dear Mr. Hagan:

Thank you for your e-mail today and for your interest in SACO Mix'nDrink Pure Skim Milk.

Our Mix'n Drink will keep its nutrition value for up to about two years if kept cool and dry, and the only vitamins that actually decrease over time are the vitamins A and D. These are not shelf-stable vitamins and are sensitive to heat and light. A good rule of thumb to follow is that the vitamins A and D will dissipate at a rate of about 20% every year if stored properly. The less heat and moisture the milk is exposed to, the better the vitamins will keep. A freezer could extend the shelf life, as long as the powder does not get moisture in it. If you had to put a time limit on the Mix'nDrink, for rotation purposes, I would date it at two years after the date of purchase.

After opening a package of dry milk, transfer the powder to a tightly covered glass or metal container (dry milk can pick up odors from plastic containers) and keep it in the refrigerator. Unsealed nonfat dry milk keeps for a few months; dry whole milk for a few weeks.

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Preserved liquid milk comes in a number of forms, none of which are very similar to each other. The most common are as follows:

CANNED MILKS: These are commonly called UHT milks (Ultra High Temperature) for the packaging technique used to preserve them. They come in the same varieties as fresh liquid milks: Whole, 2%, 1% and skim. I've even

found whipping cream in UHT packaging (Grand Chef - Parmalat), though this may be offered only in the commercial and restaurant trade. In the U.S. they all have vitamin D added. The lesser fat content milks do not keep as long as whole milk and their use by dates are correspondingly shorter term. This milk is packaged in aseptic laminated paper cartons. It has the same composition as fresh milk of the same type, and can be stored at room temperature because of the special pasteurizing process used. The milk has a boiled flavor, but

CANNED FLUID MILKS AND CREAMS

less so than evaporated milk. The dates are usually for approximately six months. The milk is still usable past its date, but the flavor soon begins to go stale and the cream separates.

With a six-month shelf life this type of canned milk naturally requires a much faster rotation cycle than other types. Several companies sell flavored milks (chocolate, etc.) in this packaging, usually in the smaller single-serving sizes. UHT milk makes excellent yogurt, losing the boiled flavor.

EVAPORATED MILK: Made from fresh, unpasteurized milk using a vacuum-heating process that removes 60% of the water, the concentrate is heated, homogenized, and in the States, vitamin D is added. It is then sealed in cans and heated again to sterilize the contents. Some brands may have other nutrients and/or chemical stabilizers added so read can labels closely. A mixture of one part water and one part evaporated milk will have about the same nutritional value as an equal amount of fresh milk. It does not taste like fresh milk but many do not find the flavor to be disagreeable. Both whole and skim milk varieties are available with the higher fat content type having the best storage life. The typical recommended storage time is six months. There is generally no date or use by code on evaporated milk.

Some grocers along with health food stores carry canned, evaporated goat's milk, in a similar concentration.

SWEETENED CONDENSED MILK: A less processed product than evaporated milk. It starts with pasteurized milk combined with a sugar solution. The water is then extracted until the mixture is less than half its original weight. It is not heated because the high sugar content prevents spoilage. It's very rich as well: 8 oz contains 980 calories. Obviously with a greatly reduced water content and a high sugar level it won't taste like fresh milk but it does have many uses in cooking. Some use condensed milk to cream their coffee. This type too is available in whole and skim varieties.

A fairly new entry into the sweetened condensed milk field is Dulce de Leche a popular dessert item in Latin America. It's basically sweetened condensed milk that has been heated to the point that the sugar begins to brown which produces a rich tasting caramel dessert. In the past you had to make it yourself, but now it can be purchased ready made in the can. I have seen it in the canned/dry milk areas or the Hispanic/ethnic foods areas of many grocery stores here in Florida.

Although it is often hard to find, the condensed milk can label

should have a stamped date code which indicates the date by which it should be consumed. Condensed milk may thicken and darken as it ages, but it is still edible.

CANNED CREAM: So far as I have found here in the U.S. only the Nestlé company produces canned creams, both being imports. One is "Media Crema" produced in Mexico with a pull-top can and the other is "Table Cream" produced in Australia in a standard (as in use an opener) can. There is a slight difference in preservatives and thickeners, but basically both are a shelf stable light cream which can be used in any way that you would use fresh light cream. I haven't yet determined a shelf-life for these products, but it seems to be in excess of two years in any decent storage environment. Like the Dulce de Leche above I found them either in the dry/canned milk areas or the Hispanic/ethnic areas of my local grocery stores. Would be worth looking or asking for in your local markets.

BUTTER

Butter can be found in several forms each with their particular strengths and weaknesses.

BUTTER POWDER: Probably the easiest to find of the shelf-stable butters the powder is a moisture free product consisting of butter fat condensed on milk solids generally with added antioxidants. It can be reconstituted by mixing with water to make a spread similar to whipped butter, but it cannot be used for frying or other applications requiring high heat that would burn the milk solids. Most butter powders have something of a milky taste due to the additional milk solids necessary to create the powder, but many do not find this objectionable. Because it is a powder (lots of surface area) with a high fat content it needs good packaging to keep it at its best. Vacuum sealing and/or oxygen absorbers will work well if you are doing your own packaging.

CLARIFIED BUTTER (GHEE): Another form of butter suitable for storage programs is clarified butter or ghee as it is known in India. This is fresh, unsalted butter gently heated to drive off the moisture with the remaining fat poured off of the butter solids. It can be purchased commercially but most choose to make it themselves. As it's essentially pure butterfat with no water there is little to spoil so will keep for years in a glass jar protected from oxygen, heat, and light. A good source of fat calories and useful in cooking, but maybe not something you'd want to

spread on a biscuit.

CANNED BUTTER: For those whom only the real thing will do it's now possible to find shelf stable real butter. It seems mostly to be sold in those nations where home refrigeration is not as common as it is here in the U.S. As a rule I do not single out suppliers for any given product but at the time of this writing (11/2003) the only U.S. importer of shelf stable canned butter I've been able to find is Bruce Hopkin's Internet Grocer (<http://www.internet-grocer.com>). His product is Red Feather brand canned butter from New Zealand. It is salted though not as heavily as most salted butter in the U.S. The manufacturer claims an eighteen month shelf-stable storage life though they do advise keeping it in a cool, dry place. Like all butter it will liquefy if allowed to warm too much. Each can contains twelve ounces (equivalent to about three sticks of butter) and once opened should be handled like any other butter.

CHEESE

There are a number of shelf-stable cheese products that are suited for storage programs. Each of them have particular strengths or weaknesses for given uses. The basic forms storage cheeses can take are:

CANNED CHEESE: Actually, it's "Pasteurized Processed Cheddar Cheese Product" but it's the closest thing to a shelf-stable real cheese that I've yet found. It's another one of those products produced for use in countries where home refrigeration is scarcer than it is here in the U.S. The only brand available in the States that I know of at this time is made by Kraft's Australian division whose product most resembles a mild white cheddar or perhaps an American cheese. The only U.S. source for this cheese that I have found thus far is again Bruce Hopkin's Internet Grocer (<http://www.internet-grocer.com>). It comes in an eight ounce can and the manufacturer claims it will keep "indefinitely" at any reasonable storage temperature.

DRIED GRATED CHEESES: These are the familiar grated dry Parmesan and Romano cheeses, possibly others as well. They're generally a coarse dry powder, low or nonfat, and often with a fair amount of salt. Kept dry, cool, and dark they'll keep as they come from the store for several years though to get the maximum possible shelf life you should vacuum seal them in glass. Usually fairly expensive for the amount you get but as they're also strongly flavored a little will go a long way.

CHEESE SAUCES AND SOUPS: These are products such as Cheez Whiz, Campbell's Cheddar Cheese Soup, chip dips and related. They're not really cheese, but a mixture of cheese, milk, flour, and other ingredients. Depending on what your end uses may be they can provide a cheese flavor, calories, and a degree of protein, fat, and calcium. In any decent storage conditions they'll keep for several years at least. Aerosol cheese is an abomination that will not be discussed here.

POWDERED CHEESE: Used in products such as boxed macaroni and cheese, au gratin potatoes, snacks, and the like, this is basically cheese that has had its moisture removed leaving behind mostly protein, fat, a fair amount of calcium and various flavoring and coloring compounds (naturally occurring or added) along with a fair amount of salt. It can't really be melted, but it can add a nice cheese flavor where a real cheese texture is not needed.

There are also cheese powder blends, typically a mixture of cheese powder, food starch, whey, milk solids and other non-cheese ingredients. It has less fat than true cheese powder, about the same protein, but less calcium. You can make it yourself with dry milk and cornstarch so there's little point in not getting real cheese powder.

Cheese powder will keep for many years in sealed metal cans kept at cool temperatures. You'll probably have to get it from restaurant foods suppliers or order it from storage foods dealers. It's high fat content means that it needs low-oxygen packaging.

EGGS

The noble fruit of the hen, eggs play an important role in the kitchen arts. Unfortunately, outside of regular runs to the store to buy fresh eggs or keeping your own hens (which is what I do) they're problematical to store. There are two basic ways to keep eggs for those times when fresh eggs may be hard to come by. One is to preserve them in the shell, a process which must be done at home as there are no commercial sources of preserved shell eggs that I know of. The second is to buy dry, or powdered, eggs. I may address home shell egg preservation in a future FAQ update but for now I will concentrate on dry eggs which anyone can buy.

DRY EGGS

Dry eggs are generally available in four different forms – whole eggs, egg whites, egg yolks, and as a mix for making scrambled eggs and omelets. Which you should buy depends on how you expect to use them. As a general rule I find dry

eggs reconstitute more easily when mixed with warm (not hot) water. Mixing the dry powder with other dry ingredients before adding liquids also increases the ease by which they can be reconstituted. Allowing the eggs to sit a few minutes before using improves water adsorption.

WHOLE EGGS: This is everything but the shell and the water. Usually found in the form of a somewhat clumpy, eggy smelling yellow powder. Typically one tablespoon of whole egg powder mixed with two tablespoons of water will equal one large fresh egg. Can be used to make most anything you'd make with fresh eggs though personally I prefer to use them in baking rather than as scrambled eggs or omelets. Whole egg powder is commonly used in baking mixes of all kinds, but I've never seen plain powdered eggs for sale in any grocery. Fortunately, they're easy to come by from mail order suppliers. A #10 can of powdered eggs is quite a lot so give some thought as to how fast you might use them and either order smaller cans, repackage an opened can into smaller containers, or plan on eating eggs often.

EGG WHITES: Nearly pure protein, egg white powder can add a high-protein boost to anything you put it in. The powder itself is whitish in color and not as clumpy as whole egg powder. When properly reconstituted it will whip into meringue like fresh egg whites and can be used in producing angel food and sponge cakes. Dry egg whites are often found in the baking section of many supermarkets. The brand name I have seen is "Just Whites" by Deb El. Powdered egg whites are also available from many mail order suppliers.

EGG YOLKS: High protein, high fat, and a source of lecithin (a natural emulsifier). Egg yolk powder can add richness and flavor to any number of foods, used to make custards, sauces, noodles, even mayonnaise. Not generally as easy to find as whole eggs and whites, but can be mail ordered. Being pure yolks this powder has a high fat content and must be appropriately packaged to achieve a good shelf life.

EGG MIX OR SCRAMBLING MIX: Typically a mix of whole egg powder, nonfat milk powder, oil, and salt. Used for making scrambled eggs, omelets, or general egg cookery. This mix does offer a degree of convenience but you can easily make it yourself and save the trouble of having to store it as a separate product.

STORING DRY EGGS

All dry egg products are exceedingly sensitive to moisture and will go off quickly if allowed to become the least bit damp. Whole eggs, egg yolks, and egg mix have high fat contents which make them very sensitive to oxygen. I highly recommend

vacuum sealing in glass jars or using oxygen absorbers in conjunction with some other form of high barrier property packaging to keep these products at their best. If you bought quality products, packaged them well in oxygen free packaging, and put them away in a good storage environment then whole eggs, egg yolks, and egg mix should be able to achieve at least a three year shelf life, possibly more. Egg whites will easily achieve five years. Naturally, if you're packaging your eggs in any sort of transparent or translucent packaging then they should be stored in a dark place.

SUGAR, HONEY AND OTHER SWEETENERS

There are a wide number of sugars to be found for purposes of sweetening foods. Fructose is the primary sugar in fruit and honey; maltose is one of the sugars in malted grains; pimentose is found in olives, and sucrose is what we know as granulated or table sugar. Sucrose is a highly refined product made primarily from sugar cane though sugar beets still contribute a fair amount of the world supply. Modern table sugar is now so highly refined as to be virtually 100% pure and nearly indestructible if protected from moisture. Powdered sugar and brown sugar are simple variations on granulated sugar and share its long life.

Liquid sweeteners do not have quite the longevity of dry sugars. Honey, cane syrup, molasses, corn syrup and maple syrup may crystallize or mold during long storage. These syrups are chemically not as simple as table sugar and therefore lose flavor and otherwise break down over time.

GRANULATED SUGARS:

Buying refined sugar is a simple matter. Select a brand you know you can trust, be certain the package is clean, dry and has no insect infestation. There's little that can go wrong with it.

GRANULATED:

Granulated sugar does not spoil, but if it gets damp it will grow lumpy or turn into a sugar rock. If it does, it can be pulverized into smaller pieces and used. Granulated sugar can be found in varying textures, coarser or finer. "Castor/caster sugar" is a finer granulation than what is commonly sold as table sugar in the U.S. and is more closely equivalent to our super fine or berry sugar.

POWDERED, CONFECTIONERS, ICING:

All names refer to the same kind of sugar, that is white granulated sugar very finely ground. For commercial use there is a range of textures from coarse to ultra-fine. For home consumption, what is generally found is either Very Fine (6X) or Ultra-Fine (10X), but this can vary from nation to nation. Not all manufacturers will indicate the grind on the package. Sugar refiners usually add a small amount of cornstarch to prevent caking which will make it

undesirable for use in sugar syrups or solutions where clarity is needed.

Powdered sugar is as inert as granulated sugar, but it is even more hygroscopic and will adsorb any moisture present. If it soaks up more than a little it will cake and become hard. It's difficult to reclaim hardened powdered sugar, but it can still be used like granulated sugar where clarity in solution (syrups) is not important.

BROWN, LIGHT & DARK:

In the United States brown sugar is generally refined white sugar that has had a bit of molasses or sugar syrup and caramel coloring added to it. Dark brown sugar has more molasses which gives it a stronger flavor, a darker color and makes it damp. Light brown sugar has less molasses which gives it a milder flavor, a blonder color and is slightly dryer than the dark variety. Light brown sugar can be made by combining one fourth to one third white sugar to the remainder dark brown sugar and blend thoroughly.

Both varieties need to be protected from drying out, or they will become hard and difficult to deal with. Nor do you want to allow them to become damper than what they already are.

There are dry granulated and liquid brown sugars available, but they don't have the same cooking qualities as ordinary brown sugars. They also don't dry out and harden quite so readily either.

RAW, NATURAL, TURBINADO & OTHERS:

In recent years, refiners have realized there is a market for less processed forms of cane sugar in the U.S. so have begun to sell these under various names and packaging. None of them are actually raw sugar as it is illegal to sell in the States due to the high impurities level in the truly raw product. All will have been processed to some degree, perhaps to remove the sticky surface molasses or to lighten the color, but will not have been subjected to the full refining and whitening processes of ordinary white table sugar. This leaves some of the natural hue and a strength of flavor that deepens with the color. All of these less refined sugars may be stored and handled like brown sugar.

Outside of the United States it is possible to buy cane sugars from the truly raw product with all of the detritus remaining

from the cane juice extraction process up through various stages of refinement much like we have here in the United States. Many can be found with names such as “muscavado”, “jaggery” (usually a raw palm or date sugar), “demerara”, “sucanat,” and others. Colors will range from quite dark to blonde and may or may not be sticky with molasses. Generally the darker the color the stronger the flavor will be. In spite of any impurities they can be stored like brown sugar since their sugar content is high enough to inhibit most microbial growth. Recently I have found demerara sugar for sale here in the U.S.

STORING GRANULATED SUGARS

All granulated sugars have basically the same storage requirements. They need to be kept in air tight, insect and moisture proof containers. For powdered, and granulated sugar you might want to consider using some desiccant in the storage container if your local climate is damp. Since brown sugars and raw sugars are supposed to be moist, they do not need desiccants. Shelf life is indefinite if kept dry, but anything you intend to eat really should be rotated occasionally. Time has a way of affecting even the most durable of foods.

I’ve used brown sugar that was six years old at the time it was removed from storage and, other than the molasses settling somewhat toward the bottom, it was fine. A friend to whom I gave a bucket of the brown sugar finished it off three years later which was nine years after it was packaged and it, too, was fine.

HONEY

Honey may be the oldest sweetener known to man - its use predates recorded history. Remains of honey have been found in the Egyptian pyramids. This product of honeybees is typically sweeter than granulated sugar by a factor of 25%-40% depending upon the specific flowers from which the bees gathered their nectar. This means a smaller amount of honey can give the same amount of sweetening as sugar. The source flowers also dictate the flavor and the color as well. Honey color can range from very dark (nearly black) to almost colorless. As a general rule, the lighter the color and the more delicate the flavor, the greater the price the honey will bring. As you might expect, since honey is sweeter than table sugar, it also has more calories as well — an average of twenty two per teaspoon compared to granulated sugar’s sixteen. There are also trivial amounts of minerals and vitamins in the bee product while white sugar has none. Honey is not a direct substitute for table sugar however, its use in recipes may call for a bit of alteration to make them to turn out right.

Although the chance is remote, raw honey may also contain minute quantities of *Clostridium botulinum* spores so should not be fed to children under one year of age. PLEASE READ THE POST FROM GERI GUIDETTI CONCERNING THIS BELOW. Raw honey is OK for older children and adults.

Honey comes in a number of forms in the retail market and all with somewhat different storage characteristics:

WHOLE-COMB:

This is the bee product straight from the hive. It is the most unprocessed form of honey, being large pieces of waxy comb floating in raw honey. The comb itself will contain many unopened honey cells.

RAW:

This is unheated honey that has been removed from the comb. It may contain bits of wax and other small particles.

FILTERED:

This is raw honey that has been warmed slightly to make it easier to filter out small particles and impurities. Other than being somewhat cleaner than raw honey it is essentially the same. Most of the trace amounts of nutrients remain intact.

LIQUID/PURE:

This is honey that has been heated to higher temperatures to allow for easier filtering and to kill any microorganisms. Usually lighter in color, this form is milder in flavor, resists crystallization and generally clearer. It stores the best of the various forms of honey. Much of the trace amounts of vitamins, however, are lost.

SPUN, CRYSTALLIZED or CREAMED:

This honey has had some of its moisture content removed to make a creamy spread. It is the most processed form of honey. It keeps quite well. Also available in various flavors.

BUYING HONEY

Much of the honey sold in supermarkets has been blended from a variety of different honeys and some may have even had other sweeteners added as well. Like anything involving humans, buying honey can be a tricky business. It pays to deal with individuals and brands you know you can trust. In the United States you should buy products

labeled U.S. GRADE A or U.S. FANCY if buying in retail outlets. However, be aware there are no federal labeling laws governing the sale of honey, so only honey labeled pure is entirely honey and not blended with other sweeteners. Honey grading is a matter of voluntary compliance which means some producers may be lax in their practices. Some may also use words like “organic”, “raw”, “uncooked” and “unfiltered” on their labels, possibly to mislead. Fortunately, most honey producers are quite honest in their product labeling so if you’re not certain of who to deal with, it is worthwhile to ask around to find out who produces a good product.

Honey may also contain trace amounts of drugs used in treating various bee ailments, including antibiotics. If this is a concern to you, then it would be wise to investigate with your local honey producer what they may have used.

STORING HONEY

Honey is much easier to store than to select and buy. Pure honey won’t mold, but may crystallize over time. Exposure to air and moisture may cause color to darken, flavor to intensify and may speed crystallization as well. Comb honey doesn’t store as well liquid honey so you should not expect it to last as long.

Storage temperature is not as important for honey, but it should not be allowed to freeze or exposed to high temperatures if possible. Either can cause crystallization and heat may cause flavor to strengthen undesirably.

Filtered liquid honey will last the longest in storage. Storage containers should be opaque, airtight, moisture and odor-proof. Like any other stored food, honey should be rotated through the storage cycle and replaced with fresh product.

If crystallization does occur, honey can be reliquified by placing the container in a larger container of hot water until it has melted. Avoid adding water to honey you intend to keep in storage or it may ferment.

Avoid storing honey near heat sources or petroleum products (including gasoline/diesel engines), chemicals or any other odor-producing products which may infuse through plastic packaging.

RAW HONEY AND BOTULISM

From: Geri Guidetti arkinst@concentric.net

Duane Miles wrote:

If I recall correctly, honey contains very, very small

amounts of the bacteria that cause botulism. For adults, this seldom causes problems. Our immune system is capable of dealing with small numbers of even nasty bacteria, they do it all the time. The problem is when we get large numbers of bacteria, or when our immune system is damaged or not yet developed.

That is where the problem with honey comes in. Some people used to use honey to sweeten milk or other foods for infants. Infants immune systems sometimes cannot handle the bacteria that cause botulism, and, of course, those infants became seriously ill. So pediatricians now advise strongly against using honey for children under a certain age.

Yes, raw honey can contain the temperature resistant spores of *Clostridium botulinum*, the bacterium that causes botulism. The organism is a strict anaerobe, meaning that it only grows in the absence of molecular oxygen. The problem with infants and honey is that the small, intestinal tract of an infant apparently is sufficiently anaerobic to allow the spores to germinate into actively growing *C. botulinum* organisms. Essentially, the infant serves the same role as a sealed, airtight, contaminated can of beans as far as the organisms are concerned. There in the infant’s body the bacteria secrete the dangerous toxin that causes the symptoms of botulism. There have been quite a few documented infant deaths due to honey. As I recall, the studies identifying honey as the source were done in the ’80s. Most pediatricians recommend no honey for the first year. It is probably best to check with your own for even later updates...Geri Guidetti, The Ark Institute

EDITOR’S NOTE: *The advice not to give raw honey or foods containing raw honey to infants under one year of age still stands. Do please understand, though, that honey is not the only means by which infants can suffer from botulism, in many of which cases no certain source of contagion could ever be determined. The actual chances of any infant being stricken is very, very small and keeping the child’s colon open, active and healthy can reduce it still more. Breast-fed children seem to be more resistant as well.*

HONEY OUTGASSING

Q: My can of honey is bulging. Is it safe to use?

A: Honey can react with the can lining to release a gas especially when stored over a long period of time. Honey’s high sugar content prevents bacteria growth. If there is no

sign of mold growth, it is safe to eat. FREQUENTLY ASKED FOOD QUESTIONS, FN250

CANE SYRUPS

CANE SYRUP:

Seldom found in supermarkets pure cane syrup is a sweet symbol of the U.S. Deep South. Produced by boiling down the extracted juice of the sugarcane in much the same fashion as sorghum and maple syrups are produced. The best syrup is clear with a dark amber color and a smooth intense flavor. Cane syrup usually has to be purchased from roadside stands, living history recreations, farm festivals, or state and county fairs. Some syrup makers will add small quantities of lemon juice or corn syrup to deter crystallization. Flavored cane syrups can sometimes be found, but are usually a sign of inferior syrup.

MOLASSES:

A by-product of sugar refining, molasses is generally composed of sugars such as glucose that are resistant to crystallization, browning reaction products resulting from the syrup reduction process, and small amounts of minerals. Flavor can vary between brands, but is usually strong and the color dark and opaque. Sulfured molasses can sometimes be found but its intense flavor is unappealing to most. Brands labeled as 'blackstrap molasses' are intensely flavored.

SORGHUM SYRUP:

This is produced in the same manner as cane syrup, but sweet sorghum cane, rather than sugar cane, is used. Sorghum tends to have a thinner, slightly sourer taste than cane syrup. Good syrup should be a clear dark amber with a smooth flavor. It can sometimes be found in the supermarket, but more often is found in the same types of places as genuine sugar cane syrup.

TREACLE:

This sweetener comes in varying colors from a rather dark version, similar to, but not quite the same as blackstrap molasses, to paler versions more similar to golden syrup. If you cannot find it in your store's syrup area check in their imported foods section.

All of the above syrups are generally dark with a rich, heavy flavor.

GOLDEN SYRUP:

This syrup is both lighter and paler in color than any of the above four, more similar to what we would call a table syrup here in the U.S. Can usually be found in the same areas as treacle above.

TABLE SYRUP:

There are many table syrups sold in supermarkets, some with flavorings of one sort or another such as maple, various fruits, butter, etc. A close examination of the ingredients list will reveal mixtures usually of cane syrup, cane sugar syrup or corn syrup along with preservatives, colorings and other additives. Table syrup usually has a much less pronounced flavor than molasses, cane or sorghum syrup or the darker treacles. Any syrup containing corn syrup should be stored as corn syrup.

STORING CANE SYRUPS

All of the above syrups, except for those having corn syrup in their makeup, have the same storage characteristics. They can be stored on the shelf for about two years and up to a year after opening. Once they are opened, they are best kept in the refrigerator to retard mold growth. If mold growth does occur, the syrup should be discarded. The outside of the bottle should be cleaned of drips after each use. Some pure cane and sorghum syrups may crystallize in storage, but this causes no harm and they can be reliquified using the same method as for honey. Molasses or other sugar refining by-products won't usually crystallize, but will dry into an unmanageable tar unless kept sealed.

CORN SYRUP

Corn syrup is a liquid sweetener made by breaking down cornstarch into its constituent sugars through an enzyme reaction. Available in both a light and a dark form, the darker variety has a flavor similar to molasses and contains refiners syrup (a by-product of sugar refining). Both types often contain flavorings and preservatives. It is commonly used in baking and candy making because it does not crystallize when heated. Corn syrup is common in the U.S., but less so elsewhere.

Corn syrup stores poorly compared to other sweeteners and because of this it often has a best if used by date on the bottle. It should be stored in its original bottle, tightly capped, in a cool, dry place. New unopened bottles can be expected to keep about six months past the date on the label and sometimes longer.

After opening, keep the corn syrup four to six months. These syrups are prone to mold and to fermentation so be

on the lookout for bubbling or a mold haze. If these present themselves, throw the syrup out. You should wipe off any drips from the bottle after every use.

MAPLE SYRUP

Maple syrup is produced by boiling down the sap of the maple tree (and a lot of it too) collected at certain times in the early Spring until it reaches a syrup consistency. This native American sweetener is slightly sweeter than table sugar and is judged by much the same criteria as honey: Lightness of color, clarity and taste. Making the syrup is energy and labor intensive so pure maple is generally expensive. Maple flavored pancake syrups are usually mixtures of corn and cane sugar syrups with either natural or artificial flavorings and should be kept and stored as corn syrups.

New unopened bottles of maple syrup may be kept on a cool, dark, shelf for up to two years. The sweetener may darken and the flavor get stronger, but it is still usable.

After the bottle has been opened, it should be refrigerated. It will last about a year. Be careful to look out for mold growth. If mold occurs, discard the syrup.

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FATS AND OILS

All oils are fats, but not all fats are oils. They are similar to each other in their chemical makeup, but what makes one an oil and another a fat is the percentage of hydrogen saturation in the fatty acids of which they are composed. The fats which are available to us for culinary purposes are actually mixtures of differing fatty acids so for practical purposes we'll say saturated fats are solid at room temperature (70°F, 21° C) and the unsaturated fats we call oils are liquid at room temperature. For dietary and nutrition purposes fats are generally classified as saturated, monounsaturated and polyunsaturated, which is a further refinement of the amount of saturation of the particular compositions of fatty acids in the fats.

BUYING AND STORING OILS AND FATS

There is a problem with storing oils and fats for the long term and that is they want to go rancid. Rancid fats have been implicated in increased rates of heart disease, arteriosclerosis and are carcinogenic (cancer causing) so are best avoided whenever possible.

Oxygen is eight times more soluble in fat than in water and it is the oxidation resulting from this exposure that is the primary cause of rancidity. The less saturated a fat is, the faster it will go off. This may not, at first, be readily apparent because vegetable oils have to become several times more rancid than animal fats before our noses can easily detect it. An extreme example of rancidity is the linseed oil (flaxseed) that we use as a wood finish and a base for oil paints. In a matter of hours the oil oxidizes into a solid polymer. This is very desirable for wood and paint, very undesirable for food.

Because of this difficulty in storing fats and oils for any long period of time many books and articles on the subject of food storage make only passing mention of them, if they say anything at all. This is unfortunate because fat contains *nine* calories to the gram compared to the *four* calories contained by either carbohydrates or protein. This makes fat a valuable source of concentrated calories that could be of real importance if faced with a diet consisting largely of unrefined grains and legumes. For small children, infants, nursing mothers, and the elderly, they may not be able to consume the volume of food that would be necessary in the course of a day to get all of the calories they would need to avoid weight loss and possible malnutrition. Additionally, fats play an important role in our perception of taste and texture and their absence would make many foods more difficult to prepare and consume.

Furthermore, a small amount of dietary fat is necessary for our bodies to properly absorb fat soluble vitamins like A,D,E and K.

Long term storage of fats may be problematical, but it is not impossible. There are some general rules you can follow to get the most life out of your stored cooking oils and fats.

#1 - Exposure to oxygen, light and heat are the greatest factors to rancidity. If you can, refrigerate your stored oil, particularly after it's been opened. If possible, buy your oils in opaque, airtight containers. If you purchase it in plastic, particularly clear plastic, then transfer it to a gas impermeable glass or metal container that can be sealed airtight. If you have a means of doing so, vacuum sealing the storage container is an excellent idea as it removes most of the air remaining inside, taking much of the oxygen with it. Transparent glass and plastic containers should be stored in the dark, such as in a box or cabinet. Regardless of the storage container, it should be stored at as cool a temperature as possible and rotated as fast as is practical. All other considerations being equal, oils and fats with preservatives will have a greater shelf life than those without, provided they are fresh when purchased.

#2 - Unless they have been specially treated, most unopened cooking oils have a shelf life of about a year to a year and a half, depending upon the above conditions. Some specialty oils such as sesame and flax seed have shorter usable lives. If you don't use a lot, try to not buy your fats in big containers. This way you won't be exposing a large quantity to the air after opening, to grow old and possibly rancid, before you can use it all up. Once opened, it is an excellent idea to refrigerate cooking fats. If it turns cloudy or solid, the fat is still perfectly usable and will return to its normal liquid, clear state after it has warmed to room temperature. Left at room temperatures, opened bottles of cooking oils can begin to rancid in anywhere from a week to a couple of months, though it may take several more months to reach such a point of rancidity that it can be noticeably smelled.

#3 - Although darker colored oils have more flavor

than paler colored, the agents that contribute to that flavor and color also contribute to faster rancidity. For maximum shelf life buy paler colored oils.

EXTENDING SHELF LIFE BY ADDING ANTI-OXIDANTS

I take no position on doing this, but if obtaining the maximum possible shelf life in your cooking fats is important to you, it is possible to add antioxidant preservatives to the fat you have purchased. Used in conjunction with a gas impermeable container, either opaque in color or stored in a dark place, and cool storage temperatures (70° F 21°C or less) then shelf life can be extended to about five years, possibly longer.

The antioxidant in question is Butylated HydroxyToluene (BHT). It is often used in the food industry to slow the development of off-flavors, odors and color changes caused by oxidation, mostly in foods with significant fat contents. BHT is on the U.S. Food and Drug Administration's Generally Recognized As Safe (GRAS) list as a common preservative. The FDA limits the use of BHT to 0.02% or 200 parts per million (ppm) of the oil or fat content of a food product. The directions that I give below will be for the FDA limit. BHT is available over the counter in the retail trade, typically found in health or natural foods stores or vitamin and nutritional supplement suppliers. It may also be found from various suppliers on the Internet.

To get the best results you will need the freshest oil you can find. Purchasing from a large, busy supermarket will usually suffice. You'll also need containers that are gas impermeable such as glass jars, or metal cans. There may be plastic containers with high gas barrier properties that will also serve, but I cannot knowledgeably say about this. It is important that your containers be food grade, clean, dry and dust-free. In keeping with the FDA's GRAS guidelines you want to add 5.3mg of BHT crystals per fluid ounce of oil or fat. If you're using a scale calibrated in grains, such as a reloading powder scale, you may use the following table.

HT in grains	OIL	BHT in milligrams
0.1 grain	1 fl oz	5.3 mg
0.7 grain	8 fl oz (1 cup)	42.4 mg
1.3 grain	16 fl oz (1 pint)	84.8 mg
2.6 grain	32 fl oz (1 quart)	169.6 mg
5.2 grain	64 fl oz (1/2 gal)	339.2 mg

10.3 grain 128 fl oz (1 gallon) 678.4 mg

NOTE: The grain weight measurements have been rounded up to the nearest tenth grain since most powder scales will not accurately measure less than one-tenth of a grain.

IMPORTANT NOTE: If you are using a reloading powder scale, be sure the balance pan is clean and the balance has been calibrated recently with a reliable set of check weights.

Remove the BHT crystals from their gelatin capsules and weigh them, if you're going to. Once you have the appropriate amount, add the crystals to a pint or so of the oil, shaking vigorously. It may take several hours for the preservative to dissolve completely. Bringing the oil up to a warm, NOT HOT, temperature will speed the process. Once completely dissolved, pour the antioxidant laden oil into the rest of the oil and mix thoroughly. Once mixed, the oil can then be poured into its storage containers leaving approximately 1/2 inch of headspace. If you have a vacuum sealer the jars or cans may be vacuum sealed to remove most of the oxygen laden air from the container, otherwise just seal the lid. Store in a cool place and if using transparent jars, be certain to put them in a larger container such as a box to keep the contents in the dark. Don't forget to label and date the jars.

Before I close out this section on fats and oils, please allow me to reemphasize that no amount of preservatives that can be added to your stored fats will substitute for proper storage and rotation. *Don't sit on your oil supply for years without rotating it. A little bit rancid is a little bit poisonous.* 'Nuff said.

COOKING ADJUNCTS

BAKING POWDER

Baking powder is a combination of an acid and an alkali with starch added to keep the other two ingredients stable and dry. The powder reacts with liquid by foaming and the resulting bubbles of carbon dioxide can aerate and raise dough. Almost all baking powder now on the market is double acting, meaning it has one acid that bubbles at room temperature and another acid which only reacts at oven temperatures. Unless a recipe specifies otherwise, this is the type to use.

Don't expose baking powder to steam, humid air, wet spoons, or other moisture. Store in a tightly lidded container for no more than a year. Even when kept bone dry it will eventually loses its potency. To test its strength, measure 1 tsp powder into 1/3 cup hot water. The mixture should fizz and bubble furiously. If it doesn't, throw it out.

For those folks concerned with aluminum in the diet, the Rumford brand has none and there may be others.

BAKING SODA

This gritty powder is sodium bicarbonate also known as sodium acid bicarbonate (NaHCO_3), a mild alkali. When combined with an acid ingredient such as buttermilk it is used in baking to leaven quick breads and other baked foods working in the same manner as baking powder. It can also be used to make hominy. When combined with an acid ingredient, the bicarbonate reacts to give off carbon dioxide bubbles which causes the baked good to rise. If kept well sealed in an air- and moisture-proof container its storage life is indefinite. If kept in the cardboard box it usually comes in, it will keep for about eighteen months. Do keep in mind that baking soda is a wonderful odor absorber. If you don't want your baked goods tasting of whatever smells it absorbed then keeping it in an airtight container is a good idea.

HERBS AND SPICES

It is difficult to give exact instructions on how best to store culinary herbs and spices because there are dozens of different seeds, leaves, roots, barks, etc., we call an herb or a spice. There are, however, some general rules that may be followed to best preserve their flavors. All spices, particularly dried, are especially sensitive to heat, air, moisture, and light. Room temperature is satisfactory for storage but refrigeration or freezing is even better. What ever you do they should be kept away from heat sources. It is common for the household spice

cabinet or shelf to be located over the stove, but this is really about the worst possible place to keep herbs and spices even if it is convenient. Dark opaque glass is best for storage, but failing that, keeping a tightly sealed glass container in a dark place is next best. The cellophane packets some products come in won't do. Tightly sealed metal containers will work as well. Even dense plastic will do, but glass is best.

Where possible, buy spices whole. Whole nutmegs will keep their flavor far longer than ground nutmeg, the same for other seeds and roots. You'll have to use a grater, grinder or whatever, but the difference in flavor is worth it.

If you buy spices in bulk containers (which is certainly cheaper) consider transferring some into smaller containers and keeping the larger one tightly sealed in a cool, dark place. This will prevent unwanted light and air from continually getting in and playing havoc. My large jars of reserve spices are kept in vacuum sealed jars with smaller jars of ready spices kept in the kitchen.

There are many mail order or online suppliers of bulk herbs and spices. My personal favorite is Penzey's (<http://www.penzeys.com>). Their products have been consistently excellent with good prices. It's worth investigating some of these companies as they can really take the sting out of purchasing large quantities.

SALT

Storage life for salt is indefinite. So long as you do not let it become contaminated with dirt or whatever, it will never go bad. Over time, iodized salt may turn yellow, but this is harmless and can still be used. Salt is rather hygroscopic and will adsorb moisture from the air if not sealed in an airtight container. If it does cake up, it can be dried in the oven and then pulverized again with no harm done.

All salt, however, is not the same. Salt comes in a number of different varieties, and very little of what is produced in the U.S. is intended for use in food. The rest of it, about 98%, has other uses. Therefore, it is important to be certain the salt you have is intended for human consumption. Once you are satisfied it is, you should then determine its appropriateness for the tasks to which you might want to set it to. Below is a list of some of the available salts

TABLE SALT: This is by far the most widely known type of salt. It comes in two varieties; iodized and non-iodized. There is an ingredient added to adsorb moisture so the salt will stay free flowing in damp weather. This non-caking agent does not dissolve in water and can cause cloudiness in solutions if sufficiently large quantities are used. In canning this won't cause a problem since little per jar is used. For pickling, though, it would be noticeable. If you are storing salt for this purpose, you should be sure to choose plain pickling salt, or other food grade pure salt such as kosher salt. In the iodized varieties, the iodine can cause discoloration or darkening of pickled foods. For folks in areas that are historically iodine deficient a store of iodized salt for table consumption should be kept.

CANNING SALT: This is pure salt and nothing but salt. It can usually be found in the canning supplies section of most grocery stores. This is the preferred salt for most food preservation or storage uses. It is generally about the same grain size as table salt.

KOSHER SALT: This salt is not really, in itself, kosher, but is used in “kashering” meat to make the flesh kosher for eating. This involves first soaking the meat then rubbing it with the salt to draw out the blood which is not-kosher and is subsequently washed off along with the salt. The cleansed meat is then kosher. What makes it of interest for food storage and preservation is that it is generally pure salt suitable for canning, pickling and meat curing. It is of a larger grain size than table or canning salt, and usually rolled to flake the grains for easier dissolving. Frequently it is slightly cheaper than canning salt and usually easier to find in urban/suburban areas.

NOTE: *Not all brands of kosher salt are exactly alike. Diamond Crystal Kosher Salt is the only brand that I'm aware of that is not flaked, but still in its unaltered crystal form. The Morton brand of Coarse Kosher Salt has “yellow prussiate of soda” added as an anti-caking agent but unlike other anti-caking agents it does not cause cloudiness in solution. Morton even gives a kosher dill pickle recipe on the box.*

Whether flaked or in its unaltered crystal form, kosher salt takes up more volume for an equivalent amount of mass than does canning salt. If it is important to get a precise amount of salt in your pickling or curing recipe you may want to weigh the salt to get the correct amount.

SEA SALT: This type of salt comes in about as many different varieties as coffee and from many different places

around the world. The “gourmet” versions can be rather expensive. In general, the types sold in grocery stores, natural food markets and gourmet shops have been purified enough to use in food. It's not suitable for food preservation, though, because the mineral content it contains (other than the sodium chloride) may cause discoloration of the food.

ROCK or ICE CREAM SALT: This salt comes in large chunky crystals and is intended primarily for use in home ice cream churns to lower the temperature of the ice filled water in which the churn sits. It's also sometimes used in icing down beer kegs or watermelons. It is used in food preservation by some, but none of the brands I have been able to find label it as food grade nor do they specifically mention its use in foods so I would not use it for this purpose.

SOLAR SALT: This is also sometimes confusingly called “sea salt”. It is not, however, the same thing as the sea salt found in food stores. Most importantly, it is not food grade. It's main purpose is for use in water softeners. The reason it is called “solar” and sometimes “sea salt” is that it is produced by evaporation of sea water in large ponds in various arid areas of the world. This salt type is not purified and still contains the desiccated remains of whatever aquatic life might have been trapped in it. Those organic remains might react with the proteins in the foods you are attempting to preserve and cause it to spoil.

HALITE: For those of us fortunate enough to live where it is warm, halite is the salt that is used on roads to melt snow and ice. It, too, is not food grade and should not be used in food preservation. This form of salt is also frequently called rock salt, like the rock salt above, but neither are suitable for food use.

SALT SUBSTITUTES: These are other kinds of metal salts such as potassium chloride used to substitute for the ordinary sodium chloride (NaCl) salt we are familiar with. They have their uses, but should not be used in foods undergoing a heated preservation processing, as they can cause the product to taste bad. Even the heat from normal cooking is sometimes sufficient to cause this.

VINEGAR

There is vinegar and then there is vinegar and it is not all alike. The active ingredient in all vinegars is *acetic acid*, but how the sour stuff was made can vary widely. The most common vinegar is *white distilled* which is actually diluted distilled acetic acid and not true vinegar at all. It keeps pretty much indefinitely if tightly sealed in a plastic or glass bottle with a plastic cap. The enamel coated metal caps always seem to

get eaten by the acid over time. It is usually about 5-6% acetic acid and for pickling it is the type most often called for.

The next most common is *apple cider vinegar* which is available in two varieties. A *cider flavored* distilled acetic acid type and a *true cider vinegar* fermented from hard cider. Either will store indefinitely at room temperature until a sediment begins to appear on the bottom. Non-distilled vinegar will sometimes develop a cloudy substance. This is called a *mother of vinegar* and it is harmless. As long as the liquid does not begin to smell foul it can be filtered out through cheesecloth or a coffee filter and rebottled in a clean container. The mother can even be used to make more vinegar. If it begins to smell bad, however, it's gone over and should be tossed out.

The more exotic *wine, balsamic, malt, rice* and other vinegars can be stored like cider vinegar. Age and exposure to light and air, however, eventually begin to take their toll on their delicate flavors. Tightly capped in a cool, dark cabinet or refrigerator is best for their storage.

YEAST

Yeast is just not a product you can stow away and forget about until you need it in a few years. After all, this single celled microscopic fungus is a living organism so if it's not alive at the time you need it, you'll get no action. When we incorporate yeast into our bread dough, beer wort or fruit juice it begins to ferment madly (we hope) and produce several by-products. If you're baking, the by-product you want is carbon dioxide which is trapped by the dough and subsequently causes it to rise. In brewing or vintning what is wanted is the ethyl alcohol and, if the drink is to be carbonated, the carbon dioxide as well.

Almost all yeasts used for these purposes are in the same genus (*Saccharomyces* or sugar fungi), but several different species or strains within species have evolved and some are more suitable for a particular task than others. It's entirely possible to use grocery store bread yeast to brew beer or ferment wine, but the flavor may leave a great deal to be desired. It's also possible to use yeast from ale brewing to make bread. From my limited experience with trying it myself the results were pretty much indistinguishable from bread yeast.

Types of Baking Yeasts

Leaving aside the brewing and vintning yeasts that are outside the scope of this FAQ I am going to concentrate on bread yeast. It comes in two generally available forms; *compressed* or *fresh yeast* and *dried yeast* which is further broken down into *active dry yeast* and *rapid acting* also known as *rapid*

rise or *bread machine yeasts*. Although both of the dry yeasts are in the same species they come from different genetic strains with different performance characteristics and are processed somewhat differently from each other.

COMPRESSED (FRESH) YEAST: Compressed yeast is only partly dried (about 70% moisture), requires refrigeration and keeps even better in a deep freezer. If kept in an air- and moisture-tight container to prevent desiccation this type of yeast will keep for a year in the freezer (0°F, -17°C or less), but only about two weeks in the refrigerator. Unless your kitchen is quite chilly it will not keep on the shelf. It should not have a mottled color or a sour odor. Compressed Yeast is generally available in 0.6-ounce and 2-ounce foil-wrapped cakes. For traditional baking, dissolve compressed yeast in warm (90°-95°F, 32°-35°C) liquids. A 0.6-ounce cake will leaven up to 4 cups of flour (about a pound). A 2-ounce cake will leaven about 12 cups or roughly three pounds of flour.

ACTIVE DRY YEAST: A granular powder with about an 8% moisture content, active dry yeast can be found in either single use foil packets or vacuum packed foil covered one pound 'bricks'. In general bread making active dry yeast is typically dissolved in water (105°-115°F, 40°-46°C) along with an equal amount of sugar to give it time to resuscitate and actively begin growing before being mixed into the dry ingredients. Bread machines, however, are often different in this regard and you should follow the directions your particular machine's manufacturer gives. Mine calls for putting the dry yeast atop the other dry ingredients completely out of contact with the liquid ingredients until the machine mixes them together. One envelope (roughly 2 ¼ teaspoons) is sufficient to leaven about four cups or roughly one pound of flour.

RAPID ACTING & BREAD MACHINE YEAST: A more finely granulated powder with a lower moisture content than standard active dry yeast the rapid acting version is designed to raise bread as much as fifty percent faster. This lends it to the 'quick' or 'rapid' cycles of many bread machines that eliminate one rise cycle of the bread dough to facilitate faster production. This form of yeast is also generally mixed with a small amount of ascorbic acid which acts as a dough conditioner to give improved rise performance. Rapid Acting yeasts often perform poorly in recipes calling for long fermentation periods. Because of its finer granulation it does not need to be dissolved in liquid first and should be added to the dry ingredients instead. In the case of bread machines follow the

manufacturer's directions. One envelope (roughly 2 1/4 teaspoons) is sufficient to leaven about four cups or roughly one pound of flour.

Interchanging Yeast Types

Can fresh, active dry, and rapid acting yeasts be used interchangeably?

Yes, to a certain extent.

To substitute Rapid Acting yeasts for Active Dry yeasts reduce the amount of Rapid Acting used by 25% from the amount of Active Dry the recipe calls for then add the dry yeast to the dry ingredients before mixing.

To substitute Active Dry for Rapid Acting increase the amount of Active Dry by 25% over what the recipe calls for of Rapid Acting yeast and dissolve in warm water (105°-115°F, 40°-46°C) with an equal amount of sugar before mixing in with the dry ingredients.

Once 0.6 ounce cake of fresh, compressed yeast is roughly equivalent to one pack of active dry yeast (2 1/4 teaspoons) or to about 1 3/4 teaspoons of Rapid Acting yeast.

NOTE: Substituting one yeast type for another can be done, but will oft times require a bit of tweaking. If at all possible use the yeast type specified in the recipe. If you can't be prepared to make adjustments where necessary.

PROOFING YEAST: Although it's generally not necessary anymore if you are concerned that your yeast may be dead due to age or poor storage conditions any type of yeast can be tested for viability by *proofing*. This is nothing more than mixing a small amount of the yeast with an equal amount of sugar in warm water 105°-115°F, 40°-46°C for dried; 90°-95°F, 32°-35°C for fresh. Within about five to ten minutes active yeast will become bubbly and begin to expand (at normal room temperature). Yeast which only slowly becomes active can still be used, but you will have to use more. If there is no activity at all, the yeast is dead and should be tossed. If you've stored your yeast in half-way decent conditions, or better yet in the freezer, proofing will usually not be necessary.

NOTE: Rapid Acting yeast loses its fast rising capabilities if dissolved in liquid for proofing, and will require two complete rises like standard active dry yeast.

STORING YEAST: All of the dry yeasts will last for months on the shelf, until the expiration date which should

be clearly stamped on the package. If packaged in an air/moisture tight container and kept in the freezer it may last for several years though one year is the general recommendation most often found among various authorities. I'm presently (12/2003) using yeast stored in my refrigerator freezer in a tightly sealed canning jar with a "Best Used By" date of June, 1998 that is still going strong. The larger packs of yeast should be transferred to an air and moisture tight container after opening. A canning jar with a decent lid will suffice.

There is another means of providing leavening for breads besides buying yeast from a grocery store and that is by using a sourdough starter. I'm not going to address it here, but I will point out that it has a Usenet newsgroup all its own (*rec.food.sourdough*) which has several FAQ's devoted to it. You can find addresses for these FAQs in the Resources section. Drop in and read for awhile and you'll learn more than you thought you could ever want to know.

INFANT FORMULA

While not universal, it's safe to say that most folks interested in food storage are planning for families, real or as yet hypothetical. Many of these families include children (or hope to) under the age of two. Very young children such as this have nutritional requirements that are different from adults and require somewhat different preparations than adults or even older children.

If at all possible, it's best for children up to the age of six months to be breast fed by their mothers and up to the age of one year breast milk should contribute a significant portion of the child's nutritional intake. Indeed, breast feeding can supplement a child's diet in an important way until age two. Even the American Academy of Pediatrics now recognizes and recommends this. There are those who nurse even longer, but I mention this only as an observation, not necessarily as a recommendation. For the preparedness-minded breast feeding makes particularly good sense as mama can consume a far wider range of storable foods than a baby can, and she can produce from those foods a nutrition source perfectly suited to her child.

To promote this end here is the contact information for the largest and best known breast feeding support group.

La Leche League International 1400 N. Meacham Road
Schaumburg, IL (USA) 60173-4808
Phone (847) 519-7730 or 1-800-LALACHE (US) Fax
(847) 519-0035 E-mail: LLLHQ@llli.org Web: <http://www.lalecheleague.org>

They can help you to find local chapters of the League in your area and point out useful books and sources of information. When our daughter was born my wife has attended a number of our local chapter's meetings and borrowed books with which to educate ourselves.

Also in this same line, there is a useful document put out by the World Health Organization titled How to Breastfeed During an Emergency. It apparently is no longer hosted on any WHO sites so I have taken the liberty of hosting it myself at:

http://athagan.members.atlantic.net/PFSFAQ/Breastfeeding_in_an_emergency.html

It would be an excellent idea to print out a few copies and put them away. You never know who you might come across who'll desperately such information should there come a Fall.

ALTERNATIVES TO BREASTFEEDING

If breastfeeding should not be a viable option you'll need to find another source of infant nutrition. I STRONGLY RECOMMEND AGAINST USING HOME-MADE INFANT FORMULAS AS A SOLE SOURCE OF NUTRITION FOR A BABY. If you know you're going to have a nursing infant on your hands, if and when the balloon should go up, you should take steps in advance of the crisis to put away a suitable food supply for the child. Young children have nutritional needs that are different from those of adults or even older children. Lacking human breast milk, you should put by a store of commercially made infant formula. Evaporated milk, dry milk, sweetened condensed milk, goat's milk and all the rest can be an important *supplement* for children over the age of six months, particularly over one year of age. For children under six months of age these products simply do not contain sufficient amounts of the appropriate nutrients to provide adequate nutrition when used as the sole source of sustenance.

As for soy milk, there are considerable important differences in soy nutritional content compared to cow's milk which is to say nothing of human milk. Soy milk alone is simply not nutritious enough to serve as a sole source of nutrition for children under the age of six months and should not be used as more than a *supplement* for children over six months of age. This does not apply to commercially made *soy protein infant formula* which is a very different product than soy milk.

SELECTING AND FEEDING AN INFANT FORMULA

If the child you're concerned with is already on the scene then you probably already know which formula you need to put away. Unless instructed against doing so by your doctor, my only suggestion here is to make sure the formula has iron in it. The problems of iron in formulas from the nineteen fifties and sixties have long ago been solved and young children very much need this nutrient.

If you feel the need to store formula in advance for a child not yet on the scene (or who is only a contingency to plan against) I suggest storing one of the *cow's milk based lactose-free formulas*. Two brand names that will work

well are “Lactofree” from Mead Johnson and “Similac Lactose Free” from Ross Laboratories. Lactose is the sugar found in milk and an inability to properly digest lactose is the most common source of infant formula feeding problems. Of course, there is the remote chance the child could have a true allergy to cow’s milk protein, but the child could be allergic to soy protein too. It’s been known to happen for a child to be allergic to both at the same time. There is no absolute certainty in preparedness, but you can plan for the most likely problems which is why I suggest storing lactose free cow’s milk formula.

Unless you store only disposable bottles and “ready to feed” formula, don’t forget that both reconstituting formula from dry powder or liquid concentrates and washing feeding equipment requires the use of clean, safe drinking water. You’ll need to carefully examine your water storage in this regard.

STORING INFANT FORMULAS AND BABY FOODS

Storing infant formula and baby food is easy. Infant foods are one of the few areas in which the (US) Federal government regulates shelf life labeling. All containers of infant formula and baby food should have a clear “best used by” or similar date somewhere on the container which is generally longer than a child will require such food. Unopened containers of formula should be stored the same way you would keep dry milk, in a dark, cool, dry place and used before the date on the container is reached. Opened containers of dry formula powder should be used within one month of opening and the contents should be kept bone dry, cool and in the dark.

If it hasn’t been needed by the time the expiration date begins to near it’s an excellent idea to donate the infant formula to a nursing infant or organization like a food bank that can put it to use before it expires. There’s too much valuable high quality nutrition in infant formula to allow it to go to waste.

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Growing and Using Sprouts

Sprouts are great to eat for everyday living and especially so in an emergency situation. Typical foods set aside for storage are traditionally low or nonexistent in vitamin C and many of the B vitamins. Yet it is exciting to know the seeds from those same storage foods can be sprouted to give a rich source of these important nutrients. Sprouts are an excellent source of vitamin C and also contain many good B vitamins. And you probably won't find a less expensive way to get these vitamins than from low calorie sprouts. Green leafy sprouts are also a good source of vitamin A. Sprouts are a good source of fiber, protein, and contain enzymes that aid digestion. In addition, sprouting destroys the seed's natural preservative enzymes that inhibit digestion.

Different kinds of seeds you can sprout: (This list gives the popularly sprouted seeds and is not all inclusive as you can sprout almost any kind of seed.)

Generally eaten raw:

Alfalfa, radish, mung bean, sunflower, clover, cabbage.

Generally cooked:

Kidney, Pinto and other miscellaneous beans.

Eaten raw or cooked:

Lentils, Soy beans, green peas and wheat. (In addition, all the sprouts that are generally eaten raw can be easily cooked.)

Alfalfa: Alfalfa, one of the most popular sprouts, is a good source of vitamins A, B, C, D, E, F, and K and is rich in many minerals, as well as many enzymes needed for digestion.

Radish sprouts are high in vitamin C and potassium and have a rich flavor.

Wheat is high in Vitamins B, C, and E and has three times the vitamin E of dry wheat. Wheat also has many minerals.

Mung Beans:

These sprouts should be sprouted under pressure to produce long and juicy sprouts. Mung bean sprouts are an excellent source of protein, vitamin C, A and E, along with many minerals.

Green Pea sprouts are rich in many of the B vitamins and vitamin C. Green pea sprouts make a rich addition to any green salad.

Soybeans:

An extremely rich source of protein and vitamins A, B, C and E. Soybeans are rich in minerals and lecithin. They can be sprouted under pressure like mung beans.

Kidney beans, pinto beans and miscellaneous beans:

They are a good source of vitamin C, many of the B vitamins and many minerals. Sprouting these beans also changes their indigestible carbohydrates to digestible carbohydrates thereby greatly reducing the intestinal gas they otherwise cause.

Lentils:

Rich in protein, vitamin C and the B vitamins. They have a mild ground pepper flavor.

Buckwheat:

Makes a great salad green. High in vitamins A, B, C and D.

Sunflower: Rich in vitamins B, D, and E, many minerals, and Linoleic Acid, the W6 EFA.

Do Not eat tomato, peppers or potato sprouts as they are poisonous.

Growing Sprouts:

Sprouts are easy to produce and require no special equipment or knowledge. All that is required to produce sprouts is seeds, moisture, warmth, darkness and maybe 10 minutes of your time every day. Methods vary from high tech production to something as simple as quart jar or a cloth covered pan. Perhaps the simplest method is to take your seeds, place them in a quart jar, and cover them with water to start the process.

Seed amounts to use per quart jar:

1/2 Cup Seeds: Wheat, All Beans, Rye, Oats, Rice, Sunflower, Lentil, Hulled Buckwheat, and Garbanzo Beans.

2 Tablespoons: Alfalfa, radish, clover, cabbage.

Be aware that seeds soak up 2 or 3 times their dry volume in water. After they have absorbed all the water they are going to absorb (2-12 hours depending on the size of the seed), drain the water off, rinse them, and put them in a dark, warm place, with the bottle upside down and tipped up against a corner so water can drip out. Of course you need to put something under the bottle to catch the dripping water. Use a lid that permits air to move in and out of the jar. You can use a thin cloth, a nylon stocking, or anything you have that's handy. Fasten it down around the opening of the jar using an elastic or bottle ring. After the seeds have stopped draining, if you are sprouting very small seeds like alfalfa, cabbage or radish seeds, roll the bottle, coating the outer wall of the bottle with seeds. Leave the bottle on it's side in the dark. Room temperature is best for growing sprouts, around 70 degrees F. Rinse the seeds twice a day, being sure to drain them well. **(Do not neglect to rinse them. They will sour and be useless.)** Within two days your seeds should begin sprouting.

For sprouts you are going to cook, let the sprout grow only as long as the seed. For sprouts you will eat raw (except wheat) let them grow up to 2-3 inches. Expose mature alfalfa, wheatgrass, buckwheat or sunflower sprouts to indirect sunlight for 4-5 hours. As they turn dark green their vitamin A content dramatically increases. (This is an important step, for if you don't, your sprouts will have only about 1 percent of this vitamin's RDA. Don't expose bean sprouts to sunlight as this will give them an unpleasant bitter taste.) When your sprouts have grown to the desired length, rinse them again, then put them in a sealed container with something to absorb the water on the bottom and store them in the refrigerator.

Sprouting mung beans under pressure

Place soaked beans in a small colander inside another container. Place several layers of burlap over the top of the seeds, then place a 3-5 pound bag of marbles or small stones on top of this. Water every two or three hours to ensure adequate moisture (this prevents the root systems from over developing in their search for water). Keep them in the dark at all times or they will turn bitter as they begin to green. When they are 2 to 3 inches long, remove them from the colander and refrigerate.

Using your sprouts

After sprouts reach their peak, they immediately begin to lose their vitamin C. Because of this, don't attempt to store sprouts longer than a week. Only grow small quantities of sprouts that can be used in a short period of time. If you plan on getting many of your vitamins from sprouts, it would be a good idea to have one or two small batches of sprouts growing all the time.

Cook sprouted beans using the same recipes you normally use. Sprouted beans cook in 2/3rds the time of unsprouted beans. Heat kills a percentage of the vitamins and enzymes gained by sprouting, so simmer or steam slowly depending on your recipe, and don't cook longer than necessary.

You can sprout a mixture of seeds to make great green salads all by themselves. You can also use raw sprouts in just about anything:

- Blended in drinks.
- Added to bean or lettuce salads.
- Mixed with already cooked breakfast cereals.
- Wrapped in tortilla or taco shells and smothered in your favorite sauce.
- Added to soups and stews just before eating.
- Sprout filled Won Tons.
- Put into sandwiches.

Raw sprouts are so versatile that they can also be thrown in just about anything then cooked, such as:

- Breads and biscuits.
- Soups.
- Pancakes.
- Eggs and omelets.
- Oatmeal or cracked wheat.
- Sauces.
- Mexican or Chinese foods.
- Potato Patties.
- Casseroles.
- Dips.
- Meatloaf.
- Any vegetable.
- Stir fried all by themselves.
- Even desserts. Really, the sky's the limit.

When cooking sprouts, it is better to steam or stir fry them than to boil them and discard the water. You only lose 20-30 percent of the vitamin C compared to 60 percent.

How much sprouting seed you should store and tips on purchasing.

It is suggested that if you plan to get all your vitamins from sprouts alone, that you store up to 125 lbs of a variety of seeds per year per person. If you have other sources for your vitamins, it is suggested you have 30 lbs of seeds set aside for sprouts to be eaten raw, and 30 lbs of sprouts intended to be cooked per year per person.

Many specialty companies exist that deal exclusively in sprout seed. Usually these seeds cost several times more than other seeds of the same type. One study shows that mung beans sold exclusively for sprouting cost 4.5 times more than regular mung beans. Yet 99 percent of the time the cheaper seed will sprout and grow as quickly as the more expensive seed. It is the web page author's opinion that it is a waste of money to buy 'sprouting seed' over regular seed. Before purchasing a large amount of storage seed intended for sprouting, purchase a small amount and test it to see if it sprouts well.

Do not attempt to store your sprouting seed for more than 5 years unless it is stored in a cool (at least 60-65 degrees F) dry place. If you are storing large seed, it may be packed in the absence of oxygen. Seed may last up to 15 years stored in this way. As your seeds get old they will take longer to sprout, and you will progressively get more seeds that won't sprout. The key again is rotate, rotate, rotate.

Use several different kinds of sprouts to find what you like before purchasing a large quantity of seed. Do not purchase seeds intended for anything except human consumption. Many seeds processed by farmers and gardeners for planting have been **treated with fungicide and or insecticide** agents and are very **poisonous**. These seeds are usually, but not always dyed red. If in doubt, ask.

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Pros and Cons of Freeze-Dried, Dehydrated, MRE, Food Bars, & Basic Commodities.

Pros

Cons

Freeze-Dried / Instant

Very low moisture
Very lightweight
Long shelf life
Reconstitutes quickly
Retains original shape, texture, color after reconstitution
Best way to dry meat items

Most expensive food storage option
Most items require water to prepare
Items are bulkier than if dehydrated

Dehydrated (most items)

Low moisture
Lightweight
Long shelf life
No waste
Not easily spoiled

Requires water to prepare
Some items take a long time to reconstitute
Some items lose taste after reconstitution
Dehydration process can affect nutritional value
Some items have poor visual appeal

MRE (Meal Ready to Eat)

Can be eaten right from pouch without preparation
Requires no water to prepare
Can be heated for hot meal by many methods
Convenient to use
Familiar foods available
No mixing or blending required

Taste of MREs considered poor by some
Artificial additives added in many recipes
Expensive considering actual food received
Many entrees more like sauces & require additional quality carbohydrates for a filling meal
Entrees alone will not supply adequate nutritional value
Because of foil pouch, they are susceptible to puncture
Can be heavy if larger quantities need to be transported

Emergency food bars

Compact - convenient
Low cost
5 year shelf life
Can take exposure to high heat

Limited nutritional value
Not a satisfying substitute for a hot meal
Not adequate for prolonged use

Grains, Beans, Basic Commodities

Very familiar
Low cost
Long storage life
Traditional basic foods
Good nutritional value
Many sproutable seeds, grains, and beans increase nutritional value

Not generally appropriate for shorter term emergencies
Very heavy weight
Requires large quantities of water and fuel to prepare
More time consuming to prepare
Time is required to adapt to basic commodity oriented diet
For higher calorie requirements a fairly large quantity of grains/beans must be consumed when eaten exclusively.

MREs: MEALS, READY TO EAT

This category includes more than the modern day military rations known by the above acronym, but also their civilian equivalents which are marketed by two of the major U.S. military MRE contractors, and a number of other products on the civilian market that fit better into this category than any other. Over the last several years the number of self-contained meals available in either the new style flexible pouches or old fashioned metal cans has greatly increased. I can't cover them all in detail so for this section I will cover only those meals that also include some form of self-contained heating device to warm the food to serving temperature. This allows one to have a hot meal yet needing no equipment other than a spoon to eat with. Whether you buy self-heating meals or supply the heat yourself to non-self heating meals you should investigate the offerings your local grocer may now be carrying. They have great potential for those situations where cooking food would be difficult or impossible.

U.S. MILITARY MREs

The Meal, Ready to Eat (MRE) is the current U.S. military field ration for those times when troops are out of contact with their regular mess facilities. In the early 1980's they replaced the older C & K-rations that had honorably served since the Second World War. These new rations represented a major leap forward in food preservation technology by disposing of the heavy, unwieldy metal can and replacing it with the much lighter, flexible "retort pouch." These pouches are the beefier cousins of the aluminized Mylar bag much used in long-term food storage and are basically constructed the same way. A thick outer layer of tough polyester film, a thin middle layer of aluminum foil for its excellent gas barrier properties, and an inner layer of food safe polypropylene film to allow heat sealing. Food is placed in the pouch then specially heat processed for preservation which renders it microbiologically shelf-stable, fully cooked, and ready to eat.

What's in an MRE?

From the Defense Logistics Agency Subsistence web site (<http://www.dscpl.dla.mil/subs/rations/meals/mres.htm>) we find this:

The twenty-four different varieties of meals can be seen in the menu table. Components are selected to complement each entrée as well as provide necessary nutrition. The components vary among menus and include both Mexican and white rice, fruits, bakery items, crackers, spreads,

beverages, snacks, candy, hot sauce, and chow mein noodles for the pork chow mein entrée. The fruits may be applesauce, pears, peaches, pineapple, or strawberry. The bakery items include a fudge brownie, cookies, fruit bars, a toaster pastry, and pound cake in flavors of lemon, vanilla, orange, pineapple, and chocolate mint. Each meal also contains an accessory packet. The contents of one MRE meal bag provides an average of 1250 kilocalories (13 % protein, 36 % fat, and 51 % carbohydrates). It also provides 1/3 of the Military Recommended Daily Allowance of vitamins and minerals determined essential by the Surgeon General of the United States.

All of which is then placed inside of a heavy plastic pouch and sealed. Being field rations they had to be designed to take considerable punishment in packs, air drops, and other forms of abuse remaining safely intact until consumed. By and large they do just that.

All of this sounds rather attractive to the person interested in emergency preparedness and they are. So much so, in fact, that several years ago the U.S. military finally said "enough!" to the continuing losses of their rations to the civilian market and banned any further civilian sale. All new MRE complete ration packs now bear the words "U.S. Government Property. Commercial Resale Is Unlawful."

This did slow the loss rate somewhat, but anyone that wants the real thing can still get them from military personnel they may know, at gun shows, some military surplus shops, or via E-Bay. Whether you should do this is up to you, but I will give a couple of cautions here:

#1 – Being a back channel acquisition chances are you have no way of knowing the storage history of what you're buying. Maybe it's been sitting in some nice cool warehouse since it was produced or maybe it bounced around in the back of a deuce-and-a-half in the Nevada desert for a month last summer. If you don't know where it's been how can you estimate how much useful shelf-life it may have left?

#2 – Make sure what you're buying really is a military MRE or MRE component. Some of the civilian commercial products can look remarkably similar, but are not quite the same. Know what

you're looking at and make it clear with the person you're buying from that you want genuine military issue (if that's what you want).

MRE Heaters: These devices will either come with your MRE at the time of purchase or they can be bought separately. They contain a small amount of salt, magnesium, and iron and when you add a small amount of water they undergo a flameless chemical reaction that will heat an 8 oz MRE entrée by roughly 100° Fahrenheit (37°C) in about ten minutes. As water is what starts the reaction it is imperative the heaters be kept dry until used. If stored in an area of high humidity the heaters can undergo a slow reaction leading to degraded performance later or even complete failure over time. As a part of the chemical reaction the heaters release small amounts of hydrogen gas which is generally harmless but large numbers of heaters in a damp, sealed storage area could conceivably present a danger. This is unlikely unless you're storing many cases of heaters. In such an event keep them in an air tight storage container with some desiccant.

While any MRE can be eaten cold these heaters can certainly improve the palatability of the food. Lacking a heater you can simply boil the individual retort pouches in water for a few minutes, lay them in the sun to warm, or tuck them in your shirt. The one thing you should not do is expose them to direct flame.

For more detailed information on U.S. military, civilian, some foreign military MREs, and other rations please see the excellent MRE Info website at <http://www.mreinfo.com/index.html>

U.S. MILITARY MRE SHELF LIFE

Much discussion has gone into how long one should keep MREs on hand before rotating them out of stock. In this regard they're no different than any other type of preserved food. The longer you keep them on hand the more unpalatable and non-nutritious they will become with heat playing a large role in shortening their useful lifespan.

The short answer to the shelf-life question (from <http://www.dscp.dla.mil/subs/rations/meals/mres.htm>) is simply "The shelf life of the MRE is three (3) years at 80 degrees F. However, the shelf life can be extended through the use of cold storage facilities prior to distribution." Of course, that's at 80° Fahrenheit (27°C). What if your storage temperature is different? Then you need the storage life chart that was developed by the U.S. Army's NATIC Research Laboratories which basically says that at a given

storage temperature an MRE will remain palatable for so many months as illustrated below:

Storage Temperature	Shelf Life
120° F (49°C)	1 month
110° F (43°C)	5 months
100° F (37°C)	22 months
90° F (32°C)	55 months
80° F (27°C)	76 months
70° F (21°C)	100 months
60° F (15°C)	130 months +

Note: As with any other stored food, time and temperature have a cumulative effect. For example, storage at 100° F. for 11 months moved to 70°F(21°C) would lose one half of the 70°F. storage.

A complete shelf-life chart for all U.S. military rations may be found here:

<http://www.dscp.dla.mil/subs/subsbo/qapubs/table.pdf>

U.S. CIVILIAN MREs (WORNICK, SOPAKCO, OTHERS?)

Except for contract overruns on individual components actual military MREs, especially complete MRE ration packs, are not legal for sale on the civilian market. Recognizing there was a civilian market for such rations both Wornick and Sopakco through its Crown Point, limited, subsidiary brought out similar products for commercial sale. Their complete civilian ration packs are not precisely the same as their military cousins, but the individual components are usually produced on the same production lines.

Because there are no legal restrictions on their sale these civilian MREs are easier to find and are generally available in three basic forms –individual components, complete ration packs, and multi-serving tray packs meant for group feeding. Exact menus vary over time, usually being a subset of whatever the companies are producing for the military at the time of their production so I'm not going to try to address specific menus.

Some of the typical differences between military and civilian

MREs are:

Menu choice. Military MREs presently have twenty four different menu choices. Their civilian equivalents are currently limited to twelve.

Ration heaters. These are standard with military MREs, but you may have to pay extra to get them with the civilian equivalents.

Total amount of food. Many of the civilian offerings contain less total food than military MREs, typically in the form of fewer side items. One notable difference is that fewer of the civilian rations contain the little Tabasco packets than their military counterparts.

The spoon. The spoons in the civilian packets are not the same as in the military rations. The civilian spoon is white plastic while the military spoon is brown and of a longer length which makes it easier to get to the bottom of the pouches without getting food on your fingers. This strikes me as particularly chintzy on the manufacturer's part.

For more detailed information on U.S. military, civilian, and some foreign military MREs, and other rations please see the excellent MRE Info website at <http://www.mreinfo.com/index.html>

U.S. CIVILIAN MRE SHELF LIVES

One would think that the shelf lives of U.S. military and civilian MREs would be the same, but are they? If you look at the manufacturer's websites for what they say about their civilian equivalent rations we find:

Crown Point, Ltd (SOPAKCO)

From <http://www.crownpt.com/Q&As.htm>

How long will these products last? </p>

SOPAKCO Packaging uses an estimated shelf life figure of "3-5 years, plus or minus" for its MRE-type pouched food products. Actual shelf life may vary from this estimate. A key factor effecting actual shelf life is the temperature of the storage environment. Storage at temperatures higher than 85F (85 degrees Fahrenheit) may shorten the shelf life of MRE-type food products. On the other hand, lowering the storage temperature will help extend the products' shelf life. This effect is common to most processed food products.

The shelf life figures given below for MRE's are based on studies conducted by the U.S. Army's NATIC Research Laboratories. This study was conducted by NATIC without participation of the MRE manufacturers. As such, SOPAKCO Packaging cannot verify the test procedures used by the NATIC labs, nor do we adopt these shelf life figures as a guarantee of any sort. The data is useful, though, as a general indication of the effects of storage temperatures on the shelf life of MRE-type food products.

Temperature (Fahrenheit): 100° 90° 85° 80° 75° 70° 60°

Storage Life in Months: 22 55 60 76 88 100 130+

The above storage data and time periods were based on "acceptable taste" measures, which is a subjective standard that may vary among each individual. Test participants were asked to indicate which products they were presented would be rated to still be of "acceptable taste". Responses were noted, and average values were calculated to yield the data above.

The above data does not indicate the maximum useful life of MRE food products. The NATIC study noted that nutritional value and product safety value of the products often extended far beyond these time points.

Again, SOPAKCO Packaging in no way adopts the NATIC shelf life figures as any form of express or implied guarantee of the actual shelf life of its MRE food products. This information is provided as a general indication of the effects of storage temperature on MRE-type packaged foods.

Long Life Food Depot (The Wornick Company's civilian sales agent)

From <http://www7.mailordercentral.com/longlifefood/Faq.asp#heaterpouches>

How long do MRE products last - what is their Shelf Life

We guarantee our MRE products to last 5 years

from the date of sale, in a room temperature environment (70 deg. F), no matter what the production date.

Of course, the production date is visible on all our entrees and on most side dishes, desserts, and other components.

The production date is a four digit number (date code) on each item, example "2156." In this example the 2 represents the year 2002 (a "3" would represent 2003, etc.), the 156 represents the 156th day of the year. See the top of the individual box or look on pouch for the Date Code.

At this time nearly all of our MRE products were manufactured between 2002 and 2003 and have always been kept in a climate-controlled warehouse to ensure freshness.

The official MRE Shelf Life Chart, created by the Army's Natick Research Lab, gives the whole picture and explains why we are prepared to guarantee our products for 5 years from date of sale. It is clear that the wholesomeness of the products extends well beyond 5 years. To see this chart and a more complete discussion of MRE Shelf Life, click here.

Which takes you to the text below

<http://www.longlifefood.com/mre.html#Shelflife>

MRE Shelf Life:

A main concern in the development and testing of rations for our armed forces has always been SHELF LIFE. An amazing amount of research has been done in the development of the retort pouch and the MRE to determine the exact length of time and the exact conditions under which it is safe to store the entrees and the side dishes.

The main thing we have to work with is the shelf life chart (shown below) compiled by the Army's Natick Research labs. This gives a very good overview and summary of all the findings gathered from all the testing of MRE products. However, it leaves many questions unanswered. Here are

additional facts and observations we have gathered about MRE shelf life:

1) The shelf life ratings shown in the chart below were determined by taste panels, panels of "average" people, mostly office personnel at the Natick labs. Their opinions were combined to determine when a particular component or, in this case, the entire MRE ration, was no longer acceptable.

2) The shelf life determinations were made solely on the basis of taste, as it was discovered that acceptable nutritional content and basic product safety would extend way beyond the point where taste degradation would occur. This means that MREs would be safe and give a high degree of food value long after the official expiration of the products as determined by taste.

3) MRE pouches have been tested and redesigned where necessary according to standards much more strict than for commercial food. They must be able to stand up to abuse tests such as obstacle course traversals in field clothing pockets, storage outdoors anywhere in the world, shipping under extremely rough circumstances, 100% survival of parachute drops, 75% survival of free-fall air drops, severe repetitive vibration (1 hour at 1 G vibration), 7,920 individual pouch drops from 20 inches, and individual pouches being subjected to a static load of 200 lbs for 3 minutes.

4) Freezing an MRE retort pouch does not destroy the food inside, but repeated freezing increases the chances that the stretching and stressing of the pouch will cause a break in a layer of the laminated pouch. These pouches are made to withstand 1,000 flexes, but repetitive freezing does increase the failure rate by a small fraction of a percent.

MRE Storage Life Chart A graphic of the chart I have reproduced above.

As we can see both company's refer to the NATIC shelf-life chart then give qualifiers "*The NATIC study noted that nutritional value and product safety value of the products often extended far beyond these time points.*" and "*This means that MREs would be safe and give a high degree of food value long after the official expiration of the products as determined by taste.*" Neither state how much or what kinds of nutrition would remain once the food goes beyond it's recommended shelf life, but it can be safely assumed the most sensitive nutrients (notably vitamins A and C among others) will

have significantly declined. Old food is not likely to be attractive food, nor will it give long term nutrition, but if it's all you've got it'll still be safe to eat it.

BRITISH/CANADIAN MREs

These are basically MREs little different in form than the American made product but made by companies in these respective nations. Shelf-life is the same. Menu choices reflect British/Canadian tastes, of course. Company contact information can be found in the Suppliers Section.

One minor difference seems to be with the Hot Pack company of U.K./Canada in that they claim their ration heaters are somewhat larger than the ones packaged with U.S. MREs

From the company's web site:

Will defrost ice or snow for drinking water.

Will heat 300 g (10.6 oz.) of food or water from room temperature to 80°C (178°F) in 12 minutes. Will provide a source of heat for up to forty five minutes after activation.

Is sometimes reusable for a limited heat cycle (dependent on how much of the heating element was exhausted in the first cycle).

The chemical reaction is totally safe. When water is added to the heater, the mixture bubbling away inside the sleeve (magnesium hydroxide) is a pharmaceutical chemical used by doctors to treat stomach acidity.

Food grade ingredients are used in the manufacturing of the heater.

Once activated, the heater will keep hot for approximately 45 minutes.

It can be used as a body warmer or to heat a drink after heating the meal.

OTHER SELF-HEATING READY TO EAT TYPE PRODUCTS

As one might expect once the bugs were worked out of retort pouch and flameless ration heater technologies the manufacturing companies that produce them would try them on the civilian market. This has been a little slow in coming, mostly because in the modern day 'fresh is best and refrigeration is cheap' world their market segment is somewhat small, but they are arriving. At the time of this writing there are several products now available, some of them quite new.

HEATERMEALS

HeaterMeals are a type of MRE in casual clothing. Like the rations above they are a retort pouch preserved meal with its own built in heater. The heater itself is the same technology as the MRE heaters (the company makes them for the military), but a little different in form, to include having its own self-contained water to start the heating reaction. The meals themselves aren't packaged with the idea of rough handling in mind, but they'll keep well on the shelf.

The meals themselves come in two basic forms:

An entrée pack with the heater, seasoning packet and cutlery

A complete meal pack with the heater, entrée, seasoning packet, cutlery, side items like fruit, snack, and dessert, and a bottle of water to drink.

If you're not having to use them under rough field conditions they represent a self-heating, completely self contained meal.

These meals can be ordered from the manufacturer, a number of dealers which are listed on the company website, or you can often find them at truck stops, some supermarkets, sporting goods stores, and other such businesses.

Shelf life info for HeaterMeals was found at: <http://www.heatermeals.com/faq.html#shelflife>

What is the shelf-life of HeaterMeals and HeaterMeals Plus Meals?

HeaterMeals are a high quality canned food, so storage is easy.

HeaterMeals Dinner entrees do not require refrigeration, and are shelf-stable for approximately 2 years. HeaterMeals entrees come with a "Please use by" date stamped on each box. This date is two years after we package the meals, as this is the optimum time to eat your HeaterMeals.

The HeaterMeals Breakfast "Pancakes, Syrup & Sausage Links" and all HeaterMeals Plus meals have a one year shelf-life.

HeaterMeals dinner entrees are designed to safely store (at 80 degrees Fahrenheit) for at least two years; three years or more, if stored at a temperature of 60°F or

cooler. The shelf-life of HeaterMeals can be even longer; and the unique packaging of the entree and water pouch permits freezing for unlimited storage.

HOT CANS – UNITED KINGDOM

In the United Kingdom there is another entry in the self-heating meal field. This is the Hot Can from Hot Can UK, Limited. It's an interesting blend of old and different new tech in that the food itself is contained in a run-of-the-mill pop-top metal can, but the food can is contained in a sealed larger can filled with calcium oxide (quicklime) and a separate water capsule. When needed the self-contained water capsule is pierced with the provided tool allowing moisture to seep into the dry quicklime below and the food can pop-top is removed. In twelve to fifteen minutes the can will have heated to 65°-70° Celsius and remains at that temperature for roughly forty five minutes which means once you've finished the food inside you can quickly rinse the can and heat something else, perhaps a beverage.

There are a variety of meals available from the company, each weighing about 400 grams (roughly 14 ozs). Shelf life is *"Three years from manufacturing date, or as indicated on printed bottom end of can."* The heater itself releases no harmful or dangerous gasses and if for some reason you should break one open and spill some of the quicklime on yourself it can simply be washed off again with water.

Company contact information can be found in the Suppliers Section. Hot Cans are probably also available through retail dealers in the U.K. and elsewhere.

ALPINEAIRE INSTANT – SELF HEATING MEALS

New on the market from AlpineAire is their entry into the self-heating meal arena. Uses the same retort and flameless heater technology as MREs but in different packaging. Snap the bottom of the package and in eight minutes your entrée is hot and ready to go. As I write this there are only two entrees with more coming in the near future. They're rather pricey at a suggested retail of \$8.95 for a mere 240 calories worth of vegetarian food. Still, it's a start and with time they may both lower the price and increase the menu choices.

Alpineaire advises an eighteen month shelf life for this particular product line. They may be ordered directly from AlpineAire or through their many stocking dealers.

MOUNTAIN HOUSE MOUNTAIN OVEN

Mountain House isn't really offering a true Meal, Ready

to Eat since you still have to add water to their freeze dried/dehydrated food, but I'm including it here since it's close. Basically, what they're offering is their own version of a flameless ration heater and some new packaging of a few of their entrees that allows the pouches to be put into their heaters to be warmed. They call their heater a "Mountain Oven" though they really don't bake anything, just warms things up.

To use their heater you dissolve one of the furnished salt tablets in a plastic bottle that comes in the kit. Place a "heat activation pad" in the bottom of the insulated over pouch then pour the salt water on it. Open up the food pouch, pour in the required amount of water then put the pouch inside the insulated bag and zip it closed (the outer bag is vented). Twenty minutes later the food should be about 100° F. (38°C) hotter than when you started.

Each Mountain Oven kit is good for five uses. At a suggested retail of \$11.99 per kit that's about \$2.40 per use which makes it rather pricey compared to the ordinary MRE heaters already on the market which can usually be purchased for about a buck apiece or less. Still, like the AlpineAire entry it's a start and with time they may come down in price and perhaps be easier to use as well.

The Mountain Oven kits can be ordered from Mountain House directly or purchased from one of their many dealers as they are distributed.

RATION BARS

U.S. Coast Guard approved lifeboat ration bars are not common storage foods. Nevertheless they have a specific use important enough to warrant inclusion in personal preparedness programs.

As many involved with emergency preparedness discover, finding foods capable of being stored for long periods of time under harsh conditions that will remain both palatable and nutritious is a real undertaking. This is especially a problem with vehicle emergency kits where interior temperatures in the Spring, Summer, or Fall may exceed 120°F (50°C) for hours at a time each day. Very little in the way of anything usefully edible will survive such sustained temperatures for long before it breaks down, becomes unpalatable, with most or all of its nutrients damaged or destroyed.

This is a problem not only for those of us trying to build vehicle emergency kits but also for mariners needing to provision life boats that might be exposed to anything from desert temperatures to arctic climates. In reaction to this and a number of other marine emergency preparedness needs most of the world's maritime nations met to develop the Safety Of Life

At Sea (SOLAS) conventions, one of which concerns itself with emergency provisions for lifeboats. In the United States responsibility for implementing the SOLAS regulations falls to the U.S. Coast Guard and they have developed guidelines by which manufacturers must abide in order to become Coast Guard approved suppliers of life boat rations.

Among the guideline requirements are:

- Lifeboat rations must be capable of withstanding long periods of high temperatures or sub freezing weather without significant deterioration;
- must not increase bodily water needs with high protein or salt levels yet provide sufficient calories to keep the body from burning its fat reserves which also increases bodily water needs;
- be compact in size and lightweight;
- be sufficiently palatable that injured or ill passengers would be able to eat them;
- not constipate nor cause diarrhea;
- use packaging that is sufficiently durable to withstand rough conditions.

Those manufacturers that meet these guidelines can submit their products for approval to be placed on the *U.S. Coast Guard Equipment List 160.046 - Emergency Provisions for Merchant Vessels* which may be found here: <http://www.uscg.mil/hq/g-m/mse/equiplists/160046.pdf>

Each of these companies produces lifeboat rations. In the U.S. the two most commonly available product lines are the Mainstay Emergency Food Ration and the Datrex Red (or White) or Blue ration.

The Mainstay rations are lemon flavored and available in 1200, 2400, and 3600 calorie packages. The Datrex rations are coconut flavored and available in 2400 (red or white ration) or 3600 (blue ration) calorie packages. As per regulations both have a five year shelf life. Each package from either company has been tabletized and subpackaged to make it easier to serve them out in controlled portions.

Both are primarily composed of complex carbohydrates, fairly low protein, enriched with extra vitamins and minerals then vacuum sealed in heavy aluminized plastic pouches similar to military MREs. Flavors are noted above, textures are similar to a fairly dense pound cake. I've sampled both and while I wouldn't care to eat them for a week straight for the relative

few days a vehicle or similar emergency kit is intended to get you through they'll get the job done and not turn into something nasty after a few months of hot weather. In the cool times of the year when vehicle interiors do not climb into oven temperature ranges food options increase considerably with some form of military or civilian-equivalent MRE being well suited to the task.

Something to consider if you're building emergency kits or bug-out bags.

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STORAGE CONTAINERS

WHAT IS FOOD GRADE PACKAGING?

Q: OK, I'm ready to start my storage program. What should I put the food in?

A: You should use food grade packaging for storing anything you intend to eat. A food grade container is one that will not transfer noxious or toxic substances into the food it is holding. If you are uncertain whether a package type is food grade you can contact the manufacturer. Ask if that particular container is (US) FDA approved meaning that it is safe for food use. When inquiring be sure to specify the characteristics of the food you are storing; wet, dry, strongly acidic or alkaline, alcoholic or a high fat content. A container that is approved for one of the above types of food may not be approved for another.

The major functions of a food storage container are to:

#1. Protect its contents from outside environmental influences such as moisture, and oxygen, but possibly also heat or cold, light, insects and/or rodents as well.

#2. Prevent damage during handling and shipping.

#3. Establish and/or maintain microbiological stability. The container should not allow microorganisms such as fungi and bacteria from outside the container to come into contact with its contents. This is of critical importance to wet-pack foods such as canned vegetables, fruits and meats.

#4. Withstand the temperatures and pressures it will be exposed to. This is necessary if the contents are to be pasteurized or sterilized, either immediately before or after filling. It must not have any structural failures nor release any noxious or toxic breakdown chemicals into the food it contains. This is the reason why purpose built canning jars are recommended for home canning and mayonnaise jars aren't. The former are made heavier to withstand high temperatures and handling whereas the latter are not and have an increased risk of breakage if used for that purpose.

Virtually all containers used in home food preservation involving exposure to high temperatures are made of glass or metal, with the exception of some specialized "heat & seal" type of plastic bags. Glass can be used with any food type providing it is clean and in sound condition but the lids,

particularly the liner inside the lid, may not be so you'll need to investigate suitability.

Metal cans are more specialized. They must be intended for food use and must also have a lining or coating of the inside that is suitable for the pH level of the food it will be in contact with.

If the foods are not subjected to some form of heat processing before or after packaging your selection of container types for home use is a great deal larger. Virtually any kind of clean, sound glass jar can be used and many types of new metal containers. Several sorts of plastics have become popular. These various kinds of plastics are each suited for different purposes, making selection a more complex task.

WHERE DO I FIND FOOD GRADE CONTAINERS?

Food grade packaging is everywhere. Every time you go into the grocery store you are surrounded by it. Many well known companies such as Tupperware and Rubbermaid manufacture and sell empty packaging for the express purpose of containing repackaged foods. The kinds of containers you are interested in and the types of foods you want to put in those containers will dictate where you need to look for a particular packaging system.

For food storage purposes most folks are usually interested in five and six gallon plastic pails, certain recycled plastic containers such as soda or juice bottles, glass jars from half pint to gallon sizes, metal containers such as the institutional sized #10 cans, and Mylar or other high barrier property plastic bags. Those are the containers most often used, but virtually anything that can protect foods from outside environmental influences, safely contain something you're going to later eat and have a volume capacity large enough to be worthwhile may be used.

A number of food storage retailers such as those listed in the Resources section sell plastic buckets, Mylar bags and a few even sell new #10 cans with lids. It may also be possible to purchase #10 cans through the LDS Family Canneries and dealers such as *Lehman's Hardware, Cumberland General Store* or *Home Canning Specialty and Supply*. On the local scene, plastic five gallon buckets are widely available, but only if you purchase them through a company catering to a food related trade will you likely be able to tell if they're safe to keep food in. If you can locate a customer service number for the manufacturer of a container that interests you call them and ask. Many

times manufacturers will make products that are FDA approved and sell them as general purpose containers, but you need to ask to be sure.

Packaging supply houses have large FDA approved packaging lines. Several such companies are listed in the Resources section and a bit of detective work will certainly turn up more. Some require minimum orders and others don't. The cost of shipping the containers will probably play a major role in your decision making. If you are going to package a great deal of food all at once, perhaps for a group, some of the companies that require minimum purchases may save you a fair amount of money and supply packaging you might otherwise have a difficult time finding. Some time spent searching the *Thomas Register*, available both online (<http://www.thomasregister.com>) and in library reference sections, might turn up some valuable leads.

For glass jars, don't overlook flea markets, yard sales, thrift shops and similar places. Canning jars can sometimes be had for very little. Delicatessens, sub shops and restaurants of all sorts can be a source of one gallon glass jars formerly containing pickles, peppers, etc. If the lids are still in good condition, they are well suited to bulk storage and can be reused over and over. When I need new buckets I go to a neighboring town to buy them from a beekeeping supply house which sells them for bulk honey storage. A bit of looking will turn up other potential sources as well.

Metal cans, by and large, are not reusable for food storage, but some companies might be able to sell you new cans. The traditional single use #10 can is only the beginning of what might be available with a little looking. Gallon sized or larger cans with double friction lids (like paint comes in) make excellent storage containers and some companies make them food safe. One gallon and larger cans with wide diameter screw caps are available from some companies as well. You might have seen some of these holding edible oils, soy sauce, honey and other liquid food. If they come with a cap that will seal air tight they would be well suited for bulk storage of grains and legumes, particularly if they come in a four to six gallon size.

Pick up your local phone book, log on to your favorite search engine or head to your local public library and explore the possibilities. Make it clear that what you want must be FDA approved and be up front about how many you need or can deal with. If one company won't deal with you, try another. You'll eventually get what you want.

PLASTIC PACKAGING

Before we can discuss plastic packaging it is necessary to understand what is the substance we call "plastic." Plastics are produced from basic polymers called "resins", each of which have differing physical properties. Additives may be blended in for color or to modify particular properties such as moldability, structural rigidity, resistance to light or heat or oxidation. Additionally, it is common for several different kinds of plastic to be laminated together each performing a particular desired task. One might offer structural rigidity and the other might be more impermeable to the transfer of gasses and odors. When bonded together a rigid, gas impermeable package can be made.

Whether that package is safe for food use will depend on the exact nature of the additives blended into the plastic. Some of them, notably *plasticizers* and *dyes*, can migrate from the packaging material into the food it's containing. This may be exacerbated by the food it's in contact with especially if it is high in fat, strongly acidic, or alcoholic in nature. Time and temperature may also play a prominent role in the migration of plastic additives into food. For this reason, the (US) FDA assesses the safety of packaging materials for food contact and conducts toxicological studies to establish safety standards. Only plastics that are FDA approved for a particular food type should be used for direct contact with that food.

Being FDA approved, however, may not be all of the story. It must still be determined whether the particular plastic in question has the physical properties that would make it desirable for your purpose.

As mentioned above each base resin has somewhat differing physical properties that may be modified with additives or combined by laminating with another plastic or even completely unrelated materials such as metal foils. An example of this is "Mylar", a type of polyester film. By itself, it has moderate barrier resistance to moisture and oxygen. When laminated together with aluminum foil it has very high resistance and makes an excellent material for creating long term food storage packaging. One or more other kinds of plastic with low melting points and good flow characteristics are typically bonded on the opposite side of the foil to act as a sealant ply so that the aluminized Mylar can be fashioned into bags or sealed across container openings. The combined materials have properties that make them useful for long term storage that each separately do not have.

The most common plastic that raises suitability questions is *High Density PolyEthylene* (HDPE). It's used in a wide

array of packaging and is the material from which most plastic five and six gallon buckets are made. It has a moderate rigidity, a good resistance to fats, oils, moisture and impacts, a fair resistance to acids, but is a relatively poor barrier to oxygen.

Whether it is suitable for your purpose depends on how sensitive to oxygen your product is and how long you need it to stay in optimal condition. Foods such as whole grains are not particularly delicate in nature and will easily keep for years in nothing more than a tightly sealed HDPE bucket. Most legumes are the same way, but those that have high fat contents such as peanuts and soybeans are more sensitive to O₂. Other foods such as dry milk powder might only go a year before deleterious changes are noticed. If that milk were sealed in an air-tight aluminized Mylar bag with the oxygen inside removed, the milk would keep for much longer. Better still would be to seal the milk in a metal can or glass jar. HDPE alone can be used for long term storage with one or more of the following precautions to keep a high food quality: The food should either be put on a shorter rotation cycle than packaging also using a second gas barrier such as Mylar; be periodically opened and re-purged or fresh absorbers should be inserted.

Another common plastic used in food storage is *polyethylene terephthalate* commonly known as PETE or PET plastic. Used to make soda, juice, and some water bottles among other products it is available for recycling into food storage containers in nearly every home. Properly cleaned and with intact screw-on lids PETE plastic containers will serve for keeping nearly any kind of food providing the containers are stored in a dark location. PETE has good barrier properties against oxygen and moisture and when used in combination with oxygen absorbers presents a complete dry-pack canning system in itself. About the only drawbacks to PETE plastics are that they are nearly always transparent to light, container volumes typically are limited to a gallon or less, and when used in conjunction with oxygen absorbers the sides will flex sufficiently to make stacking difficult though you could simply lay them on their sides.

There are other plastics and plastic laminates with good oxygen and moisture barrier properties that are suited for long term food storage, but they are not as easy to find, though some used containers might be available for reuse.

HOW DO I GET THE ODOR OUT OF PICKLE BUCKETS?

I've had fairly good luck doing it in the following way. As vinegar is the primary smell in pickles and it's acidic in nature,

we use a base to counteract it. First we scrubbed the bucket well, inside and out, with dish detergent, most any sort will do. Then we filled the buckets with hot water and dissolved a cup of baking soda in each. Stir well, get the bucket as full as you can and put the top on. Put the bucket in the sun to keep it warm so the plastic pores stay open as much as possible. In a couple of days come back and empty the buckets. Rinse them out, fill with warm water again and add about a cup of bleach and reseal. Put back in the sun for another couple of days. Empty out and let dry with the tops off. We completely eliminated the vinegar smell this way. It might be possible to cut the time down a lot, but we haven't experimented that much.

METAL CANS

Metal cans and glass jars being heat resistant, can both be used for heat processed, wet-pack foods and for non-heat treated dry pack canning. Relative to glass jars though, metal cans have several disadvantages for the do-it-yourselfer. They are hard to come by, and they need specialized equipment to seal them that can be difficult to locate. The greatest flaw which makes them unpopular for home canning is they can only be used once. As the commercial canning industry is not interested in reusing the containers, metal cans make great sense for their purposes. The cans are both cheaper (for them) and lighter than glass jars. This adds to the economy of scale that makes canned foods as cheap as they are in the grocery store.

For home canning, glass jars are better because even the smallest of towns will usually have at least one business that carries pressure and boiling water canners along with jars, rings and lids. With metal cans a sealer is also necessary which usually has to be ordered from the manufacturer or a mail-order distributor. A few of which are listed in the Resources section.

Tin cans are not really made of tin. They're actually steel cans with a tin coating on the inside and outside. Some kinds of strongly colored acidic foods will fade from long exposure to tin so an enamel liner called "R-enamel" is used to forestall this. Certain other kinds of food that are high in sulfur or that are close to neutral in pH will also discolor from prolonged contact with tin. For those foods, cans with "C-enamel" are used.

The excellent food preservation book, *Putting Food By* Chapter 6 (see reference list) has a section on the use of metal cans for wet packed foods as does the *Ball Blue Book*.

Probably the most common use of metal containers is the #10 cans such as are used by the LDS Family Canneries discussed below. This is not the only way metal containers may be used though. It will probably take a bit of searching, but there are various food grade metal containers available of sufficient volume to make them useful for food storage. They usually have double friction lids similar to paint cans or screw caps like jars that can achieve an air-tight seal. If you can find them with a sufficient volume capacity they can be of real use for storing bulky foods such as grains, legumes and sugar. Smaller cans of a gallon or less would be useful for storing items like dry milks. If properly sealed, metal cans have a far higher barrier resistance to gasses such as oxygen, CO₂, and nitrogen than any plastic.

Although they can hardly be considered portable the use of clean metal drums (not garbage or trash cans), either themselves food grade or used with food grade liners, is also a possibility. A fifty five gallon drum of grain will weigh several hundred pounds, but may make for a much easier storage solution than multiple buckets. The advantage of using such a large container is that a great amount of a single product can be kept in a smaller amount of space and fumigating or purging the storage atmosphere would be simpler. The disadvantages are the difficulties of moving it and rotating the stock in the drum. If using oxygen absorbers make sure the drum you want to use is capable of making an air-tight seal, otherwise you should stick with carbon dioxide fumigation.

POOLING RESOURCES:

THE CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS — THE MORMONS

Although the purchase of a can sealer and metal cans for home use is not generally economically feasible for most people there is one method by which it can be made practical. This is by pooling community resources to purchase the equipment and supplies. It may even not be necessary to form your own community to do this. If you live in the right area your local Latter Day Saints church may have facilities they will allow you to use. They may even have suitable food products to sell you. This is an offshoot of the church's welfare programs and is done in their Family Canneries also known as Home Storage Centers. Rather than using plastic buckets they have gone over to using metal cans and aluminized Mylar bags church-wide for dry-pack canning. By sharing the cost of the equipment and purchasing the cans in bulk quantities, they are able to enjoy the advantages of metal cans and professional equipment over plastic containers while

minimizing the disadvantages of cost.

Any food products you want to have sealed in cans or pouches will need to fall within the LDS cannery guidelines of suitability for that type of packaging. This is for reasons of spoilage control as many types of foods aren't suitable for simply being sealed into a container without further processing. If you purchase food products from them, they will already be within those guidelines.

Once you have your foodstuffs on hand, either supplying your own or by purchasing them from the cannery you're ready to package them. It is here that using some forethought concerning your packaging system can save you much time and aggravation.

IMPORTANT NOTE: *Please keep in mind that the individuals responsible for the family canneries are all volunteers with demands on their time from many areas. Be courteous when speaking with them and, if there are facilities for use, flexible in making arrangements to use them. You will, of course, have to pay for the supplies that you use, cans and lids at the least, and any food products you get from them. As a general rule they cannot put your food in storage for you. Be ready to pay for your purchases in advance. They do not take credit cards and probably cannot make change so take a check with you.*

The following is a list of suggestions to make the most efficient use of your access time:

#1 - Make your appointment well in advance. Possibly you may be able to go with another church member if you cannot go for yourself alone. Many people may be trying to make use of the canneries so making advanced reservations is a must.

#2 - Have enough people to set up an assembly line type operation. Make sure each of your people knows what they need to do and how to do it. At least four people for any serious amount of food is a good number. Ask the cannery volunteer to go over the process with you and your crew.

#3 - Make sure you have enough muscular helpers to do the heavy lifting so you don't wear yourself out or hurt your back. Some of the supplies you will be working with, such as wheat, come in fifty pound bags and a box of #10 cans or pouches full of sugar or other weighty food is heavy.

#4 - Make labels in advance for any foods you bring

with you to pack that the cannery does not carry. This will save time and possibly much confusion after the cans or pouches are filled. Once sealed one anonymous looking can or pouch looks like another.

#5 - Take out only as many as oxygen absorbers as you will use in fifteen minutes. They use most of their adsorptive capacity within two to three hours depending on temperature and humidity so you don't want to waste any by soaking up the oxygen in the room. The ones you don't use right away should be tightly sealed in a gas proof container.

#6 - Save powdery food items such as dry milk powder, pudding mixes, grain flours and meals till last. They can be messy to can and this will keep them out of your other foods. Dust masks may not be a bad idea.

#7 - Leave time to clean up after yourself. The cannery is doing you the courtesy of allowing you to use their equipment and selling you the supplies at cost. You should return the favor by leaving the place *at least* as clean as you found it. If they give you a set amount of time to work in then *finished or not* honor that time slot. Others may be waiting to use the equipment too.

#8 - Always keep in the back of your mind how much volume and weight your vehicle can haul. You'd hate to find you had canned more than you could carry home.

PREVENTING EXTERIOR CORROSION OF CANNED GOODS

Some areas have difficulty storing metal canned goods for long periods of time. This is usually caused by high humidity or exposure to salt in a marine environment. If this is a problem, it is possible to extend the life of metal cans by coating their outsides. I've seen this used on boats here in Florida, especially when loading for a long trip. There are at least five methods that can be used to do this, but for cans that require a can opener only the paraffin or mineral oil methods should be used.

PARAFFIN METHOD: Using a double boiler, paraffin is melted and brushed on the clean, unruined cans. Be certain to get a good coat on all seams, particularly the joints. If the can is small enough, it can be dipped directly into the wax. Care must be taken to not cause the labels to separate from the cans. Do not leave in long enough for the can contents to

warm.

MINERAL OIL METHOD: Use only food grade or drug store (medicinal) mineral oil. Wipe down the outside of each can with only enough oil to leave a barely visible sheen. Paper labels will have to be removed to wipe underneath with the contents written on the outside beforehand with a marker or leave the under label areas uncoated. Even with a barely visible sheen of oil the cans will tend to attract dust so you will need to wipe off the can tops before opening.

PASTE WAX METHOD: Combine 2-3 oz. of paste or jelly wax with a quart of mineral spirits. Warm the mixture **CAREFULLY** in its container by immersing it in a larger container of hot water. **DO NOT HEAT OVER AN OPEN FLAME!** Stir the wax/spirits thoroughly until it is well mixed and dissolved. Paint the cans with a brush in the same manner as above. Place the cans on a wire rack until dry.

B: A light coating of ordinary spray silicone may be used to deter rust. Spray lightly, allow to dry, wipe gently with a clean cloth to remove excess silicone.

CLEAR COATING: A clear type of spray or brush on coating such as Rustoleum may be applied. This is best suited for larger resealable cans, but will keep them protected from corrosion for years.

GLASS JARS

Compared to metal cans, glass jars are very stable, although they obviously don't take being banged around well. Fortunately the cardboard boxes most jars come in are well designed to cushion them from shocks. The box also has the added bonus of keeping damaging light away from food.

The major advantage of glass jars is they are reusable. For wet-pack canning the lids should be replaced, but the rings can be reused until they finally rust away or become too dented to use. For dry pack canning even the lids may be reused nearly indefinitely if you're careful in removing them. In my personal experience I've grown to prefer Ball lids rather than Kerr, especially for vacuum sealed dry pack canning. The red sealing compound Ball uses seems to more reliably achieve a seal than the gray compound Kerr uses.

When you get right down to the bottom line, it is seldom practical strictly in terms of dollars and cents to wet-pack your own food in jars. When you count the cost of your equipment, including the jars, rings, lids and all the rest,

along with a not inconsiderable amount of your personal time, the cost of purchasing or growing your produce, you'll almost always come out ahead to buy food canned for you by the commercial canning industry. That said, forget about the strict bottom line and examine more closely why you want to put up your own food. For many, gardening is a pleasure and they have to have something to do with the food they've grown! There's also the fact that for many, you simply cannot buy the quality of the food you can put up for yourself. The canning industry tries to appeal to a broad spectrum of the general public while you can put up food to your own family's specific tastes. Home canning is not so much about saving money as it is about satisfaction. You get what you pay for.

If home canning appeals to you, please allow me to point you toward the [rec.food.preserving FAQ](#) where much good information about methods and techniques may be found.

Dry-pack canning using glass jars, on the other hand, may well make a great deal of economic sense. It is usually far cheaper per pound to purchase dry foods in bulk quantities, but often unsuitable to store it that way. Breaking the food down into smaller units allows for easier handling and exposes a smaller quantity to oxygen and moisture before it can be eaten. Of course, packaging used for doing this can be made of many different materials, but glass is often the easiest and most convenient to acquire and use. Used containers are often free or of little cost. One source of gallon sized glass jars are sandwich shops and restaurants that use pickles, peppers and other sandwich condiments. There are also half-gallon canning jars, though they are sometimes difficult to find. Both Ball and Kerr make these jars and I have a local Ace hardware order mine.

MYLAR BAGS

The word "Mylar" is a trademark of the DuPont corporation for a special type of polyester film. Typically made in thin sheets, it has a high tensile strength and is used in a wide variety of industrial settings.

In food storage, particularly for the long term, it is commonly found as a laminate with Mylar as the top layer, a very thin aluminum foil in the middle and one or more other types of plastic films on the bottom acting as sealant plies. This laminate combination possesses a high resistance to the passage of oxygen, carbon dioxide, nitrogen, other gasses, water vapor, and light which is what makes it valuable for our purposes. Unfortunately, it has a

poor puncture resistance so must be used as an interior liner for more puncture resistant containers rather than as a stand-alone package.

Food grade aluminized Mylar complies with US FDA requirements and is safe to be in contact with all food types except alcoholic.

For food use, Mylar is most commonly available as pre-made bags of various sizes. Flat sheets or rolls of the material might also be found from which bags could be fashioned as well.

When Mylar bags are used by the storage food industry they are generally for products sealed in plastic buckets. The reason for doing this is the High Density PolyEthylene (HDPE) from which the pails are made is somewhat porous to gasses. This means that small molecules, such as oxygen (O₂), can slowly pass through the plastic and come into contact with the food inside. The problem is further compounded if oxygen absorbers are used, as the result of their absorbing action is to lower the air pressure inside the container unless it has first been carefully flushed with an inert gas such as nitrogen. How fast this migration activity will occur is a function of the specific plastic formulation, its wall thickness and the air pressure inside the container. In order to gain the maximum possible shelf life a second gas barrier, the Mylar bag, is used inside the pail.

Whether the use of these bags is necessary for your home packaged storage foods depends on how oxygen sensitive the food item is and how long you want it to stay at its best. If the container is made of a gas impervious material such as metal or glass then a second gas barrier inside is not needed. If it is HDPE or a plastic with similar properties and you want to get the longest possible storage life (say 10+ yrs for grain) then Mylar is a good idea. If you're going to use the grain in four to five years or less then it is not needed. Provided the oxygen has been purged from the container in the first place, either with a proper flushing technique, or by absorption, there will not have been sufficient O₂ infiltration to seriously impact the food. Particularly oxygen sensitive foods such as dry milk powders that are to be kept in plastic containers for more than two years would benefit from the use of Mylar. Naturally, storage temperature and moisture content is going to play a major role as well.

There is also the question of the seal integrity of the outer container. If you are using thin walled plastic buckets in conjunction with oxygen absorbers the resulting drop in air pressure inside the pail may cause the walls to buckle. If this should occur, there would be a risk of losing seal integrity, particularly if the buckets are stacked two or more deep. If

the food was packed in Mylar bags with the absorbers inside this would keep the vacuum from seriously stressing the container walls. Better still would be not to have the problem at all by either using containers of sufficient wall thickness or flushing with inert gas before sealing. Heavy wall thickness is one reason why the six gallon Super Pails have become so widespread. It should be noted that Mylar is not strongly resistant to insect penetration and not resistant at all to rodents. If mice chew through your buckets, they'll go right through the bags.

HOW DO I USE MYLAR BAGS?

Sealing food in Mylar bags is a straight-forward affair, but it may take a bit of practice to get it right, so purchase one or two more bags than you think you'll need in case you don't immediately get the hang of it.

#1 - The bags typically sold by storage food dealers look rather large when you compare them to the five or six gallons buckets they are commonly used in. That extra material is necessary though if you are to have enough bag material left over after filling to be able to work with. Unless you are sure of what you are doing, don't trim off any material until after the sealing operation is completed.

#2 - Place the bag inside the outer container and fill with the food product. Resist filling it all the way to the top. You need at least an inch or so below the bucket rim left open to get the lid to seat completely. If you'll be using desiccants and oxygen absorbers together place the desiccant on the bottom of the bag before filling.

#3 - When the pail seems to be full, gently thump it on the floor a few times to pack the product and reduce air pockets. Add any makeup food necessary to bring level back to where it should be.

#4 - Take the bag by the corners and pull out any slack in the material so that all sides can be pulled together evenly. Place your oxygen absorbers inside if you are going to use them. Now place a board over the top of the bucket and fold the bag end down over it keeping it straight and even. Place a piece of thin cotton fabric such as sheet or t-shirt material over the edge of the bag mouth. Using a clothes iron set on the cotton, wool or high setting run it over the cloth-covered Mylar about a half-inch from the edge for about twenty seconds or so until it seals. You'll probably have to do the bag in sections. Temperature

settings on irons vary so experimenting on a left-over strip to find the right setting is a good idea.

#5 - When you've done the entire bag allow it to cool then try to pull the mouth of the bag open. If moderate pressure doesn't open it, fold the bag down into the pail until you feel the trapped air pillowing up against the material and wait to see if it deflates. If it stays buoyant, your seal is good. You can seal on the bucket lid at this point or take the further step to vacuum or gas flush the bag.

Once a seal has been obtained the bags can be left as-is, vacuum sealed or gas flushed. To obtain the most efficient oxygen removal the bags can be first drawn down with a vacuum pump and then purged using an inert gas.

Vacuum Sealing Mylar Bags

Once you have obtained a good seal on the bag, pulling a vacuum on the contents is straight forward.

First you'll need something to make a vacuum with. This can be either a regular vacuum pump, a vacuum sealer such as the Tilia Food Saver or even the suction end of your household vacuum cleaner. The end to be inserted into the bag will need to be of fairly small diameter in order to keep the hole in the Mylar from being any larger than necessary. This means that if you use a vacuum cleaner you'll need to fashion some form of reduction fitting. One such that I've seen is a plastic film canister with a hole drilled in the bottom and a piece of plastic tubing epoxied in place.

Cut a hole into the Mylar bag on a corner, making the opening only just large enough to admit the vacuum probe. Insert the nozzle and using a sponge, or something similar, push down on the material over the probe to make a seal. Now draw down a vacuum on the bag. When it's drawn down as much as possible, run a hot iron diagonally across the cut corner resealing the bag.

Gas Flushing Mylar Bags

Flushing with inert gas works essentially like vacuum sealing except that you're putting more gas into the bag rather than taking it out. You'll want to keep the entry hole small, but don't make a seal around it as above. Beyond that, follow the directions as given in *Section III.B.2 - CO₂ and Nitrogen*. When you feel that the bag has been sufficiently flushed, run the iron across the corner as above to seal.

Flushing with dry ice can also be done, but it is important

to wait until the frozen carbon dioxide has completely sublimated into gas before making the final seal otherwise the bag will burst like an overfilled balloon.

REUSING OR RECYCLING PACKAGING

In an effort to save money or because new packaging may be hard to come by, it is common for many people to want to re-use previously used containers. There is nothing wrong with this, but it is sometimes more complicated than using new containers would be. Here are some general rules if you have an interest in doing this.

#1. Do not use containers that have previously contained products other than food. There are two risks this can expose you to. The first is that the particular package type may not have been tested for food use and may allow the transfer of chemicals from the packaging into your food. The second is that all plastics are porous to some degree. Small amounts of the previous contents may have been absorbed by the packaging material only to be released into your food, particularly if it is wet, oily or alcoholic.

#2. Previously used containers should only be used with foods of a similar nature and exposed to similar processes. This means that if a container previously held a material high in fat, such as cooking oil, then it should not be used to store a strong acid such as vinegar. Nor should a container be exposed to extreme conditions, such as heat, if the original use of the package did not subject it to that treatment. An exception to this is glass which is covered below. Generally speaking, dry, non-oily, non-acidic or alkaline, non-alcoholic foods may be safely contained in any food safe container. An example of this is keeping grains and legumes in HDPE buckets formerly containing pickles.

#3. Glass may be used to store any food provided it is in sound condition and has only been used to store food previously. The lid or cap, however, that seals the jar is subject to the cautions given above. Glass jars not specifically made for home canning, either boiling water bath or pressure canning, have a significant risk of breakage if used for that purpose.

#4. Porous packaging materials such as paper,

cardboard and Styrofoam should not be reused. Their open texture can trap food particles and are difficult to adequately clean. Packaging formerly holding raw meats, seafoods, or egg products are particularly at risk.

#5. Containers previously holding odorous foods may trap those odors and transfer them to foods later stored. Pickle flavored milk leaves a lot to be desired. Foods such as dry milk powders, fats and oils, flours and meals will absorb any odors seeping from your container material. Be sure to get the smell out before you fill them.

CARBON DIOXIDE AND NITROGEN

Carbon dioxide (CO₂) and nitrogen (N₂) are commonly used in packaging both fresh and shelf-stable foods, in order to extend their shelf lives. Fresh foods are outside the scope of this work so attention shall be focused on those foods suitable for use in storage programs.

The most common use of these gasses is for excluding oxygen (O₂) from the atmosphere contained inside of a storage container (called head gas). When head gas oxygen levels can be dropped below 2% the amount of undesirable oxidation reactions in stored foods can be greatly decreased resulting in longer shelf lives. Actually achieving this is not a simple matter when limited to the equipment and facilities typically available in the home. Still, with careful technique and proper packaging materials it is possible to achieve useful results.

In order for either gas to be used most effectively it should be contained inside of packaging with high barrier properties to prevent outward diffusion over time or allowing oxygen to infuse in. Examples of this kind of packaging are aluminized Mylar or other high barrier property plastics, metal cans or glass jars. Buckets made of HDPE plastic are relatively poor gas barriers and will, over time, allow oxygen to infuse into the container. In order for foods to be kept for their maximum shelf lives the containers would need to be re-purged every three to four years. Foods that are particularly oxygen sensitive, such as dry milk powders, should not be stored in HDPE without a secondary gas barrier. It is possible to use HDPE buckets alone when gas purging if a shorter rotation period is used. An example would be using wheat in four to five years instead of the eight to ten that would be achievable if a high barrier container were used.

Purging efficiency can be greatly improved when used with a vacuum device. By first drawing down the head gas of the container and then flooding with the purging gas much more

oxygen can be removed. Repeating the process once more will improve removal efficiency even more. If a true vacuum pump is not available, the suction end of a home vacuum-cleaner can be made to serve and still achieve useful results. With careful technique, oxygen levels can be dropped to between 0.5-2%. Finely textured materials such as grain flours and meals, dry milk powders, dry eggs, and similar textured foods will purge poorly and are better packaged with oxygen absorbers. Instructions for vacuum usage are given in *A.5.1 Using Mylar Bags*. Instructions for gas purging are given below in *B.1 Dry Ice* and *B.2 Compressed Nitrogen*.

A less common, but important use for carbon dioxide is fumigation. This is killing or retarding insect life contained in a product. Many chemical fumigants are available to do this but are not thought desirable by many who have foodstuffs they want to put into storage. CO₂ is not as certain as the more toxic fumigants, but it can be made to work and will not leave potentially harmful residues behind. It is possible for nitrogen to work in a similar manner, but it must be in a head gas concentration of 99%+ whereas carbon dioxide can be effective over time at levels as low as 3%. The precise amount of time necessary for the gas to do its work will vary according to the specific insect species and its growth stage along with the temperature and humidity level of the product being fumigated. In general, the more active the growth stage and the warmer the temperature the more effective CO₂ is in killing weevil infestations. The gas also exhibits bacterial and fungal inhibiting properties, but for our purposes this will be of little moment since all foods should be too dry to support such growth in the first place.

The procedure for fumigating foodstuffs with carbon dioxide is precisely the same as the one used in purging oxygen from storage containers mentioned below. The only change is that for the fastest effectiveness the sealed container should be left in a warm place for a week or so before moving it into its final storage location. The gas is still effective at cooler temperatures, but because insect life is slowed by lower temperatures the carbon dioxide takes longer to complete its mission.

NOTE: Both Mitsubishi Gas-Chemical, maker of the Ageless line of oxygen absorbers, and Multisorb, manufacturer of the FreshPax D 750 absorbers, state the their products should not be used in a high carbon dioxide environment. There are absorbers that will work well in high carbon dioxide atmospheres but they require an external moisture source which would make them difficult to use for our purposes.

DRY ICE

Using dry ice to displace oxygen from food storage containers is straightforward. To get the best results it is recommended that all foodstuffs and packaging materials be put in a warm location for a few hours before beginning the purging process. The reason for this is that the cold CO₂ sublimating from the dry ice will be denser than the warmer, lighter oxygen containing air. The cold gas will tend to stay on the bottom, gradually filling the container and pushing the warm air out the top.

When you first pick up your dry ice from the supplier, put it in a moisture proof container so that air humidity will be less able to condense and freeze on it. The sublimating gas will prevent you from achieving a tight seal, but you can slow down the water ice accumulation.

Gather your containers and any interior packaging materials. Break off a piece of dry ice of sufficient size for the volume to be purged. One pound of dry ice will produce about 8.3 cubic feet of carbon dioxide gas so approximately two ounces per five gallon bucket will do. Wipe off any accumulated water frost which should look whiter than the somewhat bluish frozen gas. Wrap in a paper towel to keep foodstuffs out of direct contact. Place in the bottom of the container that will actually contain the food, i.e. the bag. Fill the package with the food product, shaking and vibrating while doing so to achieve the maximum packing density.

If a vacuum process is not to be used then place the lid on the container, but do not fully seal. If a liner bag is being used then gather the top together or heat seal and cut off a small corner. This is to allow the air being purged to escape as it is pushed upward by the expanding gas from the dry ice. Do not move or shake the container while the ice is sublimating so as to minimize turbulence and mixing. After about two hours feel the bottom of the container immediately below where you put the ice. If it's not still icy cold complete the seal. Check the container every fifteen minutes or so to be sure that a pressure build up is not occurring. A small amount of positive pressure is OK, but do not allow the container to bulge.

If a vacuum process is used then cut off a corner of the bag and insert the probe or place the container in the vacuum chamber. Draw a vacuum and when it has reached the desired point shut it off, but do not allow air back inside. When the dry ice has finished sublimating seal the container. If a slightly larger piece of dry ice is used this process may be repeated once more to improve oxygen removal. Watch for pressure signs as above.

NOTE: *It is natural for some grains and legumes to adsorb carbon dioxide when stored in an atmosphere with high levels of the gas. This will result in a drop in head space air pressure much like using oxygen absorbers will cause as they absorb oxygen. Precautions should be taken in thin walled containers against buckling and possible loss of seal integrity. When the food products are removed from the container they will release the adsorbed CO₂ and suffer no harm.*

WARNING: Dry ice is extremely cold (about –110° degrees F.) and can cause burns to the skin with prolonged contact. Because of this you should wear gloves whenever handling it. Also, dry ice evaporates into carbon dioxide gas, which is why we want it. CO₂ is not inherently dangerous, we breath it out with every breath we exhale, but you should make sure the area where you are packing your storage containers is adequately ventilated so the escaping gas will not build to a level dangerous enough to asphyxiate you. If you must pack your containers in a coat closet, leave the door open <grin>.

IMPORTANT NOTE: *Because dry ice is very cold, if there is much moisture (humidity) in the air trapped in the container with your food, it will condense. Try to pack your containers on a day when the relative humidity is low or in an area with low humidity, such as in an air-conditioned house. Use of a desiccant package when using dry ice to purge storage containers may be a good idea.*

DRY ICE SUPPLIERS

Dry ice may be found at ice houses, welding supply shops, some ice cream stores, meat packers or you could look in your local phone book under the headings “ice”, “dry ice” or “gasses”. If you are still unable to locate a source, contact your local hospital and ask to speak to the laboratory manager. Ask where the hospital gets the dry ice they use to ship biological specimens. You may be able to use the same source.

You may also want to check out *Dry Ice Info.com* (<http://www.dryiceinfo.com>) and click on the directory link to find a dry ice retailer in your area. While you’re there check out some of the other uses for dry ice on the site. It’s an interesting place.

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OXYGEN ABSORBERS

WHAT IS AN OXYGEN ABSORBER?

Oxygen absorbers are a relatively recent food storage tool whose arrival has been a real boon to the person wanting to put up oxygen sensitive dry foods at home. The packets absorb free oxygen from the air around them and chemically bind it by oxidizing finely divided iron into iron oxide. This removes oxygen from being available for other purposes such as oxidative rancidity and respiration by insects, fungi or aerobic bacteria. The practical upshot of all this is that by removing the free oxygen from your storage containers, you can extend the storage life of the foods inside. Not all foods are particularly oxygen sensitive but for those that are the absorbers truly simplify getting the job done.

The absorbers themselves have only a relatively short life span, roughly about six months from the time they were manufactured for the types that do not need an external moisture source. They don't suddenly become ineffective all at once, it's just at that point you will begin to notice (if you can measure it) that the absorbers no longer soak up as much as they would when they were new. Better to use them while they're fresh.

HOW ARE OXYGEN ABSORBERS USED?

In order to make the best use of your absorbers you need to know three things:

#1 – Is the food I want to put by particularly oxygen sensitive for the time I want to keep it in storage? Whole grains that have not been polished or hulled such as wheat, corn, and rye are not especially oxygen sensitive. If you intend to use them up in five years or so, there's no great advantage to using oxygen absorbers, unless used to deter weevil infestations. The same for most beans and peas. Processed or high fat grains and legumes such as oats, barley, brown rice, soybeans, peanuts and split peas would benefit from their use if they are to be kept for more than a year. Whole grain products such as whole wheat flour and rolled oats would as well. Refined grain products such as white rice, white flour, degerminated cornmeal will keep fine for a year or so, possibly longer, without oxygen absorbers if kept dry and protected from weevils. Dry milk, dry eggs, dry meats, and many kinds of dehydrated

foods and any kind of freeze dried foods would benefit from oxygen absorbers. Foods with an easily transferable fat content should not be used with oxygen absorbers, nor should they be used with foods that are high in moisture or with free liquids in the storage container. These should be preserved using pressure or boiling water bath canning as appropriate.

#2 – Will the packaging I want to use seal air-tight and is the packaging material itself a good gas barrier? Obviously if the container won't seal air tight you're wasting your time trying to use oxygen absorbers but the barrier properties of a container stump many folks. Canning jars with good lids, properly sealed #10 (or other size) cans, properly sealed Mylar bags, PETE plastics with appropriate lids or caps, military surplus ammo cans with good gaskets, and many other types of packaging will seal air-tight and provide good barrier properties against oxygen infusing through the packaging material. Non-laminated flexible plastic packaging (bags, sheets, etc.), HDPE plastic buckets and any kind of non-laminated paper or cardboard container have poor gas barrier properties. "Poor" is a relative term, though, and if you're going to use the food up in two or three years, even oxygen sensitive foods can be kept in unlined HDPE buckets if you use an appropriately sized absorber and make sure the bucket is well sealed. You'll be using the food before sufficient oxygen has been able to infuse through the walls of the container to make a significant impact.

#3 – What is the volume of the container and how much air volume remains after I've filled it with food? This is important to know if you want to make the most efficient use of your absorbers and be certain your food is adequately protected. Taking the question in two parts, here is how to determine the answer:

A. Absorber capacity is rated by the amount of oxygen in milliliters that each will absorb so you'll need to know what the volume of your container is in milliliters. The table below gives conversions between common U.S. container sizes and their milliliter equivalents.

Pint jar	(16 fl oz)	475 milliliters
Quart jar	(32 fl oz)	950 milliliters
Half-gallon jar	(64 fl oz)	1,900 milliliters
#10 can	(112 fl oz)	3,300 milliliters
One gallon jar	(128 fl oz)	3,800 milliliters
Five gallon pail	(640 fl oz)	19,000 milliliters
Six gallon pail	(768 fl oz)	22,800 milliliters
Fifty-five gallon drum	(7,040 fl oz)	208,175 milliliters

Fluid ounces x 29.57 = milliliters = cubic centimeters

Now multiply the volume of your container times the 21% (0.21) of the atmosphere that oxygen constitutes and you'll come up with the volume of oxygen, in milliliters, that your container holds when it's empty.

An example: A quart jar (32 ozs) is approximately 950 milliliters in volume. Multiply 950 x 0.21 (21%) and you get 199.5 milliliters of oxygen in an empty quart jar. This leads to the second half of the above question.

B. Determining remaining air volume in a container that has been filled can be difficult. Foods vary widely in their density and porosity from flour, which will pack tightly to elbow macaroni which is mostly air even if you pack it to just short of crushing. The following are three rough and ready rules that can be used and will work.

i> Foods that have a lot of open space between the food particles (called *intersitial space*) such as macaroni, pasta, instant dry milk, instant potato flakes, many coarsely chunky dehydrated foods, cold cereals, etc. should use *one half* the container volume as the remaining air space. Using the example above with the quart jar, there would be approximately 100 milliliters of oxygen remaining.

ii> Foods that pack more densely such as non-instant milk, dry eggs, flours and meals, grains with small kernels, dehydrated foods with fine particles and the like should use *one-third* the container volume as the remaining air space. Using the example above, there would be 66 milliliters of oxygen remaining.

iii> Alternatively, you could do what many of the commercial storage food packagers do and use the *entire container volume*. This is not as efficient as more closely determining remaining air volume but it does add certainty that your absorbers will soak up all available free oxygen and still leave some capacity to deal with any microscopic leaks or infusion through the packaging material.

NOTES: #1 — Both Multisorb and Mitsubishi corporations advise that their oxygen absorbers should not be used in a high carbon dioxide environment. This is apparently for reasons that the absorbers will also absorb carbon dioxide as well as oxygen and may run out of capacity before all of the oxygen in the container has been absorbed.

#2 — If you do choose to use oxygen absorbers in packing your food give some consideration to the sturdiness of your containers. In doing its job the absorber is going be removing the 21% of the atmosphere that oxygen constitutes. Since nothing is replacing the absorbed gas this will leave the storage container with a lower atmospheric pressure inside than outside. If the container is sufficiently sturdy this pressure differential will be of little consequence. For containers with thinner walls the pressure drop could cause them partially collapse or buckle, particularly if other containers are stacked upon them. Should this occur the entire stack could fall causing one or more to burst. Metal cans and glass jars should have no problems, but some plastic buckets made of HDPE have relatively thin walls which can buckle when the internal air pressure drops. To deter this, a liner bag of Mylar or other high gas barrier plastic should used. Heavier walled buckets won't need a liner unless you're trying to achieve the maximum possible shelf life. Seal the absorbers inside of the liner bag

so that the pressure drop will not stress the walls of the container. Other containers should probably be tested or first flushed with an inert gas (N₂) before the absorber is sealed in.

#3 — If the pack of absorbers you need to open contains more than you are going to use in fifteen minutes or so, you should minimize exposure of the remaining packets. This can be done by heat sealing the bag they came in with an iron after expelling as much air as possible or better yet by vacuum sealing the bag. You can also put the remaining absorbers in as small a jar or metal can as they will fit in and closing with an air tight lid.

#4 — The chemical reaction that absorbs the oxygen releases minor amounts of heat. This heat release is trivial in an individual packet but if they are piled one atop another as you're using them they can warm each other and speed the absorptive reaction. This costs you capacity lost to open room air so it's best to spread the packets in immediate use out on a tray so they lay atop each other.

#5 — If absorbers are sealed in a package with desiccants some thought should be given to how low the relative humidity will become. Silica gel will reduce humidity to approximately 40% which should not interfere with the absorbers oxidation reaction. Other desiccants, however, are capable of reducing relative humidity to very low levels. This might adversely affect your absorber's ability to carry out its mission by removing moisture from the absorber package that is necessary to sustain the oxidation reaction. If you do use desiccants and oxygen absorbers in the same package, place the desiccant on the bottom, fill the package and then place the oxygen absorber on top of the food before sealing.

MOISTURE IN PACKAGING AND FOOD STORAGE

WHY MOISTURE IS IMPORTANT

Moisture in inappropriate amounts and places is damaging to food. Because of this, much effort is put into reducing the water content of dry foods in order to prolong their shelf lives. Once it is reduced to the desired level the product can then be packaged for storage. Unfortunately, merely reducing moisture content is not always sufficient. Environmental conditions can play a role as well.

There are four mechanisms by which environmental conditions may cause a moisture problem in your food

storage:

1. - The air trapped in the container with the food may have held sufficient humidity to raise the moisture content of the food to undesirable levels.
2. - Even if the water vapor content wasn't too high, a falling temperature level may cause the trapped humidity to reach its dew point causing water to be squeezed out of the air to condense on your food much the same way as dew forms on your lawn on cool mornings after a warm, humid night. This can be a particular problem if the condensation is localized — say, only the portion of the food next to the walls of the container — resulting in excessive moisture in that local area even though the contents as a whole would be at a satisfactorily low moisture level.
3. - The seal of the container may not be sufficiently tight enough to prevent moisture laden air from leaking in.
4. - The packaging material itself may be porous to water vapor to one degree or another. All paper, wood and cardboard has this fault. Depending upon their particular physical properties some plastics do as well. Metal and glass containers have excellent barrier properties though their seals may not.

The solution for moisture problems is multi-faceted.

1 - Make sure the product to be stored is at an appropriate water content for that particular foodstuff. Beans and grains store well at a 10% moisture level, but milk powders, dried eggs and dehydrated or freeze dried foods should be lower for best results. As a general rule, nearly any dry food will store well at moisture contents between 3%-10% with the lower the better. Don't get carried away with this though. Extreme low moisture levels (below 3%) can make some foods difficult or impossible to reconstitute and damage the viability of seeds.

Ideally, the dry foodstuffs you have on hand will have no more than a 10% moisture content. If they do not then you will need to reduce moisture to a level appropriate for the kind of food you are storing.

One of the following methods might be of use in lowering moisture content.

A - The least involved is to wait until the driest

time of year for your location making sure there is plenty of free air circulation around the food product. If this doesn't suit, then turn your air conditioning on a little high. Bring in your buckets, lids, and the storage food. Let everything sit in a well-ventilated place where it's going to get plenty of cool, dry air from the A/C (avoid anywhere near the kitchen or bathroom areas, as they put out a lot of moisture). Stir the food frequently to maximize moisture loss. A few days of cool, constant air flow and low humidity ought to dry things out. Due to its odor absorptive nature, I would not do this with any dried milk products or other powdered foods, flours or meals. This method works best with coarse particles such as grain, legumes and dried foods.

B - Warm, dry air can also be used to lower moisture content and works well if you have large quantities of grains and legumes. This is similar to what is used on farms for drying harvested grain. You'll need a source of forced, warm, *not hot*, air. Place the grain in a drum or barrel and blow the heat from the bottom so that the warm and the moisture it will carry can exit from the top. It's important to not let the bottom product get too hot. You should also monitor the top, center of the drum to be certain the product there is not getting damp from the moisture escaping other areas. Stirring occasionally may be necessary. I've seen this done with an old, drum style vacuum cleaner that put off fairly warm exhaust air and it worked pretty well. Do be sure to clean the vacuum thoroughly so you don't blow the grain full of dust.

C - If the above methods won't do or you have powdery foods to dry, you can put the food and a large quantity of desiccant (see below) in a storage container. The desiccant should be in its own container placed on top of the food and the container lid sealed on. After about a week, unseal and check the desiccant. If it's saturated, change it out with dry desiccant and reseal. Continue to do this until the contents are sufficiently dry. If it doesn't become saturated the first time,

change it anyway before sealing the bucket permanently to deter saturation in storage.

If your food products are sufficiently dry you can pack them in storage containers using the packaging method of your choice and have a reasonable expectation of your food staying in good condition. Whether you will need to use a desiccant will be dependent upon the conditions discussed below.

2 - Try to package your goods in a dry atmosphere and do not allow extreme temperature swings in storage areas. Warm temperatures and a high relative humidity when a container is sealed means the air trapped inside the container will have a high dew point. This will lead to condensation should storage temperatures fall below that dew point. An example of this would be a container sealed on a day that was 70° F and 40% relative humidity. At that temperature the relative humidity would be quite reasonable for all but the most moisture sensitive food. However, should the temperature fall to 44° F the capacity of the air to hold water vapor would have dropped to the point that it could not contain what was sealed in at 77° F and the excess would be squeezed out to condense on the food, i.e. - it will grow moister. Possibly the food will be able to adsorb this moisture without harm and then again, it may not.

3 - Use appropriate packaging materials and make certain it is sealed correctly. If you are going to consume them in four to five years, storing grains, beans and peas in unlined HDPE buckets at normal humidities is fine. If you want to keep them at their best for many years beyond that, the plastic the pail is made of is too porous to water vapor for best results and should have an interior liner of a material with better barrier properties. Dry milk powders should not be kept for more than a year in unlined HDPE, but can be kept for much longer in #10 metal cans, glass jars or Mylar bags. Naturally, even the most highly resistant packaging material is useless if its seal isn't good so be sure you use good technique when making closures.

Lastly, you may wish to consider using a desiccant if good humidity control at the time of packing is difficult or if the storage area is in a high humidity environment or if the packaging material does not have sufficiently high barrier properties.

NOTE: There has been some confusion in the past over the appropriate use of desiccants in food storage which I would like to address here. Any desiccants you may seal in your storage containers (if you use them) are not for lowering the moisture content of the foods therein, but for moderating any shifts in moisture levels caused by those factors I mention above. If the food you want to put up is too high in moisture for good storage this needs to be dealt with BEFORE you seal the packaging. An example of what I'm trying to communicate here would be 10lbs of wheat with a 15% moisture content. That's too high for safe storage and needs to be lowered, preferably to 10% or less. To lower the moisture content of that grain to 10% you need to remove the 5% excess. 5% of 10lbs is eight ounces of water. Good dry silica gel (one of the most common desiccants) will hold 40% of its mass in moisture so to soak up that extra water you would need 20 ounces of silica gel – quite a large amount – all to remove that 5% excess moisture in ten pounds of grain. Fifty pounds of grain at that same moisture level would require 100 ounces or *six and a quarter pounds of silica gel*. Clearly no practical amount of desiccant you can put inside your storage packaging will do for you what should have been done before the food was put by. Desiccants can be used for lowering food moisture content, but this will involve rotating packages of desiccant in and out of the foodstuff until the desired moisture content has been reached. Once the package is sealed any desiccant you leave inside should be there to control moisture fluctuations or to guard against moisture infiltration from the outside.

WHAT IS A DESICCANT?

A desiccant is a substance with strong *hygroscopic* properties, meaning it will soak up water vapor from the surrounding air. A number of different substances are capable of doing this, but only a relative few of them are of practical use and fewer still are going to be readily available to the average person. Before elaborating on the different types that might be useful for our purposes it's necessary to explain how to choose a desiccant.

The U.S. military has done much of the best research on the use of desiccants in packaging and have largely set the standards by which they are judged. Each type of desiccant has temperature and humidity ranges where it performs best and particular physical and chemical characteristics that may need to be considered in relation to what you propose to do with them.

The most applicable standard for home food storage defines a unit of desiccant as *the amount of desiccant*

that will adsorb at least 6 grams of water vapor at 40% relative humidity at 77° F (25° C).

Desiccant Needed to Adsorb 6 Grams of Water Vapor

Desiccant Type Desiccant Needed	Mass (weight) of
Silica Gel	15 grams
Indicating Silica Gel	75 grams ¹
Montmorillonite Clay	24 grams
Calcium Oxide (quicklime)	21.5 grams
Calcium Sulfate (gypsum, Drierite)	60 grams
Wood	43 grams ¹

¹See desiccant descriptions for clarification.

In order to maximize surface area to obtain optimal adsorption, desiccants are manufactured in granular or powder forms. This presents a problem of keeping the desiccant, which may not be safe for direct contact with food, out of the product while still allowing sufficient air flow for it to carry out its task. Manufacturers call this “dusting” and deal with it by packaging the adsorbent in materials such as uncoated Tyvek, a spunbonded high-density polyethylene material produced by the Dupont corporation. Unfortunately, I have not yet been able to locate a retail source of uncoated Tyvek, just the coated variety such as is used in postal envelopes. Second best, and what I use, is two or more layers of coffee filter paper securely sealed over the mouth of the container holding the desiccant. I've also made “cartridges” of filter paper for use in narrow necked containers such as two-liter bottles. For this I used ordinary white glue. Getting a good seal all the way around requires some care in execution. Brown Kraft (butcher paper) may be used as well.

For coarse granular materials tightly woven fabrics might serve the purpose providing the seams are tightly stitched.

TYPES OF DESICCANTS

SILICA GEL

The most commonly known and used desiccant is silica gel which is a form of silica dioxide (SiO₂), a naturally occurring mineral. It will work from below freezing to past the boiling point of water, but performs best at room temperatures (70-90° F) and high humidity (60-90%). Its performance begins to drop off over 100° F, but will continue to work until approximately 220° F. It will lower the relative humidity in a container to around 40% at any temperature in its range until

it is saturated. Silica gel will absorb up to 40% of its weight in moisture. Some forms are approved by the FDA for direct food use (check with your supplier to be sure). It recharges easily (see below in the indicating silica gel text) and does not swell in size as it adsorbs moisture.

INDICATING SILICA GEL

In the retail trade, the most common form of silica gel is indicating silica gel composed of small white crystals looking much like granulated sugar with pink or blue colored crystals scattered throughout. This is ordinary silica gel with the colored specks being coated with cobalt chloride, a heavy metal salt. When the gel has absorbed approximately eight percent of its weight in water the colored crystals will turn from blue to pink making an easy visual indicator of whether the gel has become saturated with moisture. *Because cobalt is a heavy metal, **indicating silica gel** is not food safe and should be kept from spilling into anything edible.*

The indicating silica gel will still adsorb up to 40% of its weight in water vapor like the non-indicating type will but once it has gone past the 8% level and the crystals have turned pink there is no way to tell how close it is to saturation. This isn't necessarily a problem, you'll just have to treat like the other non-indicating desiccants and either weigh it to determine adsorption or use a *humidity indicator card*. These cards are made to show various humidity ranges and can be had from many desiccant and packaging suppliers.

When saturated, both varieties of silica gel can be dried out and used again. This is done by heating the crystals in an oven at a temperature of no more than 300° F (149° C) for approximately three hours or until the crystals turn blue. Dehydrating the desiccant may also be accomplished by heating in a microwave oven. Using a 900 watt oven heat the crystals for three minute intervals until the color change occurs. The exact amount of time necessary will depend upon the oven wattage. Spreading the desiccant in a broad pan in a shallow layer will speed the process. Heating to 325° F (149° C) or more, or using a microwave oven over 900 watts can damage the gel and render it unable to adsorb moisture.

If your desiccant is packaged in Tyvek, do not heat above 250° F (121° C) or you could damage the material. This leaves a fairly narrow temperature window since silica gel will not begin to desorb moisture below 220° F (104° C). It's a good idea to use a reliable oven thermometer to check your oven temperature as the thermostats in home ovens are often off by more than twenty five degrees. Start with the packets in a cold oven and raise the temperature to 245° F (118° C), keeping it there for twenty four hours. Spread the

packets so they are not touching and keep them at least 16 inches from any heating elements or flames so that radiant heat does not damage the packaging. Tyvek should not be microwaved.

HOW DO I USE DESICCANTS?

Before you get to this point you should have already used the charts above and determined how much of the particular desiccant you're interested in you need for the size of the storage containers you'll be using. Once you know that you're ready to put them it into use.

Although they perform different functions, desiccants and oxygen absorbers are used in a similar fashion. They both begin to adsorb their respective targets as soon as they are exposed to them so you want to only keep out in the open air as much desiccant as you are going to use up in fifteen minutes or so. If you'll be using oxygen absorbers in the same package, place the desiccant on the bottom of the package and the oxygen absorber on the top. This is to keep the desiccants from robbing needed moisture from your oxygen absorbers which will hinder their operation.

If your desiccant is pre-packaged, that's all there is to it, put it in the package and seal it up. If you have purchased bulk desiccant you'll first need to make your own containers.

I use indicating silica gel for practically everything. My usual procedure is to save or scrounge clear plastic pill bottles, such as aspirin bottles or small plastic jars. Fill the bottle with the desiccant (remember to dry the gel first) and then use a double thickness of coffee filter paper carefully and securely tied around the neck of the bottle to keep any from leaking out (remember the indicating type of silica gel is not food safe). The paper is permeable to moisture, but it's tight enough not to let the crystals out. I use several winds of plain cotton string for this as both adhesive tapes and rubber bands have a way of going bad over time which might allow the cap to come off spilling the desiccant into the food.

For containers that have openings too narrow to use a desiccant container such as described above you can make desiccant packets with the same filter paper. The easiest way I've found is to wrap at least a double layer of paper around the barrel of a marker pen and use a thin bead of white glue to seal. Slide the packet off the pen and allow to dry. When ready, fill with the necessary amount of desiccant. You can then fold the top over twice and tie

with string or staple closed. Take care that the top is closed securely enough not to allow any desiccant to leak out. Virgin (not recycled) brown Kraft paper can be used to make the packets with as well.

The above method will also work other desiccants, subject to whatever precautions the individual type may have.

IMPORTANT NOTE: *The indicating form of silica gel (has small blue or pink specks in it) is not edible so you want to use care when putting together your desiccant package to insure that it does not spill into your food.*

WHERE DO I FIND DESICCANTS?

I buy indicating silica gel at Wal-Mart in their dry flower section where it is sold in one and five pound cans for flower drying. I've seen it sold the same way in crafts stores and other department type stores that carry flower-arranging supplies. You can also buy it from many other businesses already prepackaged in one form or another to be used as an adsorbent. All of the desiccant that I've found packaged this way has been rather expensive (to me) so shop carefully. There are a number of Internet sources available which will probably provide your best route for finding what you want.

Businesses carrying packaging supplies sometimes also sell desiccants. Some businesses commonly receive packets or bags of desiccants packaged along with the products they receive. I've seen montmorillonite clay in bags as large as a pound shipped with pianos coming in from Japan. Small packets of silica gel seem to be packed in nearly everything. Naturally, any salvaged or recycled desiccant should be of a type appropriate for use with the product you want to package.

It is possible to make your own desiccants using gypsum from drywall and maybe Plaster of Paris. Calcium oxide can also be produced from limestone (calcium carbonate) or slaked or pickling lime (calcium hydroxide) by roasting to drive off the adsorbed water and carbon dioxide. I don't have any clear instructions, as of yet, on how to go about this. Please do keep in mind that calcium oxide (quicklime) is caustic in nature and is hazardous if handled incorrectly.

DIATOMACEOUS EARTH

WHAT IS DIATOMACEOUS EARTH?

Diatomaceous earth is a naturally occurring substance partially comprised of the fossilized remains of diatoms.

Diatoms are microscopic sized hard shelled creatures found in both marine and fresh waters. The diatom shells are covered in sharp spines that make them dangerous to exoskeletal insects, but not to animals with internal skeletons. The spines of the diatom skeletons pierce the soft body tissues of insects between their hard exoskeletal plates and it is through these numerous microscopic wounds that the insect loses bodily moisture to the point of desiccating and dying. Creatures with internal skeletons such as humans, cattle and pets have means of resisting such damage and are not harmed. Thus, it is possible to mix a small amount of DE into your stored grains and beans to deter insect infestations without having to remove the dust again before you consume them. *Diatomaceous earth works in a purely physical, not chemical, manner thus has no chemical toxicity.*

As neat as this sounds, in the limited number of controlled studies that I have been able to find it seems that DE is not as effective in controlling food storage insects as properly used freezing techniques, fumigation with carbon dioxide (dry ice) or sealing in air-tight containers with oxygen absorbers. This is primarily for reasons that most of the insects that cause a problem in grain storage are hard-shelled weevils which have only a limited amount of soft tissue exposure. I now mostly use DE for controlling ants and roaches in areas where I feed my animals and bedding areas. Still, some folks want to use DE in their food storage so the following information is provided.

WHERE DO I FIND D.E. AND WHAT TYPE SHOULD I BUY?

IMPORTANT NOTE: There are two kinds of diatomaceous earth to be found on the market and only one of them is suitable for use as an insecticide in your stored grains. *The type you DO NOT WANT FOR FOOD USE is sold by swimming pool suppliers as a filtering agent.* DE to be used for filtering has been subjected to a heat treatment that dramatically increases its crystalline silicate content which makes it unsuitable for use with your foodstuffs. *The diatomaceous earth that is needed for use in food storage has not been heat treated and has a crystalline silica content of no more than 1-1.5%.* It is commonly sold in hardware and garden stores as an "organic pesticide" and is available from a number of storage food dealers. A few of these suppliers are listed in the *Resources* section.

I have always purchased my DE from my local hardware store and have had no concerns about its safety. However, a number of correspondents have reported to me that their local suppliers keep their DE in the same area as their chemical

pesticides. This causes some concern about possible contamination and I no longer recommend using DE from these sources. Since the actual amount of DE (by weight) that is necessary to protect grains is fairly small I recommend ordering yours from suppliers who will guarantee their product is *food grade* as stipulated by the US FDA. This will insure you receive a product that has no deleterious contaminants and is safe to use.

HOW DO I USE D.E. IN FOOD STORAGE?

To use, you should mix thoroughly one cup (8 fl ozs) of DE to every forty pounds of grain, grain products or legumes. This works out to approximately one cup of DE to every five gallon bucket of food you want to treat. You need to make certain that every kernel is coated so it is better to do the mixing in small batches where you can insure more even coating. Both the grain and the DE should be quite dry when doing the mixing otherwise you'll get an uneven distribution.

WARNING: DE is a powdery dust which you need to take steps to keep out of your lungs and eyes. A paint or hardware store filter mask and a pair of goggles will do the job. It's a good idea to do the actual mixing outside in a slight breeze otherwise you'll get DE all over everything. Even whole wheat flour dust can cause lung irritation if you breathe in a sufficient amount.

Being inactive and usually covered in a hard shell, DE works poorly on insect eggs or pupae. It has more effectiveness on larvae and adult insects with a fair amount of soft tissue exposure.

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SPOILAGE

INSECT INFESTATIONS

PESTS OF STORED GRAINS, LEGUMES AND DRY FOODSTUFFS

Insect infestations can occur in a wide variety of foodstuffs such as flours, meals, pastas, dried fruits or vegetables, nuts, sweets, whole grains, beans, sugars, TVP, jerky, bird seed and pet foods.

Naturally, the best way to deal with an insect infestation is not to have one in the first place. Try to purchase your goods from suppliers who are clean and who turn over their inventory quickly so the products you purchase will be less likely to have bugs.

When you buy foodstuffs examine them closely to be sure they are insect free. Check for any packaging or use by dates to insure their freshness. Don't shake the package, most adult insects will be found in the top couple of inches of the product and shaking the package will mix them into the contents disguising their appearance. If the package does turn out to be infested, return it for replacement.

If not already packaged for storage when you buy them transfer your foods into air- and moisture-tight containers so they cannot be invaded after you have brought them home. With sufficient time, some adult and larval insect forms can penetrate paper, cardboard and thin plastic packaging. Storage containers should be glass, metal, or heavy plastic with tight fitting lids. As with everything in food storage, you should use older packages before newer ones and opened packages before unopened ones.

Storage areas should be kept clean. Don't allow grain, flour, beans, bits of pasta or other food particles to accumulate on shelves or floors. Cracks and crevices should be sealed or otherwise blocked. Except for sticky spills, vacuuming is the best method of cleaning as soap and water can wash food particles into cracks.

Insects may also get their start in chairs, sofas and carpets where food is dropped and not cleaned up. Don't forget to replace the filter bag on the vacuum as some insects can survive and reproduce in the bag.

Bags of dry pet food and bird seed can harbor insect infestation. Decorative foodstuffs such as ears of colorful Indian corn, colored beans and hard squashes can carry

insects that may infest your edible food. Even poison baits can harbor flour beetles.

CONTROL OF INSECT INFESTATIONS

Should you find that in spite of buying fresh products and using careful packaging techniques you have an insect infestation, you can try some of the following steps:

1. If the food is too heavily infested to try to save it should be disposed of as soon as possible. Remove from the kitchen or food storage area immediately so as to not infest other foods.

2. Large bugs can be sifted or winnowed out if the food's not too heavily infested and you want to try to save it. Then treat by placing into a deep freezer at 0° F (-18° C) for three to seven days depending upon the size of the package. Refrigerator freezers usually do not freeze low enough to effectively kill all of the life stages of insects, but if left there, will slow their development. If freezing is not workable then the product could be spread on baking sheets and heated to 150° F for fifteen to twenty minutes, cooled and repackaged. This will shorten shelf life so heat treated foods should be consumed shortly thereafter.

3. The surface areas where the food containers are stored can be treated with an insecticide. This is not a replacement for clean storage habits and good containers, but is rather a supplement. This will not control insect infestations already in your stored foods.

Spray the shelf surface with 0.5% chlorpyrifos (Dursban), 1% propoxur (Baygon), 0.5 percent diazinon, or 0.25 percent resmethrin. You can find any of these in the hardware store in ready to apply packages. If a sprayer isn't feasible then they can be applied with a paint brush. Allow the solution to dry thoroughly. Cover the shelves with clean, untreated shelf paper then put properly packaged

foods back on shelves. **READ THE PRODUCT LABEL FOR SAFETY INFORMATION CONCERNING CHILDREN AND PETS.**

Household bleach, Lysol and other sterilizers will not control insect infestation, though they can be used for mold, mildew and algae.

You may continue to find some insects after the cleanup is finished. This could be for several reasons. It may be they escaped from the packages they were infesting and did not get cleaned up. There may be more packages infested than were originally found or, there may be hiding places in the storage area that need attention. Once you have carefully eliminated all food sources, the bugs should disappear in a few weeks.

MOLDS IN FOOD

Molds are fungi like mushrooms and yeast. Also like mushrooms, they reproduce by releasing spores into the air that land on everything, including your food and food storage containers. If those spores begin to grow, they create thin threads that spread through their growing medium. These threads are the roots of the mold fungus, called *mycelium*. The stalk of a mold fungus is the portion above or on the surface of the food. It produces the spores and gives the mold its color. We've all seen examples of this when we discover a dish of something or other left too long in the refrigerator only to become covered in a mold fuzz.

Molds can grow anywhere they have a growing medium (their food), sufficient moisture and warmth. Some can even grow at refrigerator temperatures, albeit more slowly than they would if it were warmer. These fungi can also withstand more salt and sugar than bacteria, which is why you sometimes find mold in jellies and jams with their high sugar content and on dry cured products like ham or bacon with their high salt content.

In the past, a slight amount of mold was commonly felt to be harmless and the food consumed anyway. For molds that were intentionally introduced, such as the mold in bleu cheese, this is fine. For the unintentional molds, it could possibly be a serious error in judgment. These unwanted molds could be producing toxic substances called *mycotoxins* which can be very bad indeed. Mycotoxins are produced around the root or mycelium of molds and these mold roots can penetrate deeply into the food. Mycotoxins can survive for a long time and most are not destroyed by cooking. The molds probably best known

for this dangerous spoilage are the various *Aspergillus* species which produces a mycotoxin known as *aflatoxin*, but there are other dangerous fungi as well, such as the *Fusarium* molds. Both of the above affect grains and some legumes. See [B.3 Molds In Grains and Legumes.](#)

IMPORTANT NOTE: In wet pack foods such as your home canned goodies, molds can do something else as well, possibly with lethal consequences. If they find their way into wet pack acid foods canned by the boiling water bath method, whether by reasons of improper procedure or contamination after the fact, they can consume the natural acids present in the food. The effect of this is to raise the pH of the food in the container, perhaps to the point that it becomes possible for spores of *Clostridium botulinum*, better known as *botulism*, to become active and reproduce. For this reason, moldy wet pack foods should be *safely* discarded. This most deadly kind of food poisoning has an entry of its own in the bacterial spoilage section.

Molds in low acid foods canned by the pressure canning method are equally dangerous and should also be discarded in a safe manner.

MINIMIZING MOLDS

You can do a number of things to minimize unwanted mold growth in your kitchen, food storage areas and refrigerators. If your kitchen is at all like mine, it is the refrigerator that is going to collect the most fungal growth. This can be dealt with by washing the inside every couple of months with a tablespoon of baking soda dissolved in a quart of warm water. Rinse clean and allow to dry. The black mildew that grows on the rubber door gaskets and other places can be dealt with by wiping down with a solution of three tablespoons of household bleach in a quart of water. I generally use a soft bristle brush for this. A really bad case will not bleach back to a white color, at least it won't for me, but will instead turn pink or red after the bleach has carried out its disinfection mission.

The rest of the kitchen can be kept mold free by keeping the area clean, dry, and spraying occasionally with a product such as Lysol. Patches of mold can be eliminated with the bleach solution used on the refrigerator doors.

Try not to purchase more fresh food than you'll be able to eat in a short period of time. This will keep you from having to deal with the moldy remains that didn't get eaten. If food does go moldy, don't sniff it. This is a good way to give yourself respiratory difficulties if you are at all susceptible to mold allergies. Moldy food should be disposed in such a

manner that your animals and children won't be able to get into it. Mycotoxins are every bit as bad for your animals as they are for you.

Obviously, you don't have to throw out everything that shows a spot of mold on it. Some foods can be safely dealt with and still partially saved if they show signs of fungal growth. Below is a set of guideline from M. Susan Brewer, Ph.D., R.D., a specialist in food safety. Her articles and works are found in many state university extension services publications lists.

If the food shows even a tiny mold spot, follow these guidelines:

1. Hard or firm foods with tiny mold spots can be trimmed; cut away the area around the mold (at least an inch) and rewrap in clean wrap. Make sure that knife does not touch the mold.

TRIM:

Hard Cheese (Cheddar, Swiss, etc.)
Bell Peppers, Carrots, Cabbage
Broccoli, Cauliflower, Brussels Sprouts
Garlic, Onions
Potatoes, Turnips
Zucchini
Apples, Pears

2. Soft foods such as cheese slices, cream cheese, sour cream and yogurt should be thrown away.

TOSS:

Soft Cheeses, (Mozzarella, Brie, etc.)
Sour Cream, Yogurt, Cottage cheese
Bacon, Hot dogs, Sliced lunch meats
Meat pies
Opened canned ham
Most left-over food
Bread, Cakes, rolls, flour, pastry
Peanut butter
Juices, berries
Jam, Jellies, Syrups
Cucumbers, Tomatoes
Spinach, Lettuce, other leafy vegetables
Bananas, Peaches, Melons
Corn-on-the-cob
Stored nuts, whole grains, rice

MOLDS IN CANNED GOODS

If good equipment and proper technique are used, it is unlikely

you will ever have mold growth in your unopened canned goods. If you do have such, there was either a flaw in the procedure used, or something affected the jar or can after the fact to break its seal. In any event, once the food has molded, it is past saving and should be discarded in such a way that children and animals will not be able to get into it. The most likely home canned products to show mold growth are jams and jellies sealed with paraffin wax.

There are a number of points in the canning process where this can occur:

- (1) In the time after the jar is taken out of its boiling water bath, but before it is filled.
- (2) In the time between when the jar is filled and covered with the melted wax.
- (3) When the wax cools, if it pulls away from the side of the jar, leaving an opening for the mold to get in.
- (4) If bubbles form in the paraffin, which break and leave holes.

For these reasons most canning authorities no longer recommend using this technique. If you must do so, the jars should be boiled for at least 10 minutes before the jelly is poured. The filled and wax capped jars should then be covered with some sort of protective lid. The book, *Putting Food By* has excellent instructions on this or see the applicable section of the *rec.food.preserving FAQ*.

MOLDS IN GRAINS AND LEGUMES

It has long been known that eating moldy grain is bad for your health with the ugly consequences of eating ergot-infected rye being a well known example. It has only been about thirty years, though, that intensive study has been carried out on other species of grain fungi and their respective mycotoxins. Fortunately, for those of us in the U.S., the USDA and the various state departments of agriculture go to a great deal of trouble to detect grain and legumes infected with these toxic fungi. In some of the less developed countries, the citizenry are not so lucky. It is good to have something of an understanding of what one should do to prevent mold growth in ones stored grains and to have an idea of what to look for and ask about when purchasing grains and legumes.

The one fungal group that has caused the most commotion in recent history are the various *Aspergillus* species of molds. Under certain conditions with certain grains, legumes, and to a lesser extent, nuts, they can produce a

mycotoxin called *aflatoxin*. This is a serious problem in some parts of the world, most especially in peanuts, occasionally in corn. I am not aware of any documented deaths in the United States from aflatoxicity, but other nations have not been so fortunate. What makes aflatoxin worrisome in this country is that it is also a potent carcinogen (cancer causing agent).

In addition to the *Aspergillus* molds, there is also a large family of molds known as *Fusarium* which can produce mycotoxins of their own, none of which do you want to be eating directly or feeding to your food animals where you will get the toxins back indirectly when the animal is slaughtered and eaten.

The Federal and state governments continuously monitor food and forage crops entering the marketplace. Those products found to be contaminated with mold or mycotoxins are not allowed to be sold for food. Once purchased however, the responsibility is yours to keep your food safe from mold growth. If you have already found mold growth in your whole grains, meals, flours or other grain products, they should be discarded. Most mycotoxins are not broken down or destroyed by cooking temperatures and there is no safe way to salvage grain that has molded.

PREVENTING MOLD GROWTH IN STORED GRAINS AND LEGUMES

The easiest method to prevent mold growth in your stored grains and legumes is to keep them too dry for mold to grow. The *Aspergillus* and *Fusarium* molds require moisture contents of 18% and above to reproduce. This is subject to some variability, but in all grains and soybeans, they must have a moisture content of that level. If you are storing raw (not roasted) peanuts, in the shell or shelled, you want to get the moisture content to less than 8% as peanuts are particularly susceptible to mold growth. The recommended moisture content for all other grain and legume storage is no more than 10%. Please see part [Grains and Legumes](#) for a method to determine moisture content. At 10% moisture, there is simply too little water for fungi to grow.

BACTERIAL SPOILAGE

Like the fungi, bacteria are everywhere, in the water, soil, air, on you, your food and your food storage containers. Fortunately, the vast majority of the bacteria we encounter are relatively harmless or even benign and only a few represent a danger to us and our stored foods.

Bacteria can be much more difficult to kill than molds and insects. Some are capable of continued growth at temperatures that would kill other spoilage organisms. When conditions are such that they are unable to grow, some bacteria can go dormant and form spores. These spores can be quite hardy, even to the point of surviving boiling water temperatures.

In order to grow, bacteria must have water, some species needing as little as a 20% moisture. For properly packaged dry grains, legumes, powdered milk and other low moisture foodstuffs bacterial spoilage will never be a problem as their moisture levels should be too scant to support growth.

WARNING: It is in wet pack canned goods (where the container has free liquid in it) and fresh foods we must be the most concerned about spoilage bacteria. It is here that a little bad luck and a moment's inattention to what you are doing could kill or seriously injure you or some other person who eats the foods you've put by. In both home-canned and commercially-canned goods, IF THE CAN IS BULGING, LEAKING, SMELLS BAD, OR SPEWS LIQUID WHEN YOU OPEN IT THEN THROW IT OUT! But, throw it out safely so that children and animals cannot get into it.

BOTULISM

Clostridium botulinum is one of the oldest life forms on this planet dating from a time before the Earth had an abundant oxygen atmosphere. Like the gangrene bacteria, it is an anaerobic organism meaning it lives and grows only in the absence of free oxygen. When conditions are not suitable for growth the bacteria can form durable seed like spores which are commonly found in the soil. This means that *C. botulinum* can be brought into your life on raw produce, tools, hands or anything else that came into contact with dirt. To further complicate matters, botulinum spores are extremely heat-hardy. The bacteria itself can be killed by a short exposure to boiling water (212° F AT SEA LEVEL PRESSURE), but its spores can not. To kill them, the food product and container must be exposed to temperatures of 240° F (AGAIN AT SEA LEVEL PRESSURE) for a long enough period of time to allow all of the food in each container to come completely up to the proper temperature. Only a pressure-canner can reach the necessary temperature.

It's not the bacteria or its spores which are directly deadly, but the toxin the bacteria creates when it grows and reproduces. In its pure form, botulism toxin is so potent that a mere teaspoon would be enough to provide a fatal dose to hundreds of thousands of people. It is this lethality that is why every responsible book on home canning, food preservation, and food storage hammers constantly on the need for care in

technique and method and why spoilage must be taken seriously.

Like any other life form *Clostridium botulinum* must have suitable conditions for its growth to become a danger. One of the most important of these is water - the botulism bacterium needs moisture in the 35% range to grow making it a danger only in improperly processed high moisture foods. Another requirement is suitable pH, which is the measure of acidity or alkalinity in a substance and is measured on a scale of 1-14. Anything above 7 is considered alkaline and everything below 7 is considered acid. If the acidity of your wet pack food is BELOW pH4.6 then *C. botulinum* is unable to grow. Keep in mind that in foods pH is not necessarily stable and could possibly change if other spoilers like mold are able to grow. If the product should change to a lesser acidity than pH4.6 your previously botulinum proof food may start allowing the lethal spoiler to grow (see [molds in canned goods](#)). This is why it is vital to use proper technique, even for acid foods like tomatoes. It has been found that when this pH shift occurs allowing *C. botulinum* to become active producing its lethal toxin the bacterium also produces minute amounts of acid which can lower the pH of the poisoned food back into what should have been the safe zone had the pH not jumped up and allowed the bacteria to grow. Again and again — use good technique and pay attention to what you are doing.

Unlike fungal mycotoxins Botulinum toxin can be destroyed by boiling food briskly in an open vessel for fifteen minutes. Because of this, if your canned food shows any safety problems you should follow this procedure. If the food shows even the slightest mold growth, keep in mind that mycotoxins are not for the most part broken down by heat and dispose of the food safely.

I won't go into the hows of home canning here. For that I strongly recommend that you read the *rec.food.preserving FAQ*, the *Ball Blue Book* or most especially the book *Putting Food By* for in depth information on this subject.

ENZYMATIC ACTION IN FOOD SPOILAGE

Every living organism uses enzymes of many sorts in its bodily functions as part of its normal life cycle. Enzymes are used in creating life. After death, enzymes play a role in the decomposition of once living tissue. The enzymes in a tomato help it to ripen and enzymes produced by the tomato and whatever fungal and bacterial spoilers are on it cause it to decay.

Fortunately, slowing down or stopping the action of a food's

enzymes is much easier than slowing or stopping some of the bacterial spoilers mentioned above. Enzymes are most active in a temperature range between 85-120° F and begin to be destroyed when the temperature goes above 140° F. Cold also slows down the action of enzymes, which is why fresh tomatoes last longer in the refrigerator than they do on the kitchen table. Most enzymatic action also requires moisture to occur. In foods stored at 10% moisture or less, there is not enough moisture for most enzymes to be active.

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RECOMMENDED FOOD STORAGE TIMES

FOOD

At 70° F.

Keep the product:

STORAGE TIPS

Baking powder	Till can date	Sealed & bone dry	
Baking soda	2 years	Sealed & dry	
Biscuit, brownie, muffin mix	9 months	Sealed, cool, dry, weevil proofed	
Bouillon, cubes or granules	2 years	Sealed, cool and dry	
Cake mixes, regular	9 months	Sealed, cool, dry, weevil proofed	
angel food	1 year	Sealed, cool, dry, weevil proofed	
Canned food: metal can, Non-Acidic	2 years	Cool & Dry	
Metal Can, Acidic	12-18 months	Cool & Dry	
Glass jars	2-3 years	Dark, Cool & Dry	
Chocolate, semi-sweet or unsweetened, bars or chips	18 months	Cool and dark	
Chocolate syrup	2 years	Cool & tightly sealed	
Cocoa, powder or mixes	8 months	Sealed and cool	
Coffee creamers, powdered	9 months	Sealed and cool	
Cornmeal	1 year	Keep dry & weevil proofed	
Cornstarch	18 months	Keep dry	
Crackers	3 months	Keep dry & weevil proofed	
Flour, refined white	8-12 months	Dry & weevil proofed,	
whole wheat	4-6 weeks	refrigerate/freeze for longer shelf life	
Frostings, canned	3 months	Cool	
Mix	8 months	Dry and cool	
Fruits, dried	6-12 months	Cool, sealed, weevil proofed	
Gelatin, all types	18 months	Protect from moisture	
Grains, whole	2 years	Dry and weevil proofed	
Hominy, hominy grits, masa harina	1 year	Dry and weevil proofed	
Honey	2 years	Cool, tightly sealed, dark	
Jellies, jams, preserves	2 years	Dark, cool, tightly sealed.	
Molasses & syrups	2 years	Tightly sealed	
Mayonnaise	6 months	Cool & dark	
Milk, condensed or evaporated	1 year	Turn over every 2 months	
non-fat dry	6 months	Bone dry and cool	
Nuts, vacuum canned	1 year	Cool and Dark	
other packaging	3 months	Cool and dark – better Refrigerated	
in shell	4 months	Cool, dry & dark, better refrigerated or frozen	Pancake
mix	6-9 months	Dry and weevil proofed	
Pastas (macaroni, noodles, etc)	2 years	Dry and weevil proofed	
Peanut butter	6-9 months	Sealed, cool, dark	
Peas and beans, dry (not soybeans)	2 years	Dry and weevil proofed	
Potatoes, instant	6-12 months	Dry and weevil proofed	
Pudding mixes	1 year	Cool and very dry	
Rice, white	2+ years	Dry and weevil proofed	
brown	3-6 months	Dry & weevil proofed, better refrigerated or frozen	
flavored or herb	6 months	Sealed, dry and weevil proofed	
Salad dressings	10-12 months	Sealed, dark, cool. Better refrigerated	
Salad oils	6 months	Sealed, dark, cool. Better refrigerated	
Sauce and gravy mixes	6-12 months	Cool and dry	
Shortening, solid	1 year	Cool, dark, tightly sealed.	
Soup mixes	1 year	Cool, dry, and weevil proofed	
Sugar, brown	2 years	Tightly sealed, Dry.	
confectioners	18 months	Tightly sealed, Dry.	
granulated	2+ years	Dry	
Syrups (corn syrup based)	8-12 months	Sealed and cool	
Vegetables, dried	1 year	Cool, dark, dry, weevil proofed	
Vinegar	2+ years	Sealed	

Storage Life of Dehydrated Foods

Determining the storage life of foods is at best an inexact science **as there are so many variables. These range from the condition your food was in when you first purchased it and includes many other factors.** This page was written with input by Mr. Stephen Portela who has over 30 years of professional food storage experience. This information should be used as a general guide only, and should not be followed “as the gospel truth” because your results may be different.

Four Factors that effect food storage:

Factor #1: The Temperature:

Temperature has more to do with how long well dried foods store than anything else. The USDA states, ***“Each 5.6 C. (10.08F) drop in temperature doubles the storage life of the seeds.”*** Obviously, there is a limit as to how far this statement can be taken. However I expect it basically holds true from room temperature down to freezing. No doubt, the inverse could also be considered true. ***“Each 5.6C. (10.08F) rise in temperature halves the storage life of seeds.”*** This theory holds true for non-garden seeds as well.

Storage Life Differences Depending on Temperature

Constant Storage Temp in degrees F	Storage life In Years
39.76 - - - 40	
49.84 - - - 30	
59.92 - - - 20	
70.00 - - - 10	
80.08 - - - 5	
90.16 - - - 2.5	
100.24 - - - 1.25	

Note: the above chart is not for a specific food but shows the relationship between temperature and storage life.

Lets look at a couple of real life examples of good and poor food storage practices:

About a year ago we got an unopened paper bag of white flour which had been stored at 70 degrees F, in a dry climate. It had been sitting for 3 years in a closet. It made fine looking bread but had such an ‘old’ and bad flavor that it was difficult to eat. For another example, a couple of years ago in the Puget Sound area we were given a 4 gallon can of wheat that had been stored up high in a garage for about 30 years. This part of the country is not as hot as some places, yet in the summers the average garage still gets up into the 90’s. Even though wheat will store for 30+ years under good conditions, the bread from this particular wheat was very bad tasting and after a few batches we ended up throwing the wheat away (something I always dislike doing).

Counter these stories with several examples told by Mr. Stephen Portela, Walton Feed’s manager: He stores his long term food storage in his basement where the temperature hovers around 60 degrees F. The experts give brown rice a 6 month storage life because of all the oils in it that go rancid. Yet, Mr. Portela has been eating from a supply of brown rice that has been in his basement over 10 years. It is still wholesome! In another example, there is a family living near him who purchased a supply of food in #10 cans 30 years ago. Their basement hovers around 58 degrees F. After 28 years, Mr. Portela took a sample of many of these items to the Benson Institute at BYU to have it tested. The results can be seen at the bottom of Mr. Portela’s welcome page. You will see everything tested had a ‘good’ to ‘satisfactory’ rating except for the eggs which had a ‘minimum passing’ rating. After 28 years I think it is most interesting that it passed at all. Mr. Portela tells me as 30 years have now passed, their storage is still in very good condition.

The bottom line is even with the very best packaging methods, if you are planning on storing your food in a warm environment, it will only last a fraction of the time it would last if stored in a cool, dry place. You can expect good storage life if your storage temperature is at 60 degrees F or below. Optimum storage temperature is at 40 degrees F or less. It is important you also find a place where the temperature remains constant. Frequent temperature changes shorten storage life. If

you don't have a cool place for your food storage, plan on rotating your storage quickly enough to prevent food loss.

Factor #2: Product moisture content:

By looking at the USDA nutritional tables, dry beans, grains, and flours contain an average of 10% moisture. Although it is very difficult and unnecessary to remove all moisture from dry foods, it is imperative that any food be stored as dry as possible. Foods with excess moisture can spoil right in their containers. This is an important consideration when packing food with dry ice as moisture condenses and freezes on the outer surface of the dry ice. For long term storage, grains should have a moisture content of 10% or less. It is difficult to accurately measure this without special equipment. See the misc.survivalism faqs for a quick and easy way of getting a rough estimate of the water content in your foods. It is also important to know that you can not dehydrate foods at home that reach these levels. Food that is dried to a moisture level of 10% moisture crisply snap when bent. Those of you who dehydrate foods at home know dehydrated foods from your dehydrator are quite pliable when bent, especially fruits. These will not store well long term.

Factor #3: Atmosphere the product is stored in:

Foods packed in air don't store as well as in oxygen free gasses. This is because air contains oxygen which oxidizes many of the compounds in food. Bacteria, one of several agents which make food go rancid also needs oxygen to grow. Food storage companies have a couple of different processes for removing the oxygen:

·**Displacing the oxygen:** This is done by purging out all the air in the product with an inert gas. Nitrogen is almost always used because it is the most inert gas known. People doing their own packing occasionally use dry ice which gives off carbon dioxide gas, and probably works just about as well.

·**Absorb the oxygen:** Oxygen absorber packets do just that. Air contains about 78% nitrogen and 21% oxygen, leaving about 1% for the other gasses. If the oxygen is absorbed, what remains is 99% pure nitrogen in a partial vacuum.

If oxygen absorber packets are used, care must be taken to use a storage container that can stand some

vacuum. If it's not air tight, air will be sucked into your container as the oxygen is absorbed, reintroducing more oxygen that must be absorbed. Before long, the oxygen absorbers will have absorbed all the oxygen they can. Obviously, your product won't be oxygen free under these circumstances.

Seeds store better in nitrogen. On the other hand, seeds you plan on sprouting, such as garden seed, or seeds set aside for growing your own sprouts store better in air. For this reason Walton cans their garden seed packs in air.

Oxygen absorbers also contain a minute amount of moisture to activate the absorber. Sometimes, with the heat generated by the absorber, they can cause sweating if you use glass bottles or tupperware type containers.

Factor #4: The container the product is stored in:

To get the best storage life out of your product it must have a hermetic (air tight) seal. Containers that do this well are:

·#10 Cans (Use only cans that are enamel lined, otherwise your food flavor will be tainted by the steel it comes in contact with. An enamel lined can also prevents the inside of the can from rusting.)

·Sealable food storage buckets

·Sealable food quality metal (lined) or plastic drums.

Whatever container you use, be sure it is food grade as your product can be tainted with whatever the container is made from. Plastic sacks are not good air tight containers, for even if they are sealed, the relatively thin plastic 'breathes,' allowing air to pass through. Paper sacks are of course even worse.

There is some concern as to how good a seal is made by the lids on plastic buckets used by food storage companies. Manufacturer studies show an extremely small amount of air transfer. This amount is so small, however, that it can be considered a hermetic seal. It has also been found that the lids can be re-used several times without dramatically degrading the performance of the seal.

People who purchase products from food storage providers are often concerned about receiving their buckets bulging or with one side collapsed in.

Collapsed buckets occasionally occur when ordering from Walton's as the elevation of their packing facility is above 6,000 feet. As the buckets are shipped to a lower elevation, the increased ambient air pressure can sometimes push in one side. If a side is popped in, it is a great indication that the bucket is indeed sealed. And this also holds true for buckets that might be under a slight amount of pressure. If either condition concerns you, crack the lid to equalize the air pressure. You can do this without seriously degrading the storageability of the product within the bucket. Remember to re-seal the lid after doing this.

Bulging cans:

Some bulging cans have been returned to Waltons. In almost every case, these cans held mixes that contained baking powder or soda. It is believed that occasionally the extremely small amount of moisture found in the product interacts over time with the baking powder or soda and creates a small amount of carbon dioxide gas. Oxyten absorbers can also react with the baking powder causing the cans to buldge. These cans have been sent off for bacteria analysis and and in each case came back negative.

Storage Life Notes About Specific Foods:

The Soft Grains

Barley Hulled or Pearled, Oat Groats, Rolled Oats, Quinoa Rye.

Soft Grains have softer outer shells which don't protect the seed interior as well as hard shelled seeds and therefore won't store as long. Hermetically sealed in the absence of oxygen, plan on a storage life of 8 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

The Hard Grains

Buckwheat, Corn, Dry Flax, Kamut, Millet, Durum wheat, Hard red wheat, Hard white wheat, Soft wheat, Special bake wheat, Spelt, Triticale.

The Hard Grains all store well because of their hard outer shell which is nature's near perfect container. Remove that container and the contents rapidly deteriorate. Wheat, probably nature's longest storing seed, has been known to be edible after scores of years when stored in a cool dry place. As a general rule for hard grains, hermetically sealed in the absence of oxygen, plan on a storage life of 15-20 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

Beans

Adzuki Beans, Blackeye Beans, Black Turtle Beans, Garbanzo Beans, Great Northern, Kidney Beans, Lentils, Lima Beans, Mung Beans, Pink Beans, Pinto Beans, Small Red Beans, Soy Beans.

As beans age they lose their oils, resist water absorbtion and won't swell. Worst case, they must be ground to be used. Storing beans in nitrogenhelps prolong the loss of these oils as does cool temperatures. Hermetically sealed in the absence of oxygen, plan on a storage life of 8-10 years ata stable temperature of 70 degrees F. They should keep proportionately longer if stored 10-20 degree F cooler temperatures.

Dehydrated Vegetables

Broccoli, Cabbage, Carrots, Celery, Onions, Peppers, Potatoes.

Dehydrated vegetables store well if hermetically sealed in the absence of oxygen. Plan on a storage life of 8-10 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

Dehydrated Dairy Products

Cheese Powder, Cocoa Powder, Powdered Eggs, Butter/margarine Powder, Powdered Milk, Morning Moo, Whey Powder.

Dehydrated Dairy Products generally store very well if stored dry in hermetically sealed containers with the oxygen removed. Plan on a storage life of 5 to 10 years if stored at a stable temperature of 70 degrees F. They should keep, probably 5 years longer, if stored at cooler temperatures. One exception is Morning Moo. As a new whey based product, it hasn't been tested for long term storage. Plan on rotating this product after 5 years. Our dairy powders (excluding our sour cream powder) contain no fat, an agent that markedly decreases the storage life of dairy products.

Flours and Other Products made from Cracked / Ground Seed.

All Purpose Flour, Bakers Flour, Unbleached Flour, White Flour, Whole Wheat Flour, Cornmeal, Mixes, Refried Beans, Cracked wheat, Germade, Gluten, Wheat flakes.

After seeds are broken open their outer shells can no longer protect the seed contents and seed nutrients start to degrade. Don't try to store unprotected flours longer than a year. Hermetically sealed in the absence of oxygen, plan on a storage life of 5 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures. Note: Granola is not a long storing food because of the nuts. They contain high concentrations of oil which go rancid over the short term. Expect granola to last about 6-9 months.

Pasta

Macaroni, Noodles, Ribbons, Spaghetti.

Pasta will store longer than flour if kept dry. Hermetically sealed in the absence of oxygen, plan on a storage life of 10 - 15 years at a stable temperature of 70 degrees F. Pasta should keep proportionately longer if stored at cooler temperatures.

Dehydrated Fruit

Fruit doesn't keep as well as many dehydrated items. Hermetically sealed in the absence of oxygen, plan on a storage life of 10-15 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures.

Honey, Salt and Sugar

Honey, Salt and Sugar should keep indefinitely if stored free of moisture. Watch out for additives in the honey. It is possible to buy honey with water and sugar added. This honey generally doesn't crystallize like pure 100% honey does when stored for a long time. If there are additives, there is no saying how long it will last.

Peanut Butter Powder

Peanut Butter Powder will not store as long as wheat flour. Hermetically sealed in the absence of oxygen, plan on a storage life of 4-5 years at a stable temperature of 70 degrees F. It should keep proportionately longer if stored at cooler temperatures.

Brown and White Rices

Brown and white rices store very differently. Brown rice is only expected to store for 6 months under average conditions. This is because of the essential fatty acids in brown rice. These oils quickly go rancid as they oxidize. It will store much longer if refrigerated. White rice has the outer shell removed along with those fats. Because of this, white rice isn't nearly as good for you, but will store longer. Hermetically sealed in the absence of oxygen, plan on a storage life for white rice of 8-10 years at a stable temperature of 70 degrees F. It should keep proportionately longer if stored at cooler temperatures. Stored in the absence of oxygen, brown rice will last longer than if it was stored in air. Plan on 1 to 2 years. It is very important to store brown rice as cool as possible, for if you can get the temperature down another ten degrees, it will double the storage life again.

Garden Seedor Sprouting Seed

All viable seeds are hibernating tiny living plants that only need moisture and warmth to sprout. And much like a chick in an egg, all the nutrients this little life needs to spring into existence is contained within it's shell. Like boiling an egg, heating a seed will kill that little life within it. However, unlike an egg, a seed can withstand cold temperatures. As seeds usually remain edible after the life within it dies, we must use different criteria when determining sproutable seed storage life. And again the big deciding factor is temperature. Plan on a storage life of 2 to 3 years at a stable temperature of 70 degrees F. They should keep proportionately longer if stored at cooler temperatures. And remember, you want to store all of these seeds in air. Packed in nitrogen, the viability of some seeds will last longer than others. This is still to a large degree an unexplored science, and therefore we recommend you store all the seeds you plan on sprouting in air. Alfalfa is a unique seed as it actually germinates better if the seed is 2 or 3 years old. Most any sample of alfalfa contains 'hard' seed and 'soft' seed. Soft seed germinates within two days while hard seed germinates in about a week. The problem is, by the time the soft seed sprouts are ready to harvest, the hard seed may not have germinated yet. As storage time draws on, the hard seed turns into soft seed. Older seed germinates closer together. Stored in cool conditions, alfalfa seed should have a good percentage of

germination up until it is 8 years old.

Total Vegetable Protein

Total Vegetable Protein, made from soy beans, has an unusually long storage life. Hermetically sealed in the absence of oxygen, plan on a storage life of 15-20 years at a stable temperature of 70 degrees F. meat substitute should keep proportionately longer if stored at cooler temperatures.

Yeast

Yeast, a living organism, has a relatively short storage life. Keep yeast in the original metal foil storage containers. If the seal remains intact, yeast should last 2 years at 70 degrees F. However it is strongly recommended that you refrigerate it, which should give you a storage life of 5 years. Frozen yeast should store for a long time.

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Water Treatment

Water Storage

Quantity

A water ration of as little as a pint per day has allowed life raft survivors to live for weeks, but a more realistic figure is 1 gallon per person per day for survival. 4 gallons per person/day will allow personal hygiene, washing of dishes, counter tops, etc. 5 to 12 gallons per day would be needed for a conventional toilet, or 1/2 to two gallons for a pour flush latrine. For short-term emergencies, it will probably be more practical to store paper plates and utensils, and minimize food preparation, than to attempt to store more water.

In addition to stored water, there is quite a bit of water trapped in the piping of the average home. If the municipal water system was not contaminated before you shut the water off to your house, this water is still fit for consumption without treatment. To collect this water, open the lowest faucet in the system, and allow air into the system from a second faucet. Depending on the diameter of the piping, you may want to open every other faucet, to make sure all of the water is drained. This procedure will usually only drain the cold water side, the hot-water side will have to be drained from the water heater. Again, open all of the faucets to let air into the system, and be prepared to collect any water that comes out when the first faucet is opened. Toilet tanks (not the bowls) represent another source of water if a toilet bowl cleaner is not used in the tank.

Some people have plumbed old water heaters or other tanks in line with their cold water supply to add an always rotated source of water. ***Two cautions are in order: 1) make sure the tanks can handle the pressure (50 psi min.), and 2) if the tanks are in series with the house plumbing, this method is susceptible to contamination of the municipal water system.*** The system can be fed off the water lines with a shutoff valve (and a second drain line), preventing the water from being contaminated as long as the valve was closed at the time of contamination.

Water can only be realistically stored for short-term emergencies, after that some emergency supply of water needs to be developed

Water Collection

Wells

Water can only be moved by suction for an equivalent head of about 20'. After this cavitation occurs, that is the water boils off in tiny bubbles in the vacuum created by the pump rather than being lifted by the pump. At best no water is pumped, at worst the pump is destroyed. Well pumps in wells deeper than this work on one of the following principles:

1) The pump can be submerged in the well, this is usually the case for deep well pumps. Submersible pumps are available for depths up 1000 feet.

2) The pump can be located at the surface of the well, and two pipes go down the well: one carrying water down, and one returning it. A jet fixture called an ejector on the bottom of the two hoses causes well water to be lifted up the well with the returning pumped water. These pumps must have an efficient foot valve as there is no way for them to self-prime. These are commonly used in shallow wells, but can go as deep as 350 feet. Some pumps use the annular space between one pipe and the well casing as the second pipe this requires a packer (seal) at the ejector and at the top of the casing.

3) The pump cylinder can be located in the well, and the power source located above the well. This is the method used by windmills and most hand pumps. A few hand pumps pump the water from very shallow wells using an aboveground pump and suction line. A variety of primitive, but ingenious, pump designs also exist. One uses a chain with buckets to lift the water up. Another design uses a continuous loop rope dropping in the well and returning up a small diameter pipe. Sealing washers are located along the rope, such that water is pulled up the pipe with the rope. An ancient Chinese design used knots, but modern designs designed for village level maintenance in Africa use rubber washers made from tires, and will work to a much greater depth.

Obviously a bucket can be lowered down the well if the well is big enough, but this won't work with a modern drilled well. A better idea for a drilled well is to use a 2' length or so of galvanized pipe with end caps of a diameter that will fit in the well casing. The upper cap is drilled for a screw eye, and a small hole for ventilation. The lower end is drilled with a hole about half the diameter of the pipe, and on the inside a piece of rigid plastic or rubber is used as a flapper valve. This will allow water to enter the pipe, but not exit it. The whole assembly is lowered in the well casing, the weight of the pipe will cause it to fill with water, and it can then be lifted to the surface. The top pipe cap is there mostly to prevent the pipe from catching as it is lifted.

Springs

Springs or artesian wells are ideal sources of water. ***Like a conventional well, the water should be tested for pathogens, VOCs (Volatile Organic Compounds such as fuel oil or benzene), pesticides and any other contaminants found in your area.*** If the source is a spring it is very important to seal it in a spring box to prevent the water from becoming contaminated as it reaches the surface. It is also important to divert surface runoff around the spring box. As with a well, you will want to periodically treat the spring box with chlorine, particularly if the spring is slow moving. The spring may also be used for keeping food cool if a spring-house is built. If this is the case, it is still recommended to build a spring box inside the house to obtain potable water.

Surface water

Most US residents served by municipal water systems supplied with surface water, and many residents of underdeveloped countries rely on surface water. ***While surface water will almost always need to be treated, a lot of the risk can be reduced by properly collecting the water.*** Ideal sources of water are fast flowing creeks and rivers which don't have large sources of pollution in their watershed. With the small amounts of water needed by a family or small group, the most practical way to collect the water is through an infiltration gallery or well. Either method reduces the turbidity of the collected water making it easy for later treatment.

Water Purification

Heavy Metals

Heavy metals are only a problem in certain areas of the country. The best way to identify their presence is by a lab test of the water or by speaking with your county health department. Unless you are down stream of mining trailings or a factory, the problem will probably affect the whole county or region. Heavy metals are unlikely to be present in sufficient levels to cause problems with short-term use.

Turbidity

Turbidity refers to suspended solids, i.e. muddy water, is very turbid. Turbidity is undesirable for 3 reasons:

- 1) aesthetic considerations
- 2) solids may contain heavy metals, pathogens or other contaminants,
- 3) turbidity decreases the effectiveness of water treatment techniques by shielding pathogens from

chemical or thermal damage, or in the case of UV treatment, absorbing the UV light itself.

Organic compounds

Water can be contaminated by a number of organic compound such as chloroform, gasoline, pesticides, and herbicides. These contaminants must be identified in a lab test. It is unlikely ground water will suddenly become contaminated unless a quantity of chemicals is allowed to enter a well or penetrating the aquifer. ***One exception is when the aquifer is located in limestone.*** Not only will water flow faster through limestone, but the rock is prone to forming vertical channels or sinkholes that will rapidly allow contamination from surface water. Surface water may show great swings in chemical levels due to differences in rainfall, seasonal crop cultivation, and industrial effluent levels

Pathogens

Protozoa

Protozoa cysts are the largest pathogens in drinking water, and are responsible for many of the waterborne disease cases in the US. Protozoa cysts range in size from 2 to 15 μm (**a micron is one millionth of a meter**), but can squeeze through smaller openings. In order to insure cyst filtration, filters with an absolute pore size of 1 μm or less should be used. The two most common protozoa pathogens are ***Giardia lamblia*** (Giardia) and ***Cryptosporidium*** (Crypto). Both organisms have caused numerous deaths in recent years in the US, the deaths occurring in the young and elderly, and the sick and immune compromised. Many deaths were a result of more than one of these conditions. Neither disease is likely to be fatal to a healthy adult, even if untreated. For example in Milwaukee in April of 1993, of 400,000 who were diagnosed with Crypto, only 54 deaths were linked to the outbreak, 84% of whom were AIDS patients. Outside of the US and other developed countries, protozoa are responsible for many cases of amoebic dysentery, but so far this has not been a problem in the US, due to better wastewater treatment. This could change during a survival situation. Tests have found Giardia and/or Crypto in up to 5% of vertical wells and 26% of springs in the US.

Bacteria

Bacteria are smaller than protozoa and are responsible for many diseases such as typhoid fever, cholera, diarrhea, and dysentery. Pathogenic bacteria range in size from 0.2 to 0.6 μm , and a 0.2 μm filter is necessary to prevent

transmission. Contamination of water supplies by bacteria is blamed for the cholera epidemics which devastate undeveloped countries from time to time. Even in the US, *E. coli* is frequently found to contaminate water supplies. Fortunately *E. coli* is relatively harmless as pathogens go, and the problem isn't so much with *E. coli* found, but the fear that other bacteria may have contaminated the water as well. Never the less, dehydration from diarrhea caused by *E. coli* has resulted in fatalities.

Viruses

Viruses are the 2nd most problematic pathogen, behind protozoa. As with protozoa, most waterborne viral diseases don't present a lethal hazard to a healthy adult. Waterborne pathogenic viruses range in size from 0.020-0.030 μm , and are too small to be filtered out by a mechanical filter. All waterborne enteric viruses affecting humans occur solely in humans, thus animal waste doesn't present much of a viral threat. At the present viruses don't present a major hazard to people drinking surface water in the US, but this could change in a survival situation as the level of human sanitation is reduced. Viruses do tend to show up even in remote areas, so case can be made for eliminating them now.

Physical Treatment

Heat Treatment

Boiling is one guaranteed way to purify water of all pathogens. Most experts feel that if the water reaches a rolling boil it is safe. A few still hold out for maintaining the boiling for some length of time, commonly 5 or 10 minutes, plus an extra minute for every 1000 feet of elevation. If one wishes to do this, a pressure cooker would allow the water to be kept at boiling with out loosing the heat to evaporation. One reason for the long period of boiling may be to inactivate bacterial spores (which can survive boiling), but these spore are unlikely to be waterborne pathogens.

African aid agencies figure ***it takes 1 kg of wood to boil 1 liter of water.*** Hardwoods and efficient stoves would improve on this.

Water can also be treated at below boiling temperatures, if contact time is increased. A commercial unit has been developed that treats 500 gals of water per day at an estimated cost of \$1/1000 gallons for the energy. The process is similar to milk pasteurization, and holds the water at 161° F for 15 seconds. Heat exchangers recover

most of the energy used to warm the water. Solar pasteurizers have also been built that would heat three gallons of water to 65° C and hold the temperature for an hour. A higher temperature could be reached if the device was rotated east to west during the day to follow the sunlight.

Regardless of the method, heat treatment does not leave any form of residual to keep the water free of pathogens in storage.

Reverse Osmosis

Reverse osmosis forces water, under pressure, through a membrane that is impermeable to most contaminants. The most common use is aboard boats to produce fresh water from salt water. ***The membrane is somewhat better at rejecting salts than it is at rejecting non-ionized weak acids and bases and smaller organic molecules (molecular weight below 200).*** In the latter category are undissociated weak organic acids, amines, phenols, chlorinated hydrocarbons, some pesticides and low molecular weight alcohols. ***Larger organic molecules, and all pathogens are rejected.*** Of course it is possible to have a imperfection in the membrane that could allow molecules or whole pathogens to pass through.

Using reverse osmosis to desalinate seawater requires considerable pressure (1000 psi) to operate, and for a long time only electric models were available. Competing for a contract to build a hand powered model for the Navy, Recovery Engineering designed a model that could operate by hand, using the waste water (90 percent of the water is waste water, only 10% passes through the filter) to pressurize the back side of the piston. The design was later acquired by PUR. While there is little question that the devices work well, the considerable effort required to operate one has been questioned by some survival experts such as Michael Greenwald, himself a survivor of a shipwreck. On the other hand the people who have actually used them on a life raft credit the availability of water from their PUR watermaker for their survival.

PUR manual watermakers are available in two models: The Survivor 06 (\$500) produces 2 pints per hour, and the Survivor 35 (\$1350) produces 1.4 gal/hr. The latter model is also available as the Power Survivor 35 (\$1700), which produces the same water volume from 4 Amps of 12 VDC, and can be disconnected and used as a hand held unit. A number of manufactures, including PUR, make DC powered models for shipboard use. PUR recommends replacing the O rings every 600 hours on its handheld units, and a kit is available to do this. Estimates for membrane life vary, but

units designed for production use may last a year or more. ***Every precaution should be taken to prevent petroleum products from contacting the membrane as they will damage or destroy the membrane.*** The prefilter must also be regularly changed, and the membrane may need to be treated with a biocide occasionally

Reverse osmosis filter are also available that will use normal municipal or private water pressure to remove contaminants from water, as long as they aren't present in the levels found in sea water.

The water produced by reverse osmosis, like distilled water, will be close to pure H₂O. Therefore mineral intake may need to be increased to compensate for the normal mineral content of water in much of the world.

Distillation

Distillation is the evaporation and condensation of water to purify water. ***Distillation has two disadvantages: 1) A large energy input is required and 2) If simple distillation is used, chemical contaminants with boiling points below water will be condensed along with the water.*** Distillation is most commonly used to remove dissolved minerals and salts from water.

The simplest form of a distillation is a solar still. A solar still uses solar radiation to evaporate water below the boiling point, and the cooler ambient air to condense the vapor. The water can be extracted from the soil, vegetation piled in the still, or contaminated water (such as radiator fluid or salt water) can be added to the still. While per still output is low, they are an important technique if water is in short supply

Other forms of distillation require a concentrated heat source to boil water which is then condensed. Simple stills use a coiling coil to return this heat to the environment. These can be improvised with a boiler and tight fitting lid and some copper tubing (Avoid using lead soldered tubing if possible). FEMA suggests that, in an emergency, a hand towel can be used to collect steam above a container of boiling water. More efficient distillations plants use a vapor compression cycle where the water is boiled off at atmospheric pressure, the steam is compressed, and the condenser condenses the steam above the boiling point of the water in the boiler, returning the heat of fusion to the boiling water. The hot condensed water is run through a second heat exchanger which heats up the water feeding into the boiler. These plants normally use an internal combustion engine to run the compressor. Waste heat from the engine, including the exhaust, is used to start the process and make up any heat loss. This is the method used in most

commercial and military desalinization plants

Inflatable solar stills are available from marine supply stores, but avoid the WW2 surplus models, as those who have used them have had a extremely high failure rate. Even new inflatable solar stills may only produce from 30-16 oz under actual conditions, compared to a rating of 48 oz/day under optimum conditions.

Jade Mountain also offers the following portable models in travel cases:

Traveler (WC106) 1 gpd, 23 lb., 24x26x10 folded \$ 695

Base Camp (WC107) 2 gpd, 51 lb., 48x48x4 folded \$ 895

Safari (WC108) 48x48x5 \$1095 A ruggedized version of the Base Camp above.

Microfilters

Microfilters are small-scale filters designed to remove cysts, suspended solids, protozoa, and in some cases bacteria from water. Most filters use a ceramic or fiber element that can be cleaned to restore performance as the units are used. Most units and almost all made for camping use a hand pump to force the water through the filter. Others use gravity, either by placing the water to be filtered above the filter (e.g. the Katadyn drip filter), or by placing the filter in the water, and running a siphon hose to a collection vessel located below the filter (e.g. Katadyn siphon filter). Microfilters are the only method, other than boiling, to remove Cryptosporidia. Microfilters do not remove viruses, which many experts do not consider to be a problem in North America. Despite this the Katadyn microfilter has seen considerable use around the world by NATO-member militaries, WHO, UNHCR, and other aid organizations. Microfilters share a problem with charcoal filter in having bacteria grow on the filter medium. Some handle this by impregnating the filter element with silver such as the Katadyn, others advise against storage of a filter element after it has been used. The Sweetwater Guardian suggests using a freezer for short-term storage

Many microfilters may include silt prefilters, activated charcoal stages, or an iodine resin. Most filters come with a stainless steel prefilter, but other purchased or improvised filters can be added to reduce the loading on the main filter element. ***Allowing time for solids to settle, and/or prefiltering with a coffee filter will also extend***

filter life. Iodine matrix filters will kill viruses that will pass through the filter, and if a charcoal stage is used it will remove much of the iodine from the water. Charcoal filters will also remove other dissolved natural or manmade contaminants. Both the iodine and the charcoal stages do not indicate when they reach their useful life, which is much shorter than the filter element. If you are depending on the stage for filtering the water you will have to keep up with how much water passes through it.

New designs seem to be coming out every month. The best selling brands seem to be the PUR, and Sweetwater Guardian. The Katadyn doesn't sell as well to outdoor enthusiasts due to its high cost, but for years it was state of the art for water purification and still has a loyal following, especially among professionals in relief work. Below is the data on a few of the more common units, for an excellent field test of some common units, see the December 96 issue of Backpacker magazine.

Note that the first price is for the filter, the second for the replacement filter. The weight is from manufacturer's literature if it was not listed in the Backpacker article. Filter life is from manufacturer's literature and should be taken with a grain of salt.

[Alan's note: These prices are now several years out of date. You'll need to investigate current pricing]

Basic Designs Ceramic Filter Pump (\$29/\$15, 8 oz.) Cheap flimsy filter, claimed to filter up to 500 gallons with a 0.9 μ m ceramic filter. Not EPA rated, may not have passed independent lab tests, prone to damage, filter element must be submerged in water.

General Ecology- First Need Deluxe (\$70/\$30, 20 oz) This filter uses a structured matrix micro strainer, though General Ecology won't reveal what the structure is. It has survived independent lab tests, and filters particles to 4 μ m, while actually removing viruses (the only filter capable of doing this) through electrostatic attraction. The filter cartridges can't be cleaned (other than by back flushing), but are good for 100 gallons. Pump design isn't the best. Other models are available from the manufacturer.

Katadyn PF (\$295/\$145, 22.7 oz). The original microfilter using a 0.2 μ m silver impregnated ceramic candle. An extremely thick filter allows it to be cleaned many times for up to 14,000 gallons capacity. While the Katadyn seems well made, one reader of this list reported breaking the candle, and Backpacker Magazine broke the

case during a field test. The pump, while probably indestructible, is somewhat slow and hard to use, requiring 20 lbs. of force on a small handle. The PF also lacks a output hose as the Katadyn engineers felt it would be a source of contamination.

Katadyn Combi (\$185/\$75 (ceramic)/\$19 (carbon), 29 oz) A cheaper version of the PF incorporating both ceramic and carbon stages. Much faster filter than the PF.

Katadyn Minifilter (\$139/\$59, 8.3 oz) A smaller and cheaper version of the PF, easier to pump, but generally not well received. Good for 200 gallons.

Katadyn Expedition (\$680/\$77, 13 lb.) Similar filter to the PF (exact same cartridge as the Drip Filter Below), but designed for much higher production, stainless steel case with spade type D handle, produces 0.75 gpm. Filter good for 26,000 gallons.

Katadyn Drip Style Filter (\$240, \$77, 12.5 lb.) Filter elements similar to those in the PF are mounted vertically in top 3 gallon plastic bucket, water drips through filters into second 3 gallon bucket with faucet. 1 qt, per hour with the 2 filters included, a third filter can be added to increase rate 50%. Each filter good for 13,000 gallons. The mounting hardware for the filters is available for \$10 to allow you to make your own filter of what ever size is needed. Each mounting kit requires a 1/2" hole in the bottom of the raw water container.

Katadyn Siphon Filter (\$92, 2 lb.) Similar design to PF filter element, but a siphon hose replaces the pump, filters 1-2 quarts per hour (allow 1 hour for the filter to "prime" itself via capillary action), but multiple filters can be used in the same container. Collection vessel must be lower than raw water container. Good for 13,000 gallons.

MSR Miniworks (\$59/\$30, 14 oz) MSR's smaller filter, using a 0.3 μ m ceramic element. Pump is well designed, and easy to use. Main drawback is that the clean water discharge is from the bottom of the filter, and no hose is provided. While the bottom is threaded for a Nalgene bottle, it is a pain in the butt to fill a canteen or 2 liter bottle. Claimed to filter 100 gallons, Backpacker Magazine feels this may be one of the few filters without a grossly inflated rating.

MSR Waterworks (\$140/\$30/\$30, 17 oz) MSR's first filter with a 0.2 μ ceramic and membrane stage and a carbon stage. Other wise similar to the Miniworks.

PUR Pioneer (\$30/\$4, 8 oz), newly introduced low-end

microfilter. 0.5 µm, 1 lpm filter rate, 12 gallon capacity

PUR Hiker (\$50/\$20, 12 oz) PUR's microfilter only design, filters to .5 µm. Well liked, as are the other PUR filters. Very compact. 200 gallon capacity

PUR Scout (\$70/\$35/\$15, 12 oz) Combines a iodine resin stage, a 1.0 µm filter, and a activated charcoal filter. 200 gallon capacity

PUR Explorer (\$130/\$45, 22 oz) PUR's top of the line model. Bulky, but well made, with a high output (1.4 lpm, faster than any of the hand held models listed and one of the easiest to pump) Has a 1.0 µm filter plus a iodine resin stage, 300 gallon capacity

Sweetwater Walkabout (\$35/\$13, 8.5 oz.) Sweetwater's low end filter, 0.2 µm, .7 lpm, 100 gal capacity

Sweetwater Guardian (\$60/\$20, 11 oz) Uses a glass fiber and carbon filter, filters to .2 µm, claimed to last for 200 gallons. An iodine resin stage can be added that will kill viruses, and will last for 90 gallons. Pump is well designed, but it takes a few seconds to pull a captive pin to fold for storage. Available in white or OD.

Timberline Eagle (\$20/\$13, 8 oz) At 1 µm, this filter only does protozoa, but is much easier to pump, lighter, and cheaper. Filter is attached to pump, and must rest (but doesn't have to be submerged) in water to be purified. Looks flimsy, but seems to hold up. Claimed to last for 100 gallons.

It is also possible to build your own microfilter using **diatomaceous earth**, sold for swimming pool filters (DE). Usually pressure is required to achieve a reasonable flow rate. A DE filter will remove turbidity as well as pathogens larger than 1 µm.

[Alan's note: This type of diatomaceous earth is **NOT** the type you want for food storage. Don't get them confused.

Slow Sand Filter

Slow sand filters pass water slowly through a bed of sand. Pathogens and turbidity are removed by natural die-off, biological action, and filtering. Typically the filter will consist of 24 inches of sand, then a gravel layer in which the drain pipe is embedded. The gravel doesn't touch the walls of the filter so that water can't run quickly down the wall of the filter and into the gravel. Building the walls with a rough surface also helps. A typical loading rate for the filter is 0.2 meters/hour day (the same as .2 m³/m² of surface area). The filter can be cleaned several times before the sand has to be

replaced.

Slow sand filter construction information:

Slow sand filters should only be used for continuous water treatment. If a continuous supply of raw water can't be insured (say using a holding tank), then another method should be chosen. It is also important for the water to have as low turbidity (suspended solids) as possible. Turbidity can be reduced by changing the method of collection (for example, building an infiltration gallery, rather than taking water directly from a creek), allowing time for the material to settle out (using a raw water tank), prefiltering or flocculation (adding a chemical such as alum to cause the suspended material to floc together.)

The SSF filter itself is a large box, at least 1.5 meters high. The walls should be as rough as possible to reduce the tendency for water to run down the walls of the filter, bypassing the sand. The bottom layer of the filter is a gravel bed in which a slotted pipe is placed to drain off the filtered water. The slots or the gravel should be no closer than 20 cm to the walls. again to prevent the water from bypassing the sand.

The sand for a SSF needs to be clean and uniform, and of the correct size. The sand can be cleaned in clean running water, even if it is in a creek. The ideal specs on sand are effective size (sieve size through which 10% of the sand passes) between 0.15 and 0.35 mm, uniformity coefficient (ratio of sieve sizes through which 60% pass and through which 10% pass) of less than 3, Maximum size of 3 mm, and minimum size of 0.1 mm.

The sand is added to a SSF to a minimum depth of 0.6 meters. Additional thickness will allow more cleanings before the sand must be replaced. 0.3 to 0.5 meters of extra sand will allow the filter to work for 3-4 years. An improved design uses a **geotextile** layer on top of the sand to reduce the frequency of cleaning. The outlet of a SSF must be above the sand level, and below the water level. The water must be maintained at a constant level to insure an even flow rate throughout the filter. The flow rate can be increased by lowering the outlet pipe, or increasing the water level. One common idea for maintaining the water level is to use a elevated raw water tank or pump, and a ball valve from a toilet.

While the SSF will begin to work at once, optimum treatment for pathogens will take a week or more. During this time the water should be chlorinated if at all possible (iodine can be substituted). After the filter has stabilized,

the water should be safe to drink, but chlorinating of the output is still a good idea, particularly to prevent recontamination.

As the flow rate slows down the filter will have to be cleaned by draining and removing the top few inches of sand. If a geotextile filter is used, only the top ½" may have to be removed. As the filter is refilled, it will take a few days for the biological processes to reestablish themselves.

Activated Charcoal Filter

Activated charcoal filters water through adsorption, chemicals and some heavy metals are attracted to the surface of the charcoal, and are attached to it. Charcoal filters will filter some pathogens though they will quickly use up the filter adsorptive ability, and can even contribute to contamination as the charcoal provides an excellent breeding ground for bacteria and algae. Some charcoal filters are available impregnated with silver to prevent this, though current research concludes that the bacteria growing on the filter are harmless, even if the water wasn't disinfected before contacting the filter. The only filter I know of that uses only activated charcoal, and doesn't require pressurized water is the Water Washer (\$59). Available from the Survival Center.

Activated charcoal can be used in conjunction with chemical treatment. The chemical (iodine or chlorine) will kill the pathogens, while the carbon filter will remove the treatment chemicals. In this case, as the filter reaches its capacity, a distinctive chlorine or iodine taste will be noted.

Activated charcoal can be made at home, though the product will be of varying quality compared to commercial products. Either purchased or homemade charcoal can be recycled by burning off the molecules adsorbed by the carbon (This won't work with heavy metals of course.)

The more activated charcoal in a filter, the longer it will last. The bed of carbon must be deep enough for adequate contact with the water. Production designs use granulated activated charcoal (effective size of 0.6 to 0.9 mm for maximum flow rate. Home or field models can also use a compressed carbon block or powered activated charcoal (effective size 0.01) to increase contact area. Powered charcoal can also be mixed with water and filtered out later. As far as life of the filter is concerned, carbon block filters will last the longest for a given size, simply due to their greater mass of carbon. A source of pressure is usually needed with carbon block filters to achieve a reasonable

flow rate.

Sol-Air Water Treatment

If sufficient dissolved oxygen is available, sunlight will cause the temporary formation of reactive forms of oxygen such as hydrogen peroxide and oxygen free radicals. This form of water treatment is called **solar photooxidative disinfection** or sol-air water treatment. Sol-Air water treatment has been shown to dramatically reduce the level of fecal coliform bacteria. There is some evidence that other bacteria and viruses may be affected also. While not as reliable as other methods, it does offer a low-tech solution in emergencies. Sol-Air treatment requires bright sunlight, and has been shown to be effective when ever the sun causes a distinct shadow to be cast. Exposure to 4.5 hours of bright sunlight has been shown to cause a thousand fold reduction in fecal coliforms in lab tests.

In order for Sol-Air to be effective, oxygen must be present. Experiments have shown that shaking a bottle filled 3/4 with air will restore oxygen levels to near saturation. As the treatment continues, some of the oxygen will come out of solution, while other oxygen will be consumed by the killed pathogens, so the shaking should be repeated every few hours. Data shows that maximum activity occurs when the water temperature is above 50° C (122° F), so this method may be unsuitable in colder climates unless special solar collectors are used.

Either glass or plastic bottles may be used. Plastic bottles will allow short wave ultraviolet radiation to pass, increasing the rate of microbial inactivation, but may yellow with age, reducing light transmission, and may leach plasticizers into the water at the elevated temperatures that will occur. The leaching of plasticizers can be reduced by using bottles of PET (polyethylene terephthalate) rather than PVC. Glass bottles on the other hand are more durable. Research has used bottles with 2 liters of capacity, but if the water is free of turbidity, larger containers can be used. Plastic bags, or some sort of flat glass container represent the ideal container as this maximizes the solar energy received per ounce of water.

Bottles should be filled 3/4 full in the early morning with water as free of turbidity as possible. After capping the bottles should be shaken vigorously for a few minutes then placed upright in the sun, where they will be not be shaded later in the day. The shaking should be repeated at least three times during the day. At the end of the day the water should be reasonably freed of bacteria, though it is most practical to let the water cool for consumption the following day. Each day a new batch should be treated due to the lack of a residual disinfected.

After consumption of the water the bottle should be air dried to prevent algae growth with continual use.

Improvised Mechanical Filter

If the materials aren't available to build a slow sand filter, or some other means of water treatment is preferred, it may still be advantageous to mechanically filter the water before treating it with chemicals or passing through a microfilter. Generally the idea is to allow the water to flow as slowly as possible through a bed of sand. In a municipal water treatment plant this is called a rapid sand filter. The particular design below is included, because the designer, a research engineer at Oak Ridge National Laboratories, found it particularly effective at removing fallout from water. The filter will do little or nothing to remove pathogens, though removing suspended solids allows other water treatment methods to work more effectively.

Expedient water filter, from *Nuclear War Survival Skills*, Cresson Kearny, ORNL

1) Perforate the bottom of a 5 gallon bucket, or similar container with a dozen nail holes even spread over a 4" diameter circle in the center of the container.

2) Place a 1.5" layer of small stones or pebbles in the bottom of the can. If pebbles aren't available, marbles, clean bottle caps, twisted coat hangers or clean twigs can be used.

3) Cover the pebbles with one thickness of terrycloth towel, burlap sackcloth, or other porous cloth. Curl the cloth in a roughly circular shape about three inches larger than the diameter of the can.

4) Take soil containing some clay (pure clay isn't porous enough, pure sand is too porous) from at least 4" below the surface of the ground (nearly all fallout particles remain near the surface except after disposition on sand or gravel.)

5) Pulverize the soil, then gently press it in layers over the cloth that covers the pebbles, so that the cloth is held snugly against the walls of the can. The soil should be 6-7" thick.

6) Completely cover the surface of the soil layer with one thickness of fabric as porous as a bath towel. This is to keep the soil from being eroded as water is being poured into the filter. A dozen small stones placed on the cloth near its edges will secure it adequately.

7) Support the filter on rocks or sticks placed across the top of a container that is larger than the filter can (such as a dishpan)

The contaminated water should be poured into the filter can, preferably after allowing it to settle as described below. The filtered water should be disinfected by some method.

If the 6 or 7 inches of filtering soil is a sandy clay loam, the filter will initially deliver about 6 quarts/hour. If the filter is any faster than this then the fabric layer needs to be removed and the soil compressed more. The filtering rate will drop over time as the filter begins to clog up. When this happens the top 1/2" of soil can be removed to increase the filtering rate. After 50 or so quarts, the filter will need to be rebuilt with fresh soil.

As with any filter, optimum performance will be achieved if sediment in the water will be allowed to settle out before passing the water through the filter

If the water is contaminated with fallout, clay can be added to help the fallout particles to settle out. The procedure is as follows:

Fill a bucket or other deep container 3/4 full with contaminated water.

Dig pulverized clay or clayey soil from a depth of four or more inches below ground surface and stir it into the water.

Use about 1 inch of dry clay or clayey soil for every 4" depth of water. Stir until practically all of the clay particles are suspended in the water.

Let the clay settle for at least 6 hours. This will carry the fallout particles to the bottom and cover them. Carefully dip out or siphon the clear water and disinfect it.

Chemical Treatment

Chlorine: Chlorine is familiar to most Americans as it is used to treat virtually all municipal water systems in the United States. For a long time chlorine, in the form of Halazone tablets, was used to purify small batches of water for campers and military troops. Later questions emerged about the effectiveness of Halazone, and in 1989, Abbot labs pulled it off the market. If Halazone tablets are encountered outside the US, the nominal shelf life is 6 months, and the dosage is 2 tabs per liter. Until recently,

there was no chlorine product designed for wilderness/survival use available in the US.

Chlorine has a number of problems when used for field treatment of water. When chlorine reacts with organic material, it attaches itself to nitrogen containing compounds (ammonium ions and amino acids), leaving less free chlorine to continue disinfection. Carcinogenic trihalomethanes are also produced, though this is only a problem with long-term exposure. Trihalomethanes can also be filtered out with a charcoal filter, though it is more efficient to use the same filter to remove organics before the water is chlorinated. ***Unless free chlorine is measured, disinfection can not be guaranteed with moderate doses of chlorine.*** One solution is superchlorination, the addition of far more chlorine than is needed. This must again be filtered through activated charcoal to remove the large amounts of chlorine, or hydrogen peroxide can be added to drive the chlorine off. Either way there is no residual chlorine left to prevent recontamination. This isn't a problem if the water is to be used at once.

Chlorine is sensitive to both the pH and temperature of the treated water. Temperature slows the reaction for any chemical treatment, but chlorine treatment is particularly susceptible to variations in the pH as at lower pHs, hypochlorous acid is formed, while at higher pHs, it will tend to dissociate into hydrogen and chlorite ions, which are less effective as a disinfectant. As a result, chlorine effectiveness drops off when the pH is greater than 8.

Chlorine, like iodine, will not kill Cryptosporidia.

Methods of chlorine treatment:

Bleach: Ordinary household bleach (such as Clorox) in the US contains 5.25% sodium hypochlorite (NaOCL) and can be used to purify water if it contains no other active ingredients, scents, or colorings. Bleach is far from an ideal source due to its bulkiness (only 5% active ingredient), and the instability over time of the chlorine content in bleach. Chlorine loss is further increased by agitation or exposure to air. One source claims chlorine loss from a 5% solution at 10% over 6 months if stored at 70° F. Nevertheless, this may be the only chemical means available to purify water, and it is far better than nothing. Normal dosage is 8 drops (0.4 ml) per gallon. Allow the treated water to sit for 30 min., and if there isn't a slight chlorine smell, retreat. ***Note:*** USP standard medicine droppers are designed to dispense 0.045-0.055 ml per

drop. Use of other solvents or some chemicals can change this. The dropper can be calibrated against a graduated cylinder for greater accuracy.

Some small treatment plants in Africa produce their own sodium hypochlorite on site from the electrolysis of brine. Power demands range from 1.7 to 4 kWh per lb. of NaOCL. 2 to 3.5 lbs. of salt are needed for each pound of NaOCL. These units are fairly simple and are made in both the US and the UK. Another system, designed for China, where the suitable raw materials were mined or manufactured locally, used a reaction between salt, manganese dioxide, and sulfuric acid to produce chlorine gas. The gas was then allowed to react with slaked lime to produce a bleaching powder that could then be used to treat water. A heat source is required to speed the reaction up.

AquaCure: Designed for the South African military, these tablets contain chlorine and alum. The alum causes the suspended solids to flocculate and the chlorine adds 8 PPM chlorine. This is a great way to treat turbid water, though it will leave a lot of chlorine in clear water (The one tablet/liter could be halved for clear water.)

The US distributor for Aqua Cure is:

Safesport Manufacturing, Box 11811, Denver, CO 80211
1 800 433 6506

Bleaching Powder (Chlorinated Lime): Can also be purchased and used as a purification means if nothing else is available. Bleaching powder is 33-37% chlorine when produced, but loses its chlorine rapidly, particularly when exposed to air, light or moisture.

Calcium Hypochlorite: Also known as High Test Hypochlorite (HTH). Supplied in crystal form, it is nearly 70% available chlorine. One product, the Sanitizer (formally the Sierra Water Purifier) uses these crystals to superchlorinate the water to insure pathogens were killed off, then hydrogen peroxide is added to drive off the residual chlorine. This is the most effective method of field chlorine treatment. The US military and most aid agencies also use HTH to treat their water, though a test kit, rather than superchlorination, is used to insure enough chlorine is added. This is preferable for large-scale systems as the residual chlorine will prevent recontamination.

Usually bulk water treatment plants first dilute to HTH to make a 1% working solution at the rate of 14g HTH per liter of water. ***While testing to determine exact chlorine needs***

are preferable, the solution can be used at the dose rate of 8 drops/gallon, or for larger quantities, 1 part of 1% solution to 10,000 parts clear water. Either of these doses will result in 1 PPM chlorine and may need to be increased if the water wasn't already filtered by other means.

When test kits are available, the WHO standard is a residual chlorine level of 0.2 to 0.5 mg/l after a 30 min. contact time. The may require as much as 5 mg/l of chlorine to be added to the raw water.

Iodine: Iodine's use as a water purification method emerged after WW2, when the US military was looking for a replacement for Halazone tablets. ***Iodine was found to be in many ways superior to chlorine for use in treating small batches of water.*** Iodine is less sensitive to the pH and organic content of water, and is effective in lower doses. Some individuals are allergic to iodine, and there is some question about long term use of iodine. The safety of long-term exposure to low levels of iodine was proven when inmates of three Florida prisons were given water disinfected with 0.5 to 1.0 PPM iodine for 15 years. No effects on the health or thyroid function of previously healthy inmates was observed. Of 101 infants born to prisoners drinking the water for 122-270 days, none showed detectable thyroid enlargement. However 4 individuals with preexisting cases of hyperthyroidism became more symptomatic while consuming the water.

Nevertheless experts are reluctant to recommend iodine for long term use. Average American iodine intake is estimated at 0.24 to 0.74 mg/day, higher than the RDA of 0.4 mg/day. Due to a recent National Academy of Science recommendation that iodine consumption be reduced to the RDA, the EPA discourages the use of iodized salt in areas where iodine is used to treat drinking water.

Iodine is normally used in doses of 8 PPM to treat clear water for a 10 minute contact time. The effectiveness of this dose has been shown in numerous studies. ***Cloudy water needs twice as much iodine or twice as much contact time.*** In cold water (Below 41° F or 5° C) the dose or time must also be doubled. In any case doubling the treatment time will allow the use of half as much iodine

These doses are calculated to remove all pathogens (other than cryptosporida) from the water. Of these, giardia cysts are the hardest to kill, and are what requires the high level of iodine. If the cysts are filtered out with a microfilter (any model will do since the cysts are 6 µm), only 0.5 PPM is needed to treat the resulting water.

Water treated with iodine can have any objectionable taste removed by treating the water with vitamin C (ascorbic acid), ***but it must be added after the water has stood for the correct treatment time.*** Flavored beverages containing vitamin C will accomplish the same thing. Sodium thiosulfate can also be used to combine with free iodine, and either of these chemicals will also help remove the taste of chlorine as well. Usually elemental iodine can't be tasted below 1 PPM, and below 2 PPM the taste isn't objectionable. Iodine ions have an even higher taste threshold of 5 PPM. Note that removing the iodine taste does not reduce the dose of iodine ingested by the body.

Sources of Iodine:

Tincture of Iodine: USP tincture of iodine contains 2% iodine and 2.4% sodium iodide dissolved in 50% ethyl alcohol. For water purification use, the sodium iodide has no purification effect, but contributes to the total iodine dose. Thus it is not a preferred source of iodine, but can be used if other sources are not available. 0.4 cc's (or 8 drops) of USP tincture (2% iodine) added to a liter of water will give the 8 mg/l (same as 8 PPM). If the iodine tincture isn't compounded to USP specs, then you will have to calculate an equal dose based on the iodine concentration.

Lugol's solution: Contains 5% iodine and 10% potassium iodide. 0.15 cc (3 drops) can be added per liter of water, but 3 times more iodine is consumed compared to sources without iodide.

Betadyne (povidone iodine): Some have recommended 8 drops of 10% povidone iodine per liter of water as a water treatment method, claiming that at low concentrations povidone iodine can be regarded as a solution of iodine. One study indicated that at 1:10,000 dilution (2 drops/liter), there was 2 PPM iodine, while another study resulted in conflicting results. However, at 8 drops/liter, there is little doubt that there is an antimicrobial effect. The manufacturer hasn't spent the money on testing this product against EPA standard tests, but in other countries it has been sold for use in field water treatment.

Kahn-Vassher solution: By adding a sufficient amount of iodine crystals to a small bottle, an almost unlimited supply of saturated iodine solution can be produced. As long as crystals remain in the bottle, the solution is saturated. Concentration of the iodine is dependent of temperature, either condition at ambient temperature can be assumed,

or commercial models such as Polar Pure incorporate a liquid crystal thermometer to determine dose.

One criticism of this method is the chance of decanting iodine crystals into the water being treated. This isn't that much of a problem as iodine is very weakly toxic, but the Polar Pure incorporates a collar into the neck of the bottle to help prevent this. Another disadvantage to this method is that the saturated iodine solution must be kept in glass bottles, and is subject to freezing, but this is hardly an insurmountable problem. Freezing, of course, doesn't affect the crystals.

This is the method I use, but I do use the commercial Polar Pure bottle, and refill it as necessary with USP crystals. During a crisis, or extended camping trips I would microfilter the water first, so a much lower dose of iodine is needed.

With the Polar Pure bottle, dosage information is provided. Otherwise a 1 oz bottle can be used to carry the solution. The bottle is filled with water after use. At the next use, 1/2 of the supernate (15 cc) is poured off into a liter of water. At 68° F, this will yield a dose of 9 mg/l. To use this method with a microfilter to get a 0.5 PPM concentration, either large batches of water need to be treated (1/2 oz to 4.5 gallons would be 0.5 PPM), or a TB syringe or medicine dropper can be used to measure doses. A USP medicine dropper should give 20 drops per ml.

Iodine can also be dissolved in alcohol to make a solution of known concentration. I am not aware of any commercial products, but a pharmacy could compound one for you, or you could do it your self. One suggested formula is 8g iodine/100 cc ethyl alcohol which yields enough solution to disinfect 250 gallons of water. At the rate of 0.1 cc (2 drops)/liter to give a concentration of 8 mg/l.

Tetraglycine hydroperiodide (e.g. Potable Aqua): This is the form of iodine used by the US military for field treatment of water in canteen sized batches. Usual dose in one tablet per quart of water to give a concentration of 8 mg/l. Two tablets are used in cloudy or cold water or contact time is doubled. ***The major downside of this product is that the product will lose its iodine rapidly when exposed to the air.*** According to the manufacturer, they have a near indefinite life when sealed in the original bottle, but probably should be discarded within a few months of opening. The tablets will change color from gun metal gray to brown as they lose the iodine, and you should see a brown tint to the water after treating.

Iodine Resin Filter: Some commercial microfilters incorporate an iodine resin stage to kill viruses and bacteria, without putting as much iodine in the water as if it had been added to the raw water. A few products rely exclusively on an iodine resin stage. Downside of these filters are their fragile nature, dependency of effectiveness on flow rate and the inability to identify when they need to be discarded. If you are going to use one where the water is known to be contaminated with viruses, then one of the better known brands such as the PUR or Sweetwater Viraguard is recommended. More than one pass through the filter may be necessary in cold weather.

Resins do have the advantage of producing less iodine in the water for the same antimicrobial effect as for the most part, they only release iodine when contacted by a microbe. The downside is that physical contact between the microbe and the resin is needed.

Silver: Silver has been suggested by some for water treatment and may still be available outside the US. Its use is currently out of favor due to the EPA's establishment of a 50 ppb MCL (Maximum Contaminate Level) limit on silver in drinking water. This limit is set to avoid ***argyrosis***, a cosmetic blue/gray staining of the skin, eyes, and mucous membranes. As the disease requires a net accumulation of 1 g of silver in the body, one expert calculated that you could drink water treated at 50 ppb for 27 years before accumulating 1 g. Silver has only been proven to be effective against bacteria and protozoan cysts, though it is quite likely also effective against viruses.

Silver can be used in the form of a silver salt, commonly silver nitrate, a colloidal suspension, or a bed of metallic silver. Electrolysis can also be used to add metallic silver to a solution.

Some evidence has suggested that silver deposited on carbon block filters can kill pathogens without adding as much silver to the water.

Katadyn markets a silver based water treatment product called Micropur. The manufacturer recommends a 2 hr contact time at a dose of 1 tab per liter and states the product is "For the disinfection and storage of clear water. Reliably kills bacterial agents of enteric diseases, but not worm eggs, ameba, or viruses. Neutral to taste... insure protection against reinfection for 1-6 months."; The following forms are available:

Micropur Tablets

MT1 1 tablets/qt 25 gal MT2 1
tablet/5qts 62.5 gal

Micropur Fluid

MF 75 10 drops/gal 75 gals MF250
10 drops/gal 250 gals

Micropur Crystal

MC250 1 packet/gal 250 gal MC
2500 1 spoon/25 gal 2500 gal
MC12500 1 spoon/250 gal 12500
gal

Potassium Permanganate: Potassium Permanganate is no longer commonly used in the developed world to kill pathogens. It is much weaker than the alternatives, more expensive, and leaves a objectionable pink or brown color. If it must be used, 1 gram per liter would probably be sufficient against bacteria and viruses (no data is available on it effectiveness against protozoan cysts).

Hydrogen Peroxide: Hydrogen Peroxide can be used to purify water if nothing else is available. Studies have shown of 99 percent inactivation of poliovirus in 6 hr with 0.3 percent hydrogen peroxide and a 99% inactivation of rhinovirus with a 1.5% solution in 24 minutes. Hydrogen Peroxide is more effective against bacteria, though Fe^{+2} or Cu^{+2} needs to be present as a catalyst to get a reasonable concentration-time product.

Coagulation/Flocculation agents: While flocculation doesn't kill pathogens, it will reduce their levels along with removing particles that could shield the pathogens from chemical or thermal destruction, and organic matter that could tie up chlorine added for purification. 60-98% of coliform bacteria, 65-99% of viruses, and 60-90% of giardia will be removed from the water, along with organic matter and heavy metals.

Some of the advantages of coagulation/flocculation can be obtained by allowing the particles to settle out of the water with time (sedimentation), but it will take a while for them to do so. Adding coagulation chemicals such as alum will increase the rate at which the suspended particles settle out by combining many smaller particles into larger floc which will settle out faster. The usual dose for alum is 10-30 mg/liter of water. This dose must be rapidly mixed with the water, then the water must be agitated for 5 minutes to encourage the particles to form flocs. After this at least 30 minutes of settling time is need for the flocs to fall to the bottom, and them the

clear water above the flocs may be poured off. Most of the flocculation agent is removed with the floc, nevertheless some question the safety of using alum due to the toxicity of the aluminum in it. There is little to no scientific evidence to back this up. Virtually all municipal plants in the US dose the water with alum.

In bulk water treatment, the alum dose can be varied until the idea dose is found. The needed dose varies with the pH of the water and the size of the particles. Increase turbidity makes the flocs easier to produce not harder, due to the increased number of collisions between particles.

Treatments requiring electricity:

Ozone: Ozone is used extensively in Europe to purify water. Ozone, a molecule composed of 3 atoms of oxygen rather than two, is formed by exposing air or oxygen to a high voltage electric arc. Ozone is much more effective as a disinfectant than chlorine, but no residual levels of disinfectant exist after ozone turns back into O_2 . (one source quotes a half life of only 120 minutes in distilled water at 20° C). Ozone is expected to see increased use in the US as a way to avoid the production of trihalomethanes. While ozone does break down organic molecules, sometimes this can be a disadvantage as ozone treatment can produce higher levels of smaller molecules that provide an energy source for microorganisms. If no residual disinfectant is present (as would happen if ozone were used as the only treatment method), these microorganisms will cause the water quality to deteriorate in storage.

Ozone also changes the surface charges of dissolved organics and colloiddially suspended particles. This causes microfloculation of the dissolved organics and coagulation of the colloidal particles.

UV light: Ultraviolet light has been known to kill pathogens for a long time. A low pressure mercury bulb emits between 30 to 90 % of its energy at a wave length of 253.7 nm, right in the middle of the UV band. If water is exposed to enough light, pathogens will be killed. The problem is that some pathogens are hundreds of times less sensitive to UV light than others. The least sensitive pathogens to UV are protozoan cysts. Several studies show that Giardia will not be destroyed by many commercial UV treatment units. Fortunately these are the easiest pathogens to filter out with a mechanical filter.

The efficacy of UV treatment is very dependent on the

turbidity of the water. The more opaque the water is, the less light that will be transmitted through it. The treatment units must be run at the designed flow rate to insure sufficient exposure, as well as insure turbulent flow rather than plug flow.

Another problem with UV treatment is that the damage done to the pathogens with UV light can be reversed if the water is exposed to visible light (specifically 330-500 nm) through a process known as photoreactivation.

UV treatment, like ozone or mechanical filtering leaves no residual component in the water to insure its continued disinfection. Any purchased UV filter should be checked to insure it at least complies with the 1966 HEW standard of 16 mW.s/cm² with a maximum water depth of 7.5 cm. ANSI/NSF require 38 mWs/cm² for primary water treatment systems. This level was chosen to give better than 3 log (99.9%) inactivation of *Bacillus subtilis*. This level is of little use against *Giardia*, and of no use against *Crypto*.

The US EPA explored UV light for small scale water treatment plants and found it compared unfavorably with chlorine due to 1) higher costs, 2) lower reliability, and 3) lack of a residual disinfectant.

since it claims that it destroys heavy metals and pathogens without filtering them.

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Questionable or Dangerous methods of water treatment

Aerobic 07: Also sold as Aerobic Oxygen. The company refuses to release the disinfectant. It maybe chlorine dioxide, a well known, if somewhat unstable, disinfectant. The company has shown company sponsored tests showing effectiveness against viruses and bacteria (but not against *Giardia*). No independent testing has been performed, nor has anybody provided concentration-time data for the product.

Survival Straw: This product claims to destroy and eliminate impurities including bacteria, protozoa, fungi, chemicals and heavy metals using a matrix of metal alloy. The manufacturer claims the product's media meets EPA and FDA specs, which is no indication of the filter's effectiveness. The filter violates a number of laws of physics

Long Term Storage MASTER FOOD LIST

___ 6 GRAIN PANCAKE MIX
 ___ 6 WAY ROLLED GRAIN, 6 TYPES OF GRAIN
 ___ 9 GRAIN CRACKED CEREAL
 ___ ALFALFA FOR SPROUTING
 ___ ALFALFA, POWDER
 ___ ALFALFA, CUT
 ___ Almonds, Raw
 ___ ALLSPICE (JAMAICAN) POWDER
 ___ ALLSPICE (JAMAICAN) WHOLE
 ___ Amaranth, Organic
 ___ ANISE (STAR), WHOLE
 ___ ANISE SEED, WHOLE
 ___ APPLE FLAKES, PEACH FLAVOR, DEHYDRATED
 ___ APPLE FLAKES, STRAWBERRY FLAVOR
 ___ APPLE SLICES,
 ___ APPLESAUCE, DEHYDRATED
 ___ ARROWROOT POWDER
 ___ BAKING POWDER,
 ___ BAKING SODA,
 ___ BANANA SLICES, DEHYDRATED,
 ___ BARBECUE SPICE BLEND - GROUND
 ___ BARLEY FLAKES
 ___ BARLEY FOR SPROUTING
 ___ BARLEY, HULLED,
 ___ Barley, Hulless Waxy
 ___ BARLEY, PEARL
 ___ BASIL (EGYPTIAN) - CUT
 ___ BASIL (SWEET CALIFORNIA), CUT
 ___ BAY LEAVES, CUT
 ___ BAY LEAVES, WHOLE
 ___ BEANS, BLACK, BULK, FREEZE DRIED
 ___ BEANS, 10-BEAN MIX,
 ___ Anasazi Beans
 ___ BEANS, AUZZUKIE
 ___ BEANS, BABY LIMAS,
 ___ BEANS, BLACK EYED,
 ___ BEANS, BLACK TURTLE,
 ___ BEANS, GARBANZO,
 ___ BEANS, GREAT NORTHERN WHITE,
 ___ BEANS, GREEN, DEHYDRATED,
 ___ BEANS, KIDNEY,
 ___ BEANS, LARGE LIMA,
 ___ BEANS, MUNG,
 ___ BEANS, NAVY, BULK, DEHYDRATED,
 ___ BEANS, PINK,
 ___ BEANS, PINTO,
 ___ Refried Beans
 ___ Refried Beans w/corn oil
 ___ BEANS, SMALL RED
 ___ BEANS, SMALL WHITE, NAVY
 ___ BEANS, SOY,
 ___ BEANS, SPROUTING, AUZZUKIE,
 ___ BEANS, SPROUTING, GARBANZO,
 ___ BEANS, SPROUTING, MUNG,

___ BEANS, SPROUTING, SOY,
 ___ BEE POLLEN
 ___ Bouillon, Beef
 ___ Bouillon, Chicken
 ___ BROCCOLI, DEHYDRATED
 ___ BUCK WHEAT, HULLED,
 ___ BURDOCK ROOT CUT
 ___ BUTTER POWDER,
 ___ BUTTERMILK POWDER
 ___ CABBAGE
 ___ CABBAGE SEED,
 ___ CAJUN SPICE BLEND, GROUND
 ___ CAKE MIX, GINGERBREAD (ADD WATER)
 ___ CAKE MIX, BROWNIE (ADD WATER)
 ___ CAKE MIX, CARROT (ADD WATER)
 ___ CAKE MIX, DEVIL'S FOOD
 ___ CAKE MIX, LEMON
 ___ CAKE MIX, POUND CAKE (ADD WATER)
 ___ CAKE MIX, SPICE
 ___ CAKE MIX, SWISS CHOC (ADD WATER)
 ___ CAKE MIX, WHITE
 ___ CAKE MIX, YELLOW
 ___ CAKE, FUNNEL (ADD WATER)
 ___ CARAWAY SEED
 ___ CARDAMOM (DECORTICATED) WHOLE
 ___ CARDAMOM (WHOLE GREEN PODS)
 ___ CARDAMOM (GROUND)
 ___ CAROB (ROASTED), POWDERED
 ___ CARROT DICES, DEHYDRATED,
 ___ CAYENNE (40 HEAT UNIT) DOMESTIC
 ___ CAYENNE (60 HEAT UNIT) IMPORTED
 ___ CAYENNE (90 HEAT UNIT)
 ___ CELERY
 ___ CELERY SEED - GROUND
 ___ CELERY SEED - WHOLE
 ___ CHAMOMILE TEA BAGS
 ___ CHEESE SAUCE, DEHYDRATED, BULK
 ___ CHEESE, CHEDDAR, DEHYDRATED, BAG
 ___ CHIA SEEDS (FOR SPROUTING)
 ___ CHICKWEED
 ___ CHILI BLEND, GROUND
 ___ CHILI PEPPERS, GROUND
 ___ CHILI, CRUSHED
 ___ CHINESE FIVE SPICE,
 ___ CHIVES, CUT
 ___ CHOCOLATE CHIPS, MILK CHOCOLATE
 ___ CHOCOLATE CHIPS, SEMI SWEET
 ___ CILANTRO CUT
 ___ CINNAMON CHIPS, SMALL CUT
 ___ CINNAMON POWDER
 ___ CINNAMON STICKS, 1 INCH,
 ___ CLOVES (SMALL VERY FRAGRANT)
 ___ CLOVES POWDER
 ___ Cocoa Mix
 ___ Cocoa Mix Chocolate Mint Truffle
 ___ Cocoa Mix Mint
 ___ Cocoa Mix, Orange Creme
 ___ COCOA FOR COOKING,
 ___ COCONUT (UNSWEETENED) - MEDIUM
 ___ CORIANDER SEED, GROUND

___ CORIANDER SEED, WHOLE	___ GARLIC GRANULES (CALIFORNIA)
___ CORN MEAL, BAG	___ GARLIC POWDER (DOMESTIC)
___ CORN, SWEET, DEHYDRATED	___ GARLIC MINCED
___ CORN, WHOLE YELLOW, PAPER BAG	___ G EL CAPS -00-
___ Corn, Yellow Grit-hominy polenta	___ GELATIN, CHERRY,
___ CORNSTARCH	___ GELATIN, LEMON,
___ Corn Syrup Solids	___ GELATIN, LIME,
___ CREAM OF TARTAR	___ GELATIN, ORANGE,
___ CUMIN SEED, GROUND	___ GELATIN, PEACH,
___ CUMIN SEED, WHOLE	___ GELATIN, RASPBERRY,
___ CURRY POWDER, HOT BLEND	___ GELATIN, STRAWBERRY,
___ CURRY POWDER, REGULAR BLEND	___ GERMADE,
___ DILL SEED, WHOLE	___ GINGER ROOT PIECES, 1/4 IN PIECES
___ DILL WEED, (DOMESTIC) CUT	___ GINGER ROOT POWDER
___ DOUGH ENHANCER, NATURAL	___ GINSENG POWDER
___ DRESSING, 1000 ISLAND	___ GOTU KOLA POWDER
___ DRESSING, BLEU CHEESE,	___ GRANOLA, 25 LB BAG
___ DRESSING, OUR HOUSE DRESSING	___ GRAVY MIX, BROWN,
___ DRINK BASE, APPLE CIDER, INSTANT,	___ GRAVY MIX, CHICKEN,
___ DRINK MIX, APPLE, DEHYDRATED,	___ GRAVY MIX, TURKEY,
___ DRINK MIX, CHERRY,	___ GRAVY, COUNTRY STYLE,
___ DRINK MIX, Fruit Punch	___ GREEK SEASONING, GROUND
___ DRINK MIX, GRAPE,	___ HERB MIX (SALT SUBSTITUTE)
___ DRINK MIX, HOT CIDER,	___ HONEY, Clover
___ DRINK MIX, LEMONADE,	___ HONEY, Creamy Whipped
___ DRINK MIX, ORANGE,	___ HONEY, COX'S (CREAMED)
___ DRINK MIX, Peach	___ ITALIAN SEASONING, CUT
___ DRINK MIX, PINK LEMONADE,	___ ITALIAN SEASONING, GROUND
___ DRINK MIX, STRAWBERRY,	___ KELP POWDER
___ DRINK MIX. Tofu	___ Kamut
___ DRINK, APPLE, W/FRUIT JUICE	___ LECITHIN GRANULES
___ DRINK, PEACH, DEHYDRATED, BG	___ LEMON GRANULES
___ EGG MIX, DEHYDRATED,	___ LEMON JUICE POWDER (INSTANT)
___ EGG WHITES, DEHYDRATED,	___ LEMON PEEL CUT
___ EGGS, Whole	___ LEMON PEPPER BLEND, GROUND
___ FAJITA SEASONING,	___ LENTILS, 100 LB BAG
___ FENNEL SEED, POWDER	___ LICORICE MINT BLEND (TEA) NO CAFFEINE
___ FENNEL SEED, WHOLE	___ LICORICE ROOT POWDER
___ FENUGREEK SEED, WHOLE	___ LICORICE SPICE BLEND (TEA) CAFFEINE FREE
___ FLAVOR CRYSTALS, MAPLE, NATURAL & ART	___ LICORICE STICKS
___ FLAVOR CRYSTALS, VANILLA, NATURAL & AR	___ MACE, GROUND
___ FLAVOR CRYSTALS, WALNUT, NATURAL & AR	___ Macaroni & Cheese
___ FLAX SEED,	___ MAPLE LEAF
___ FLOUR, ALL PURPOSE,	___ MARGARINE POWDER,
___ FLOUR, BAKERS BLEND high protein	___ MARJORAM, CUT
___ FLOUR, Whole Wheat	___ MEAT TENDERIZER, SEASONED,
___ FLOUR, Whole Wheat Red	___ MEAT TENDERIZER, UNSEASONED,
___ FLOUR, UNBLEACHED,	___ MICROWAVE POPCORN CINCH BUTTER
___ FLOUR, UNBLEACHED, Hard White	___ MILK, INSTANT, NON FAT DRY,
___ FLOUR, UNBLEACHED-Red	___ MILK, REGULAR, NON FAT DRY,
___ FLOUR, UNBLEACHED-White	___ MILLET,
___ FRANKINCENSE	___ MILLET, HULLED,
___ FROSTING MIX, CHOCOLATE	___ MIX, BELGIAN WAFFLE
___ FROSTING MIX, FUDGE	___ MIX, BLUEBERRY MUFFIN
___ FRUCTOSE,	___ MIX, BROWNIE
___ FRUIT BLEND (TASTY TEA) NO CAFFEINE	___ MIX, BUTTERMILK BISCUIT
___ FRUIT BLEND TEA BAG	___ MIX, Cheasecake
___ FRUIT GALAXY, DEHYDRATED BAG	___ MIX, CHOCOLATE CHIP COOKIE
___ FRUIT WHIRLS	___ MIX, COOKIE, CHOCOLATE CHIP
___ GARLIC (DOMESTIC),	___ MIX, Fudge Brownie

___ MIX, Honeywheat Bread & Roll
___ MIX, Scones
___ MIX, WHITE FROSTING,
___ MOLASSES, HOME MADE,
___ MRE, COMPLETE MEAL,
___ MRE, Applesauce
___ MRE, Beef Frankfurters
___ MRE, Beef Ravioli
___ MRE, Beef Steak (chunked & formed)
___ MRE, Beef Teriyaki
___ MRE, Cheese Spread
___ MRE, Cheese Tortellini
___ MRE, Cherry Beverage Powder
___ MRE, Solid Chicken Breast Patties
___ MRE, Chicken Noodle
___ MRE, Chicken Salsa
___ MRE, Chili Macaroni
___ MRE, Chocolate covered cookies
___ MRE, Cocoa
___ MRE, Crackers
___ MRE, Ham Slices
___ MRE, Lemon Pound Cake
___ MRE, Meat Loaf W/Brown Onion Gravy
___ MRE, Mexican Rice
___ MRE, Oatmeal Cookie Bar
___ MRE, Pasta Vegetable
___ MRE, Pasta & Vegetable Alfredo Sauce
___ MRE, Peanut Butter
___ MRE, Pork w/Rice
___ MRE, Pork Chow Mein
___ MRE, Escalloped Potato W/Ham
___ MRE, Potato Sticks
___ MRE, Spaghetti
___ MRE, Grilled Turkey Breast & Potatoes
___ MRE, Turkey Breast & Potatoes
___ MRE, Western Beans
___ MRE, White Rice
___ MUFFIN, BLUEBERRY
___ MUFFIN, CORN,
___ MUNG BEANS (FOR SPROUTING)
___ MUSHROOM SLICES, DEHYDRATED,
___ MUSTARD SEED (BROWN) WHOLE
___ MUSTARD SEED (YELLOW) POWDER
___ MUSTARD SEED (YELLOW) WHOLE
___ MYRRH GUM PCS
___ Noodles, Egg
___ NUTMEG, GROUND
___ NUTMEG, WHOLE
___ OAT BRAN,
___ OAT GROATS,
___ OATS
___ OIL, 100% CANOLA FRYING OIL,
___ ONION, CHOPPED
___ ONION, GRANULES
___ ONION, POWDER, DOMESTIC
___ ORANGE PEEL GRANULES
___ ORANGE SPICE
___ OREGANO (GREEK), CUT
___ OREGANO (MEXICAN), CUT
___ OREGANO (MEXICAN), GROUND

___ OREGANO (MEXICAN), WHOLE,
___ PAN D'ARCO (CUT)
___ PANCAKE MIX, 6 Grain
___ PANCAKE MIX, Blueberry
___ PANCAKE MIX, BUTTERMILK,
___ PANCAKE OLD FASHIONED,
___ PAPRIKA GROUND
___ PARSLEY FLAKES (CALIFORNIA)
___ PARSLEY HERB POWDER
___ PASTA, EGG NOODLES,
___ PASTA, LASAGNA, WIDE CUT,
___ PASTA, MACARONI, JUMBO SHELL,
___ PASTA, MACARONI, LARGE SHELL,
___ PASTA, MACARONI, ELBOW,
___ PASTA, MACARONI, SALAD,
___ PASTA, MACARONI, SMALL ELBOW
___ PASTA, MACARONI, SMALL SHELL,
___ PASTA, MACARONI, Whole Wheat
___ Pasta-Pizza Sauce Mix
___ PASTA, SPAGHETTI,
___ Peach Slices
___ peach Flavor Apple Slices
___ PEANUT BUTTER POWDER, DEHYDRATED
___ PEAS, Alaskan
___ PEAS, BLACK EYED,
___ PEAS, SPLIT GREEN,
___ PEAS, SPLIT YELLOW,
___ PEAS, SWEET GARDEN, DEHYDRATED
___ PEAS, WHOLE GREEN,
___ PEPPER (BLACK) 1/4 CRACKED
___ PEPPER (BLACK) TABLE GRIND
___ PEPPER (WHITE), FINE GROUND
___ PEPPERCORNS (BLACK), WHOLE
___ PEPPERMINT, DOMESTIC
___ PEPPERMINT TEA BAGS
___ PEPPERS (GREEN BELL)
___ PICKLING SPICE BLEND, WHOLE
___ POPCORN, RABBIT EARS,
___ POPPY SEED
___ POPPY SEED, (BLUE), WHOLE
___ POTATO DICES, DEHYDRATED
___ POTATO FLAKES, DEHYDRATED,
___ POTATO GRANULES,
___ POTATO SLICES, DEHYDRATED,
___ POTATO, HASHBROWNS, DEHYDRATED,
___ POULTRY SEASONING, GROUND
___ PSYLLIUM HUSKS
___ PUDDING, BANANA, ADD MILK/INST
___ PUDDING, BUTTERSCOTCH, MILK/INS *
___ PUDDING, Custard
___ PUDDING, CHOCOLATE, MILK/COOK *
___ PUDDING, CHOCOLATE, MILK/INST *
___ PUDDING, COCONUT, MILK/INST *
___ PUDDING, LEMON, MILK/INST *
___ PUDDING, Tapioca
___ PUDDING, VANILLA, ADD MILK/INST *
___ PUDDING, VANILLA, MILK/COOK
___ PUMPKIN PIE SPICE,
___ PUMPKIN SEEDS, SHELLED
___ Quinoa,

___ RADISH SEED,
 ___ RADISH SEED, (FOR SPROUTING)
 ___ RAISINS, Select
 ___ RAISINS, Golden
 ___ RASPBERRY LEAF
 ___ RED CLOVER SEEDS (FOR SPROUTING)
 ___ RICE, Basmati Brown-Organic
 ___ RICE, BROWN, LONG GRAIN
 ___ RICE, Par Boiled
 ___ RICE, WHITE, LONG GRAIN
 ___ ROSE HIP POWDER
 ___ ROSEMARY, CUT
 ___ ROSEMARY, GROUND
 ___ ROSEMARY, WHOLE
 ___ RYE FLAKES, PAPER BAG
 ___ RYE, PAPER BAG
 ___ SAGE, FINE POWDER
 ___ SAGE, RUBBED
 ___ SAGE, WHOLE
 ___ SALAD SUPREME SEASONING
 ___ SALT
 ___ SAUCE, AU JUS INSTANT
 ___ SAUSAGE SEASONING,
 ___ SESAME SEED (NATURAL) WHOLE
 ___ SHEPHERDS PURSE
 ___ SHORTENING POWDER, DEHYDRATED
 ___ SLIPPERY ELM POWDER
 ___ SOUP BASE, BEEF FLAVOR
 ___ SOUP BASE, CHICKEN FLAVOR,
 ___ SOUP BASE, CREAM, NON DAIRY
 ___ SOUP MIX, ABC,
 ___ SOUP MIX, BEEF BARLEY
 ___ SOUP MIX, OLD FASHIONED,
 ___ SOUP, AU-JUS SAUCE
 ___ SOUP, BEEF, BARLEY, VEGETABLE
 ___ SOUP, BEEF Noodle
 ___ SOUP, BEEF Flovored Stew
 ___ SOUP, CHICKEN NOODLE, (GREAT FLAVOR)
 ___ SOUP, CORN CHOWDER BASE, MAKES
 ___ SOUP, CREAM OF CHICKEN, MAKES
 ___ SOUP, CREAM OF MUSHROOM, MAKES
 ___ SOUP, CREAM PEA CHOWDER, MAKES
 ___ SOUP, CREAMY CHEDDAR CHWD,
 ___ SOUP, Creamy Potato
 ___ SOUP, FRENCH ONION SOUP,
 ___ SOUP, ITALIAN TOMATO/VEG,
 ___ SOUP, MINESTRONE,
 ___ SOUP, Mountain Stew Blend
 ___ SOUP, NE CHOWDER BASE,
 ___ SOUP, OLD FASHIONED SOUP MIX
 ___ SOUP, ORIGINAL CREAM SOUP BASE
 ___ SOUP, VEGETABLE BEEF #
 ___ Sour Cream Powder
 ___ SOUTHERN BUTTERMILK BISCUIT MIX
 ___ SOUTHERN CORNBREAD II (YELLOW)

___ SOY SAUCE,
 ___ SPEARMINT SPICE BLEND (TEA) NO CAFFEIN
 ___ SPELT, (ORGANIC)
 ___ SPINACH FLAKES
 ___ SUGAR, BROWN,
 ___ SUGAR, POWDERED,
 ___ SUGAR, WHITE
 ___ SUNFLOWER SEED, RAW,
 ___ Sweet Potato
 ___ SYRUP, APRICOT,
 ___ SYRUP, BLUEBERRY,
 ___ SYRUP, BOYSENBERRY,
 ___ SYRUP, NATURAL BUTTER FLAVOR,
 ___ SYRUP, STRAWBERRY,
 ___ SYRUP, LIGHT CORN,
 ___ T.V.P. BACON FLAVORED,
 ___ T.V.P. BEEF FLAVORED, DEHYDRATED
 ___ T.V.P. CHICKEN FLAVORED,
 ___ T.V.P. IMAGIC BARBECUE MIX
 ___ T.V.P. IMAGIC BBQ FLAVOR,
 ___ T.V.P. IMAGIC SLOPPY JOE MIX
 ___ T.V.P. IMITATION HAM FLAVOR CHIPLETS
 ___ T.V.P. PEPPERONI, IMITATION FLAVOR
 ___ T.V.P. SAUSAGE FLAVOR
 ___ T.V.P. TACO BEEF FLAVOR
 ___ T.V.P. ULTRA-SOY, MINCED, NATURAL FLAVOR
 ___ TACO SEASONING, GROUND
 ___ TAPIOCA PEARLS (MEDIUM) WHOLE
 ___ TARRAGON (CALIFORNIA), CUT
 ___ TEA STRAINER(S)
 ___ THYME, GROUND
 ___ THYME LEAVES
 ___ TOMATO POWDER, DEHYDRATED,
 ___ TUMERIC POWDER
 ___ VALERIAN ROOT CUT
 ___ VALERIAN ROOT POWDER
 ___ VANILLA EXTRACT
 ___ VEGETABLE FLAKES, MIXED
 ___ VEGETABLE SOUP BLEND
 ___ VEGETABLE STEW BLEND
 ___ WHEAT BRAN, PAPER BAG
 ___ WHEAT FLAKES, WHITE,
 ___ WHEAT GERM
 ___ WHEAT, CRACKED,
 ___ WHEAT, GOLDEN 86,
 ___ WHEAT, HARD RED STORAGE,
 ___ WHEAT, HARD WHITE,
 ___ WHEAT, SOFT WHEAT,
 ___ WHEAT, VITAL GLUTEN,
 ___ WHEAT, WHITE, GOLDEN 86,
 ___ WHEY,
 ___ WHITE CREAM SAUCE
 ___ WHITE PEPPER, WHOLE
 ___ YEAST, INSTANT

SEED LIST

Eventually you will need to start raising your own food. To do this, you will need seeds, but not the kind of seeds you buy at the store. Why? Because those are hybrid seeds, and most hybrid seeds have no capacity to reproduce.

Hybrid seeds are a cruel trick played out on humanity. Seeds are God's gift to mankind, and for corporations and marketing people to purposely create seeds that can't produce offspring seems criminal. Yet this is exactly what goes on every day, all over the world. It's all about protecting patents and "profits." Well, those profits might get you killed if you're dumb enough to go along with the mainstream and buy hybrid seeds.

You need non-hybrid seeds. These are genetically-pure seeds, grown for hundreds or thousands of years, that consistently produce viable offspring. There's only one place I know of to get a complete garden-package of non-hybrid seeds at an affordable price: the **Ark Institute**. Buy their non-hybrid seed package and store it away as if it were gold. If civilization breaks down, these seeds may be the key to your survival and prosperity. While everyone else is scratching their heads wondering why their green beans won't sprout, you'll be reaping a huge harvest of self-proliferating, non-hybrid fruits and vegetables.

When you buy the non-hybrid seed package from the **Ark Institute**, you'll receive these seeds:

- Asparagus
- Green Bush Beans
- Yellow Bush Beans
- Red Kidney Beans
- White Navy Beans
- Pinto Beans
- Sweet Green Peas
- Snow Peas
- Red Beets
- White Sweet Corn
- Yellow Sweet Corn
- Spring Broccoli
- Fall Broccoli
- Red Cabbage for Salads
- Cabbage for coleslaw/kraut
- Early Carrots
- Mid-Season/Late Carrots
- Salad Cucumbers
- Pickling Cucumbers
- Eggplants
- Butterhead Lettuce
- Red Lettuce
- Mildew-resistant Cantaloupe
- Summer Oak Leaf Lettuce
- Basil
- Spanish Onions
- Red Onions
- Yellow Onions
- Scallions
- Green/Red Sweet Pepper
- Long Yellow Sweet Peppers
- Cayenne Hot Pepper
- Pie Pumpkins
- Giant Radish
- Spinach
- Canning/Catsup Tomato
- Yellow Summer Squash
- Zucchini Summer Squash
- Butternut Squash
- Acorn Winter Squash
- Solid Salad/Canning Tomato
- Italian Plum Tomato
- Large Salad Tomato
- Heirloom Slicing Tomato
- Flour/M Meal Corn
- Wheat
- Drought-resistant Cantaloupe
- Romaine Lettuce
- Parsley

OK, But What Do I Prepare For?

Before you can prepare, you must determine what you are preparing to survive and how each disaster threatens you, your safety and survival. That will give you the parameters necessary for the following steps.

This initial exercise isn't tough, it only takes a few minutes of thought. We suggest you jot notes or switch into your word processor while you work.

But first, it's important to realize that you cannot prepare for everything — only the army tries to do that, and we've yet to meet anyone with their resources. Captain Dave suggests you prepare only for those potential disasters that are likely to occur within the next five years. Sure, you may wait seven years for the next earthquake, but remember the survivalists creed: *better safe than sorry*.

What's going to happen in the next five years? If we knew, our web page would look different. You'll have to extrapolate, evaluate trends, read the newspaper, conduct your own research. At the very least, take a few minutes and consider your location. Pull out a map and look what's within a two-mile, five-mile 10-mile and 25-mile radius of your home and place of work. Put on your pessimist hat and consider what might go wrong that could directly impact you. Decide if that's something you want to prepare for (see questions one and two, below).

For example, if you live a "safe" distance outside of a flood plain, your house might still gets flooded in the 100-year flood, should you prepare for it? We would, but it's your call. It's your ass on the line, so you have to decide.

That nuclear plant 20 miles away has an excellent safety record. Should a nuclear disaster be on your list? Again, you make the call.

Are you worried about a meteorite crashing into your house? Well, it has happened, but it's probably not worth preparing for.

Finally, if you've been afraid of something since you were a child — whether it's a raging fire or nuclear war — prepare for it. At the very least, you'll sleep better at nights knowing you have done all you can.

Here are some questions to ask yourself:

What natural disasters or extreme conditions am I (we) likely to face in the next five years?

Make a list and rank them in order of most to least likely to impact you. Your list might look like this:

Natural Disasters

Weather-related

Hurricanes

Flash flooding

High winds

Avalanche

Wildfire

Tornadoes

Flooding

Hail

Extreme high heat

Heavy thunder storms

Mud/rock slides

Severe winter weather

Drought

Non Weather-related

Earthquake

Volcano eruption

Tidal wave/Tsunami

Man-made Disasters

War (*conventional, biological, chemical or nuclear*)

Toxic material emission or spill (*from a train, semi-truck or nearby plant*)

Riot or other civil disorder

Nuclear plant melt down or other nuclear disaster

Terrorism

Fire

Government action against you

Stock market crash Severe depression

Other

Plague or disease outbreak

Comet strike or giant meteor

Personal Emergencies

Kidnapping

Mugging, robbery or other criminal attack

Unemployment

financial disaster

Death in family

Home destroyed by fire

Random acts of violence

What are the ramifications of each item on my list.??

Now, take your list and create a second column. Put the ramifications of each disaster in the second column. What do we mean by ramification? How the disaster or emergency situation could affect you. Think this one through very carefully, as everyone's situation is different. For example, families with children have different concerns than those without or singles.

Potential Disaster Ramifications

Thunder storm with electrical outage for 2 (average) to 48 hours (severe)

Food spoilage possible

Lack of air conditioning/furnace

Damage to house or car from nearby trees

Possible local flooding (see below)

Local transportation impaired by fallen trees, wires

Lightning damage/fire potential

Severe winter weather, Electrical power outage for 4hrs (average) to 72 hours (severe)

Would affect furnace operation

Exposure problems

Frozen pipes

Disruption of travel, transportation

Self or family members possibly stranded away from home

Possible food shortages and empty shelves at local markets

Nearby flash flooding Local transportation disrupted

Danger while traveling in car or by foot

Possible loss of some utilities

Nearby train derailment Possible leak or spill of chemicals

Short-term exposure problem

Long-term cancer concerns

Evacuation may be necessary

Riot or other civil disorder Disruption of commute (ala Los Angeles)

- Stranded in car or office while family is at home and/or school

- Danger of riot spreading to my neighborhood

- Danger of local kids/low lives taking advantage of situation

- Attack or threat to personal safety

- Looting and rampaging by otherwise lawful citizens

- Fire with potentially no response by authorities

- Police are overwhelmed, cannot protect law-abiding citizens

Nuclear plant problems

- Reactor vessel damage could result in release of radioactive chemicals to atmosphere

- Evacuation necessary

Terrorism Threat to safety at work and during business travel

- Disruption of commerce, travel

- Less personal freedom, privacy as a result of government reaction to terrorism

Once you've created a chart like the one above, you know what situations you are most likely to face and can prepare your survival plan

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Surviving in the City

Introduction

While we all want to do our best to prepare for a coming crisis, and many Saints realize the city is perhaps the worst place to live, very few of us are really prepared to pack up the old Winnebago and head for the hills. Most American Saints, whether they're aware or not, are going to stay in the cities.

This is not a hasty decision for most Saints. Most of us depend on the city for our livelihood, and we can be better prepared by continuing to live in the city, earn a good income, and make preparations for exiting the city at the appropriate time – or by staying in the city and living off existing supplies.

This special report explains some of the most critical dangers of living in a city and presents some solutions to surviving them. If you are one of the Saints who has decided to stay in the city, you'll benefit greatly from this information.

Cities are artificial

Every city is an artificial construct. Cities formed as people came together to conduct business, participate in social interaction, and benefit from efficiencies in public services (such as schools, sewers, water, etc.) and a common defense. Yet cities cannot survive alone. They need resources from the country; most notably, food, water and electricity. While electricity and water can sometimes be created or found within city limits, the acreage requirements of food dictate that no city could possibly feed its own people.

Read that last phrase carefully: "No city can feed its own people." Not one. Cities are, by their very nature, dependent on the importation of food. The advent of just-in-time delivery systems to our grocery stores means that most cities would run out of food within a week if supplies were for some reason disrupted.

Remember, cities are not self-sufficient. Although they may seem to be in 2005, they have for a long time been entirely dependent on the American farmer for their support – something almost all Americans take for granted (except the farmer, of

course...)

Risks in the City

The city presents some serious risks during a crisis. The four most serious ones are 1. the collapse of social order (riots), 2. the failure of the water treatment and delivery systems, 3. the depletion of food supplies 4. the failure of the power grid and 5. you may be quarantined. While not every situation will appear in every city, every situation will most certainly appear in some cities. Will that include yours?

We'll tackle these one at a time:

1. The Collapse of Social Order

"Social order" is a delicate thing, and it exists as a psychological barrier that could easily collapse under the right conditions. We all saw this during the L.A. Riots following the Rodney King trial verdict as citizens of L.A. set fire to their own town, yanked people from vehicles and beat them literally to death, and even fired guns at firemen attempting to save their buildings! More recently we were all witness to the looting, violence and total breakdown of society following Hurricane Katrina in New Orleans.

What allowed this to happen? Simple: the simultaneous melting away of the psychological barrier of "order." Once people realized 911 couldn't handle the load, or was offline, that the local police were helpless or had simply abandoned their posts, "Law and Order" ceased to exist in their minds. They then conducted their lives in the way they always wanted to, but couldn't because of the police. That is, they ran out to the local stores and just took whatever they wanted (looting). They took out their racial frustration on innocent victims who happened to be driving through the area, and they let loose on a path of destruction that only stopped when men with rifles (the National Guard) were called in to settle things down. In other words, *only the threat of immediate death stopped the looting and violence*. Rifles work wonders.

Imagine store owners lying prone on the roofs of their stores with AK-47's, firing at anyone who approached. This is exactly what happened in Los Angeles. But worse, imagine the lawless horde firing at the rescue copters trying to bring in supplies to the desperate masses in New Orleans.

The National Guard eventually got things under control. This event was isolated, however, to one city. Imagine a hundred cities experiencing the same thing. Will the National Guard be able to handle the load? Not likely. What about local police? They aren't fools; if things look bad enough, they'll grab their families and head for the hills, just like they did in New Orleans. *No pension is worth getting killed for.* A few U.S. cities could be transformed into literal warzones overnight. It would require all-out martial law and military force to have any chance whatsoever of bringing order to these streets. And the reality is that there are not enough military in the USA to secure all of the cities if this happens.

This collapse of social order is perhaps the greatest risk of staying in the city during a crisis. What, exactly, would cause this collapse of social order? *Lack of three things: food, water, and money.* When people run out of food, some will begin ransacking their neighborhood, searching for something to eat. (Remember that in a city, a "neighbor" does not mean the same thing as a "neighbor" in the country. They are not necessarily your friends.) It won't take long, then, for violence to take over in some cities. While certain regions will certainly manage to keep things under control and people will form lines at the local (depleted) Red Cross shelter, other cities will see an explosion of violence. Imagine the gang-infested regions of L.A., Chicago, New York, St. Louis & New Orleans. Do you think those people are going to stand in line and wait? They already have guns; now they finally get to use them. Pent-up racial tensions & hostilities will simply serve as justification for shooting people of the same or other color in order to get their food.

Even if the food somehow gets into the cities, lack of money (due to the government not sending out checks) could cause the same thing. Eventually, lack of money results in looting and mass theft. As the stealing balloons, it also results in a collapse of social order. Water; the same thing (but faster).

The collapse of social order is also very dangerous because it doesn't require any "actual" collapse of the power grid, telecommunications, transportation or banking. Social order is a psychological artifact. It is a frame of mind, and any global panic can quickly remove the mental barrier that right now keeps people basically "lawful."

2. The Failure of Water Treatment and Delivery Systems

Will the water treatment facilities fail during a crisis? Many will. Some won't. The problem lies in figuring out whether yours will. Certainly, they depend on electricity, and if the power goes down, so will the water.

The most important question here, though, is about what will happen when the water stops flowing (or if it is flowing, but it's not drinkable). As you are probably aware, while people can live without food for long periods of time (2-3 weeks), water is needed on a daily basis. You can go 2-3 days without it, at most, but beyond that, you'll quickly turn to dust.

That means people will do anything to get water, because to not have it means death. And guess where it's going to be the most difficult to actually get water? You guessed it: in the cities. During the first day of the water crisis, many people still won't figure out what's going on. They'll figure it's a temporary breakage of a water main and the government will get it fixed within hours. As those hours stretch into the next day, these people will get very worried.

By the second day, more and more people will realize the water isn't coming. At that point, you could easily see a breakdown of social order, as described in the previous section (as you can see, these things all tend to cause each other...). People will begin their "search for water," and the first place they're likely to go is where they always go for liquids: the grocery store, the local Walmart, the 7-11. The shelves will be cleaned out rather quickly.

Beyond that (because those liquids aren't going to last long), you're going to see people engaged in a mass-exodus from the cities. They'll take the gas they have left in their tanks and they'll leave the city in search of water. Some will go to "Grandma's house" out in the country where they might at least find a pond or stream to drink from. Others will simply go on an expanded looting mission, stopping at any house they see and asking the residents (with a gun in their face, likely) if they

have any water to “donate.”

As a result of all this, if water stops flowing, here are the events you can expect to see in some of the worse-off cities:

- Looting of all the grocery stores by the second or third day (remember New Orleans?)
- Minor outbreaks of violence during the looting. Shop owners, for example, may attempt to defend their shops with fire-arms (ala L.A. Riots)
- Mass exodus of residents from the city in search of water
- Ransacking of any houses or farms within a gas-tank radius of the city, presumably by desperate people with guns
- Mass traffic jams on the outbound highways as people run out of gas and abandon their vehicles (if bad enough, this could actually block the highways and trap people in the cities) (Remember Hurricane Rita?)
- Mass outbreak of water-borne diseases as people use streams and rivers as both a water fountain and a bathroom. People crapping upstream are going to infect the people drinking downstream. Very few have any kind of water filtration device

That last point is really critical. Once the water flow stops, disease is going to strike.

3. The Depletion of Food Supplies

The food supplies will likely dwindle quickly as we approach a possible crisis due to people stocking up just in case. Once the crisis actually hits, expect to see breakdowns in the transportation sector that will result in major delays in food delivery. This means food may arrive in sporadic fashion in some cities (if at all).

Once this happens, food suddenly becomes really valuable to people (even though they take it for granted today). And that means any small shipment of food that arrives will be quickly grabbed and eaten or stored. It only takes one week without food to remind people how much they actually need it, so expect the atmosphere to be that of a “near panic” if food is delayed by as little as three days.

The level of panic will vary from city to city. Some cities or towns may experience very little difficulty receiving food. Others may face near-starvation circumstances.

Remember, the cities depend entirely on food shipped in from the farms and food processing companies. Also, note that if there’s a water problem as mentioned in the previous section, and the mass exodus begins, the highways may be jammed up at critical locations, causing gridlock for the trucking industry. If we’re lucky, some trucks will continue to roll. If we’re not, assume that nothing gets through.

A shortage of food ultimately results in the same behavior as a shortage of water. First, people eat what’s in the pantry, then they loot the grocery stores. After that, with all local supplies depleted and no hope on the horizon, they leave the city and start ransacking nearby homes. Some will hunt in nearby forests, but most city-dwellers don’t know how to hunt. In any case, anyone with the means to leave the city will likely do so soon after their food shortage begins.

4. The Failure of the Power Grid

Nothing is as suddenly obvious – nor has such a gigantic psychological impact – as the failure of the power grid. When the electricity stops, almost everybody knows it at the same instant (unless it happens at night).

Naturally, during the first few hours of the power failure, if it occurs, people will assume it’s a temporary situation. Maybe a tree fell on some power lines, or perhaps a transformer blew up somewhere nearby. They’ll sit tight and wait for the power to come back on.

What if it doesn’t? Then the city faces a severe problem. Without power, obviously, everything shuts down. Within hours, the looting begins in the more crime-ridden cities (we saw this in New York a few decades ago...). The longer the power stays off, the worse the social disorder.

The loss of power will bring the entire city to a halt. While vehicles may get around for a few more days (using whatever fuel they have left), businesses obviously won’t be operating. Houses that depend on electricity for heat will quickly reach winter temperatures,

freezing many occupants to death. While those that depend on electricity for Air Conditioning will just as quickly reach Summer temperatures, resulting in death from heat stroke. Hospitals and police stations may have generators on hand, with a few days' worth of fuel, but in short order, that will be depleted, too.

But the water treatment plant will almost certainly be off-line without power, causing all the events mentioned in the water section, above. Let's face it, the power is the worst thing to be without in the city. If you have power, you can survive a food shortage, perhaps even a short water shortage. But without power, all bets are off. If you have a "bug-out" vehicle stocked and ready to go (see below), this might be the time to bail.

5. Quarantine, Marshal Law or city has been sealed off.

A new threat that manifest itself in the aftermath of Hurican Katrina is the possibility that the government will Quarantine or Seal off the exits of a city to keep all of the residents contained within its boundaries so as not to allow them to flee or leave. This could be done for purely noble reasons like controlling an outbreak of disease/plauge from spreading to nearby communities or for more diabolical reasons like exerting control over population centers by stopping the free movement of people. If you lived in New Orleans, the only time you could leave was before and during the Hurricane. Afterwards you were trapped and could only leave when and where you were permitted. Countless people tried to walk out of the city and were turned back at gunpoint by the National Guard only to be sent back into the hell hole until they could be "outprocessed" and evacuated. Regardless of why, the issue is that should you choose to remain in the city, *you may not have the option of leaving once the disaster responce begins..*

Solutions in the City

Okay, so you're stuck in the city. You've made the decision to stay. You've read the problems above, you believe they make sense, and you're intelligently frightened. What now?

You really have two strategies. You can:

- Stay and defend your house
- Bug out (leave the city and head for the hills)

Important! This is not an either/or situation. You can

begin by staying in your house and assessing the situation. You'll want to have a "bug-out" vehicle stocked and ready, just in case, if you can afford one, but you may never actually choose to bug out. You'll have to be the ultimate judge of this. Just remember that when you bug out, you face major risks and disadvantages. Among these:

- 1. You're severely limited in how much you can carry
- 2. You have limited range due to fuel
- 3. You expose yourself to social chaos, roadblocks, random violence, etc.
- 4. Your house will certainly be looted while you're gone
- 5. You run the risk of mechanical break-downs of your vehicle
- 6. You must have a place to go that you know is in better shape than where you currently are.

In general, unless you have a specific, known safe place as your final destination, I don't advise people to bug out. Just "heading for the hills" is a very poor plan. You might not make it. But heading for Grandma's house or some known, safe place could be a very good plan indeed, depending on whether Grandma is ready, willing and able to accept you!

For these reasons (and more), staying and defending your house is sometimes the only reasonable course of action, even if it seems dangerous. For the most part, looters and people looking for food are going to have plenty of easy victims, so if you show a little willingness to use force to defend your property, you'll likely send people on to the next house.

That is, until the next house is already empty and you appear to be the last house on the block with any food and water left. If you're in a bad enough area, your neighbors may "gang up" on you and demand your supplies or your life. This is truly a worst-case scenario, and unless you literally have a house full of battle rifles and people trained to use them (and the willingness to shoot your neighbors), you're sunk. *This is why the best situation by far is to keep your neighbors informed and help them get prepared.* Then you (both your member and non-member neighbors) can act as a group, defending your neighborhood and sharing

the supplies you have with anyone willing to help defend you. (And don't think for a second that your non-member neighbors won't remember all that food storage in your garage!)

When you have this kind of situation going, your neighbors realize you are their lifeline. You supply them with food and water, and they will help support you because they are, in effect, supporting their own lives. The best situation is when your neighbors and other ward members have their own food and water supplies. That way, they aren't depleting yours, and they have a strong motivation for getting together with you defend your neighborhood. (More on this below...)

Storing (and Hiding) Your Food

Storing food is just as important in the city as in the country, but hiding it is far more important. That's because in the worst areas, marauders will be going from house to house, demanding your food or your life. If you're dumb enough to put everything you own in the obvious places, you might as well not buy it in the first place. They will find it. To count on having any amount of food left over after the marauders break in, you'll need to hide your food.

One alternative is to plan on defending your home with force. If you have enough gun-wise people in the house, and enough firearms and ammo, you can probably pull this off. But most Saints aren't nearly as experienced with firearms as the gang members. A better alternative might be to plan on bringing your supplies to your ward/stake building where all of the Saints can both pool and defend their resources. This of course will depend greatly on your local Bishop and Stake President.

Back to hiding: the best way to hide your food is to bury it. You'll need airtight containers, long-term food that won't rot and you'll need to plan ahead. Bury your food at night so nobody will notice, and make sure you don't leave the map on the refrigerator door! (Better to memorize it!) Try to get the ground to look normal after you're all finished. You'll want to bury your food as early as possible because it gives the grass time to regrow over the spot. If you're in an area that snows, you'll have a great concealment blanket! Most food marauders won't go to the trouble to dig up food, especially if

you insist you don't have any.

Best plan: Have some smaller amount of food stashed around the house, letting them find something. Better to give them something and send them on their way. The art of hiding your food is an ancient one. You've got to get creative. Use the walls, the floors, and the structure of the house.

If hiding your food is simply not an available alternative, then try not to advertise it. Keep it put away in your house or garage in as discreet a manner as possible. Don't make a point of telling people that you have a years supply (or more). Word gets around fast that Bro. Jones has a ton of food in his garage. Boxes of food fit nicely under beds, behind furniture, in the attic, etc.. Be Creative!!

To sum up the food storage, you really have three strategies here:

- Store it all in your house and plan on defending it by force.
- Bury it in your yard in case you get overrun by looters.
- Store part of it in your house, and hide the bulk of it.
- Relocate all of it as soon as you recognize a major disaster is in progress

An alternative to burying that would be faster and easier would be to simply build a false wall in your garage and seal up your food behind the false wall. Sure, you might lose 2-3 feet of useable space in your garage, but the tradeoff is knowing everything is safe and sound.

Storing Extra Water

Water can be stored in exactly the same way, although you might want to bury the barrel before you actually fill it with water. Make sure you treat your storage water, rotate it or have filters on hand when you get ready to use it.

If you don't have a yard, or it's not practical to bury your water, you'll have to store water inside your house. This can get very tricky because water takes up a lot of space and it's very difficult to conceal. It's best to get containers made for long-term storage, but in a pinch, use what you can find, just make sure its clean

and food grade material. But a lot of these containers will deteriorate quickly, and they may break easily. Also, consider what happens if your water may be subjected to freezing. Will your containers survive? Be sure to leave enough air space to handle the expansion.

In order to prepare yourself for the water shortage, assuming you're going to stay in the city, stock at least six months of water at a minimum two gallons a day per person. That's nearly 400 gallons of water if you have two people.

Of course, even with the best in-house preparations, you may find yourself depleted of water supplies. In this situation, one of your best defenses is to have a really good water filter (like the Katadyn filter) that can remove parasites and bacteria from the water. You can also treat your water in other ways (iodine, distillation, silver solution, bleach, etc.). Armed with these items, you can safely use stream or river water (or even pond water) for drinking.

WATER WELLS

By far, the best solution for obtaining long-term water supplies is to drill a well. Buy the best-quality hand-pump available (cast-iron pumps available from Lehman's) and a good cylinder. They will last a lifetime if installed properly. With this setup, you'll have a near-unlimited supply of water.

The total cost of doing this, depending on where you live, ranges from about \$4000 - \$6000. Is it worth it? If you've got the money, I think so. However, many cities simply don't allow the drilling of wells, so you may not be able to get one drilled even if you want to.

The deeper your well, the more expensive it gets. Most well drilling companies charge by the foot. When water is deeper, you also need a bigger pump and a more powerful cylinder, so the costs tend to really grow the deeper you go. If you can find water at 20', you're very lucky and it might not cost you even \$2000. If you have to go down to 200', it might cost you \$7500, and you're at the depth limit of hand-powered pumps anyway.

Defending Your Life and Property

Let's talk about force. No doubt, there are plenty of nice people in this country, and I think that in small

towns and rural areas, people are going to find ways to cooperate and get along. I also think, however, that some cities will suffer complete social breakdown and violence will rule. If you happen to be stuck in one of these cities, you're going to need to use force to defend your house. The section that follows discusses what I consider to be extreme responses to violence in the most dire situations. Hopefully, you won't find yourself in these circumstances, but if you do, the information below may be valuable.

Important: Do not use your lights at night. If you are stocking propane-powered lanterns, solar-powered flashlights, or other unusual supplies, using them at night will announce to everyone within line of sight that you have more than the "usual" supplies. Expect them to come knocking in your door. At most, let a fire burn in the fireplace, but in general, avoid drawing attention to your house.

Defending your house is a crucial element on your stay-in-the-city plan. Make your house your fortress, and hold drills to help other family members practice some of the more common activities such as hiding, defending, evacuating, etc.

Some useful items for home defense include:

- A guard dog
- Pepper spray
- Firearms
- Smoke bombs (military-grade)
- Trip wires

Let's go over these:

The guard dog is certainly a welcome addition to any family trying to defend their house. Although he probably eats a lot of food, the investment is worth it. Dogs also tend to sleep light, so let them sleep right next to the food storage areas, and make sure you sleep within earshot. If the dog barks, don't consider it an annoyance, consider it an INTRUSION.

Pepper spray is a great alternative to the firearm. It will incapacitate people and certainly give them a painful experience to remember. On the downside (potentially), it might just remind them that next time they come back for food, they better kill you first. So understand the limitations of pepper spray.

Firearms are useful for obvious reasons. In the worst-case scenario, when looting is rampant, you may have to actually shoot someone to protect yourself or your family. If you're squeamish about pulling the trigger under these circumstances, don't plan to stay in the city. Use the "bug out" plan instead.

Smoke bombs can be useful for covering a planned escape from your house. You can purchase high-volume smoke bombs that will quickly fill up any house with an unbreathable cloud of military-grade white smoke.

Trip wires are great perimeter defenses. You can buy them from Cheaper Than Dirt (they run a few hundred dollars). They will give you early warning if someone is approaching. You can connect the tripwires to flares, shotgun shells, lightsticks or other warning devices. This way, you can have an audible or visible alert, your choice.

In addition to these devices, you can make significant fortification-style improvements to your home. While none of these are very affordable, they certainly help defend your home:

- Replace glass windows with non-breakable plexiglass
- Add steel bars to the windows
- Replace all outside door locks with heavy-duty deadbolts
- Replace all outside doors with steel doors, preferably without windows
- Remove bushes and other shrubs where people might hide
- Black out the windows entirely to avoid light escaping at night (similar to what residents of London did during the WWII bombing raids)
- Build secret hiding places for food, coins, or even people
- Create escape hatches or passageways
- Rig pepper-spray booby traps

These aren't as absurd as they might at first sound. Many Saints living in rough cities already have steel bars covering their windows, and removing extra bushes and shrubs is a well-known tactic for making your home a safer place.

LIGHT

To light your home when there's no electricity, try the following:

- Use LED flashlights and rechargeable solar-charged batteries. You can buy all these items from the Real Goods catalog.
- Use propane-powered lanterns. You can find these in the camping section of your local Walmart. Be sure to purchase extra mantles and store lots of propane.
- Purchase quality oil lamps from Lehman's and stock up on oil. You can also purchase cheap kerosene lamps from the Sportman's Guide or Walmart, then simply purchase and store extra kerosene.
- Buy extra candles.
- Purchase lots of olive oil. Not only can you cook with it (and besides, it's a lot healthier than corn or vegetable oil), olive oil also burns as a clean candle fuel. You can float a wick in a jar half-full of olive oil and light the wick. Viola, a home-made candle. Olive oil is a fantastic item for your storage anyway because even if you purchase all the grains in the world, you'll still need cooking oil, and you obviously can't buy powdered cooking oil. Well-stored olive oil can last for thousands of years.

STAYING WARM

Did you know that people won't steal giant logs? Although they may easily steal wood you've already chopped, most people won't have any way of stealing logs. They're too heavy, and the vehicles won't have any gas left. For this reason, your best bet in regards to stocking fuel for your house is to stock up on UNCUT wood logs.

It takes a lot of extra research to find out how to get them (took me a few weeks of asking around), but you can find a source if you look hard enough. Or you can usually get a permit to go out and cut your own. The effort is worth it, because this will give you a ready-to-go source of heat and fuel that cannot be easily stolen.

The catch, of course, is that you'll need equipment to cut and chop the wood. A chainsaw is REALLY nice in this way, but it requires fuel. Fortunately, chain saws

don't use much fuel, so if you have a way to store as little as 50 gallons or so, you've got enough to power your chainsaw for a few years (at least!). You'll need fuel stabilizers, too, which you can buy at your local Walmart. (Be sure to buy extra chains for your chainsaw, too.)

You'll also need splitting hardware. You can buy log splitters or just buy an axe, a wedge, and a sledgehammer. Better yet, buy all four so you have a choice of what to use. And remember, wood splits much better when it's frozen, too, so you might just wait until the cold hits in Winter to start splitting your wood. Only split a little at a time, because you don't want to end up with a big pile of nicely-split wood sitting out in your yard. It will invite theft from people who don't have any. If you already have trees on your property, you're all set. Cut down about 4-5 cords right now, so they can start drying out, then chop them as you need 'em.

A "cord" of wood, by the way, is a volume measurement. It's 8' x 4' x 4', or 128 cubic feet of wood (stacked). Some people that sell wood will try to rip you off, so make sure you know what you're buying. If you purchase logs, it's better to get a price per linear foot, based on the diameter of the log. For example, you might ask for logs that are an average of 10" in diameter, and you'll ask how much the charge per linear foot would be. Something in the range of \$1 - \$2 would be great.

Relations With Neighbors

I've already mentioned the importance of getting along with your neighbors. It really is crucial to your city-based survival plan. The best situation to be in, as mentioned before, is to have neighbors & other church members who are aware of the issue and who are getting ready for it by stocking their own food, water, and other supplies. Every neighbor & member that becomes self-reliant is one less neighbor or member you'll have to support.

The range of neighbor situations, from best to worst, is as follows:

- Best case: your neighbor is current Recomend holder, is aware of and both temporal & Spiritually prepared for an emergency with their own supplies and training.
- Good case: your neighbor is aware of a potential crisis, and even though they don't

have their own supplies, they're willing to help defend yours as long as you share

- Bad case: your neighbor is a non-member that didn't prepare for it, figuring they would just steal from you if things got bad. They are aware of YOUR supplies but don't have their own.
- Worst case: your neighbor isn't aware of anything, he is anti-mormon and he's a violent, angry neighbor just released from prison. He is going to be caught off guard by the ensuing events and will likely attempt to use violence to get what he needs or wants.

Your decision on whether to stay in the city may depend greatly on the quality and quantity of your neighbors. If you do live in a bad neighborhood, do what you can to relocate. If you live in a good neighborhood, do the best you can to educate and inform your neighbors. *This might well be the most important missionary work you ever do for your own temporal salvation!*

Gun Control in the Cities

No matter how you felt or thought about gun control in the past, it's time to face disaster-induced reality. The gun-control politicians (and the people who supported them) have placed Americans in a situation where not only can the police not protect us in a timely manner, but we cannot lawfully defend ourselves. Criminals unlawfully have firearms; citizens lawfully don't. Intentionally or otherwise, gun-control supporters have created a situation where an unfortunate number of innocent men, women and children are going to be in danger during a crisis simply because they could not obtain the tools of self-defense.

It also happens that the cities where the rioting will likely be the worst are precisely the cities where firearms are most likely to be banned from lawful ownership (and where criminals may wield near-absolute power for a while...). Perhaps when society recovers from it, we can review the fallacy in the cause / effect logic that keeps people voting for gun-control laws, but in the mean time, millions of people are going to have to resort to breaking the law in order to protect their families. And yes,

you too will have to resort to breaking the law if you are to acquire a firearm in an area where guns are entirely banned from private citizens (like New York, Los Angeles, etc.).

After the disaster hits, if the rioting gets really bad, we're going to see local police begging law-abiding citizens for help. Your firearm will be a welcome addition to the force of law and order, believe me. No local cop is going to mind you having a handgun if you're manning a roadblock protecting a neighborhood of families with children. Act responsibly, tell them what you're doing, and they'll probably give you a big thanks. But if you're carrying a gun while you smash a window of the Walmart and walk off with a stereo; well that's a different story. Be prepared to get shot.

See, cops don't mind private ownership nearly as much as we've all been led to believe. I know, I work with law enforcement officers in a small town, and I ask them about topics like this. When the crisis hits, they'll be more than happy to have your cooperation. We're all going to need as many law-abiding gun-toting citizens as possible in order to fend off the criminals and establish some degree of order.

One More Reason To Move Out

If you really feel you need a firearm to protect yourself and your family, your best bet may be to move to a city or state where people are a lot more accepting of firearms. You'd be surprised what a difference the locale makes. Check the gun laws in any state you're considering moving to. Obviously, "cowboy" states like Arizona, Texas and Wyoming will have fewer restrictions on firearms (and, interestingly, they have less of a problem with gun violence). States where the population is more dense (like Florida, California, New York) tend to have much greater restrictions on private ownership of firearms.

Bugging Out

Suppose it's July 14, 2006, and you've changed your mind about this city thing. You happened to be right smack in the middle of one of the worst-hit cities in the country. The looting is getting worse, the power has been out for two weeks, and your

water supplies are running low. You still have enough gas in your truck to make it out of town... if you can get past the gangs, that is. You've decided to BUG
O U T !

Some basic pointers:

- Don't try to bug out in a Chevy Geo. You will likely need a big heavy 4x4 truck in order to go off-road and around stalled vehicles
- Get something that can carry at least 1000 pounds of supplies. A big 4x4 pickup will do nicely! Yes, it requires more fuel, but you can carry the fuel as cargo.
- Don't bug out unless you can have someone ride shotgun, literally. You will need an armed passenger in case you run into not-so-nice people

WHAT TO TAKE

Ahh, the bug-out supply list. All this will fit in your truck. Here's what you should take if you're preparing to bug out with two people:

- Your 96 hour kits for each person in the vehicle
- 20 gallons of water
- 40 gallons of extra fuel or more (and a full gas tank)

WHERE TO GO

As mentioned earlier, if you have a designated place of refuge (Grandma's house, a cabin in the woods, etc.), head straight for it. If not, you're basically driving anywhere you can go, so try to head for an area that forested and near a creek or river where you can get some water.

Conclusion

Choosing to remain in the city is a rational choice for many Saints in many situations. However, as you have seen from the dangers described here, the further away you can get from the population centers in general, the better your chances of surviving.

Most Saints, perhaps yourself included, have a difficult time actually accepting that a major disaster is going to be as bad as described in this report. And after all, if you leave the city, sell out, quit your job, and move to the country – and then nothing bad happens – you will have disrupted your life, and you may find

yourself broke, jobless, and homeless. You COULD assume it will be a mild event, which I suppose is also a credible possibility. In that case, surviving in the city will be quite feasible, especially if you have neighbors that can support your efforts and you don't live in a dangerous city with high racial tensions. However, the very nature of a major disaster means that if only one or two major infrastructure components goes down, the ripple effect will quickly create a much worse scenario. It seems there is very little room for "mild" effects unless they are miniscule. The most likely scenario at this point clearly points to massive disruptions, severe shortages in food and water, loss of power in some areas, and a breakdown of social order in certain areas where the population density is high.

But you can survive anything with good planning, an open mind, and plenty of practice. Why not start now?

Money

The first thing to understand is that nearly all of the current money supply is in the form of electronic data entries on computers rather than in cash. Most of the wealth of the world is in promises to pay (credit) rather than in cash. Of the approximately \$460 billion U.S. money supply, only about 4%, \$17.9 billion, in cash is currently circulating in the U.S. (according to the St. Louis Fed figures for June, 1998). The rest is held by individuals, companies, banks and governments in foreign countries. When a disaster hits and the computers in the banks or ATMs go down, or if there are bank runs, all that electronic wealth could evaporate overnight. In the event of a national disaster, the total money supply could shrink by 96%.

Most people (Saints and non-members alike) currently thought of as wealthy have their wealth tied up in credit-related investments of one kind or another—the stock market, bonds, CD's, real estate, etc. Almost nobody keeps a big stash of cash around because there's been no need for large amounts of cash for a long, long time. All these currently wealthy people could suddenly become poor if a financial crash were to hit us. I don't mean metaphorically poor, I mean really freezing, starving poor, broke, destitute. All their resources will be in the wrong form for the new conditions. Only those who have cash will be wealthy after a national disaster; survival requires cash.

Can't the government simply print enough paper money to replace all the electronic money? The answer is no, it's impossible. The presses at the Bureau of Engraving and Printing are already running at capacity 24 hours a day just to replace the paper money that wears out each year. To replace just the \$17.9 billion of paper currency currently circulating would take 2 years at the current BEP printing capacity. It would take several decades to replace the entire \$460 billion.

It has been reported that the Fed has been printing and stockpiling cash in case of a bank run, and they will have an extra \$50 billion on hand

along with \$150 billion they have apparently been secretly stockpiling for years. This makes a possible total of \$218 billion just in case. Even if this is true, \$218 billion is a long, long way from \$460 billion and light years away from \$7 trillion, which is the total value of the entire U.S. economy. Note that if the total U.S. economy is worth \$7 trillion but that only \$460 billion of that total exists as physical cash (and only \$17.9 billion is circulating within our borders), then the vast majority of the wealth of America is obviously only electronic, credit money. After a major disaster or financial crash, no banks or no electricity or no oil or coal or no trains means no electronic wealth. We're back to an all-cash economy.

Cash For Survival

The answer to the money question is a simple one: *Have Cash*—coins and green pieces of paper with pictures of dead presidents on them. Start converting some of your credit investments and electronic forms of money into cash. If you have cash after the disaster, you will be one of the few wealthy people in the world. Not only will you be able to survive the disastrous times, you will be able to use your cash to build a prosperous future for you and your family.

A word of warning: you must be very careful to keep a low profile both now and in the future. You want to attract as little attention as possible now while you convert to cash and later when you use your cash, for two different but equally vital reasons.

First, although you have every right to convert all your investments and savings into cash, doing so may invite the attention of the government DEA agents who may think you're some kind of drug dealer. The drug laws are so powerful regarding the confiscation of suspected drug dealers' wealth that you could find yourself in a protracted legal battle to get back the money that belongs to you. You want to avoid attracting the attention of bank tellers or branch managers who might report to the DEA that you are withdrawing large sums of cash.

Secondly, when everyone around you is impoverished and hungry, it's very prudent to keep your

own wealth out of sight. A desperate man will go to extremes to feed his family and keep them sheltered and warm; a hungry man will do what is necessary to procure food. Someone who flashes a lot of cash is courting danger.

Get your cash in tens and twenties and a few fifties. If you receive any crisp new bills, stop off at a convenience store and buy a candy bar or something, hand the clerk a new bill and you will receive older, worn bills in change. Afterwards, anyone with brand new money may invite envy as a hoarder or may become a target for robbers. You want to avoid attracting attention to yourself both now and then.

You will need ones and fives after a disaster, but it's too noticeable to cash a large check and ask for a lot of very small bills.

Coins

You will also need coins. Gold and silver might be useful during the rebuilding stage several years after the crisis, but for the first couple of years, ordinary dimes and quarters, nickels and pennies will be the most easily traded form of money. In a massive deflation, which is what a financial crash would create, real hard money becomes far more valuable. A loaf of bread that costs \$1.25 today may cost 5 cents afterwards assuming there's any bread to be had. People are completely used to ordinary pocket change coins, so that's what they will most readily accept for local transactions—and I believe nearly all transactions will be local after a major national disaster.

You need to start saving up a coin stash. Once a month or so, take a few \$20 bills to a bank in which you do not have an account and trade them for rolls of quarters or dollar coins. Any bank will exchange paper for coins without question.

Gold And Silver

Gold and silver coins are real money, based on their standard precious metal content; they have always been a historical refuge in times of crisis and because of increased public awareness about a possible disasters, gold and silver coins are

becoming more desirable to have. You are not interested in numismatic collectible coins; you're only interested in gold and silver coins for their precious metal content.

The cheapest way to hold silver coins is to buy pre-1965 junk silver dimes and quarters. No one knows the future value ratio of silver coins to copper-clad coins (our currently circulating ones) after a disaster, but there's no doubt that silver coins will be worth considerably more than clads once people get used to having them.

You pay a higher premium for silver dollars than you do for silver dimes and quarters but it would be wise to have some silver dollars on hand as part of your survival plan. They are bigger and more impressive looking than dimes and quarters; even though a silver dollar may have the same metal content as ten silver dimes or four silver quarters, it just looks more valuable. The alternative is to buy brand new American Silver Eagles. These are current manufacture pure Silver coins from the US Mint. Though not commonly seen in circulation, they are legal tender and worth far more than their face value.

Gold

Gold coins are the most desirable, most valuable, form of real, hard money. Gold is scarce, it does not rust or corrode, it's very beautiful to look at, it's highly desirable as jewelry, it has industrial uses, and a long, long monetary history in many cultures worldwide. It's the real deal.

Right now the price of gold is higher than it's been for 25 years, which should warn us that inflation is on the way (Inflation or the threat of inflation causes an immediate rise in the price of gold).

The best gold coins are American coins in one oz., 1/2 oz., 1/4 oz. and 1/10 oz. denominations. People have no experience with real gold money and they will probably more readily accept U.S. gold coins than foreign coins. Although the U.S. 1 oz. Liberty coin is slightly more expensive to buy than the South African Kruger

Rand, for example, when you go to spend gold, you'll find it easier to move the American coins.

Get more smaller denomination gold coins than larger ones. In other words, buy more 1/10 oz. coins than 1/4 oz. coins, and more 1/4 oz. coins than 1/2 oz. coins, etc. The reason for this is that gold is an immense store of value for its size and weight. You will not be able to go into a local flea market or general store with a one oz. gold coin and be able to buy a few loaves of bread and some local cheese. How will the store owner make change for such a high value coin? You will use the fraying paper money, followed by clad coins and then silver coins before you'll place any gold on the counter. Gold is for large purchases so a small gold coin will be of far greater use on most occasions than a larger one. Save your 1 oz. gold coins to purchase major items.

Storing Cash

Now you need to find a safe place to hide your cash. First, tell no one that you have a load of cash, except possibly your spouse, and don't tell your spouse unless you're absolutely certain of the strength of your marriage. I'm not kidding. Hard times drive people to do things they would not do ordinarily, and if the hammer hits hard as it may well do, these will be the hardest times in our country's history. If your spouse is a full and completely trustworthy celestial partner in your life, consider yourself fortunate and keep no secrets; otherwise, be careful.

If you plan to hide your cash somewhere in your house, you want to make sure to protect it from fire, so go to a Walmart or a similar discount store and buy a fireproof storage box. You should be able to get one for under \$40. It will protect your cash from burning for a half hour of direct flame. Put your paper money and your gold and silver in the box. If you fill it up, buy another one and fill that one up too. As you begin changing some of your electronic credit wealth into cash, gold and silver, your money is fully under your control. As long as you keep it safe, it will always be there for you.

Defense

"People who live in delightful, well-mannered suburbs, who never have to contest for their lives and property, often fail to grasp the subtle logic of violence. It is a mistake seldom made by hardened criminals."
James Dale Davidson and Lord William Rees-Mogg in *THE GREAT RECKONING*

In a massive social collapse, most people will be able to keep only that which they can defend. This includes their lives, their homes, their food, their money, and if they're male, even their wives and perhaps their children. This is a thought that may disturb many people who are doing serious emergency planning; many members of our church do not have a "survivalist" background or mindset and they've never had any reason to think about physically defending that which is precious to them. A major disaster may change all that, just as it may change nearly everything else in the world for those living through it.

In an orderly, productive society with a stable division of labor, the harsh realities of life are not so obvious. You have laws that most people obey and you have professional police who enforce those laws. It's their job to defend the lives and property of the average citizen; if there's any violence to be done in that defense, the police handle that. The average person never has to consider defending what is his unless he is personally threatened by a criminal. The threat of force by the police keeps order in the society and tends to discourage aggressive criminal behavior (not always very well in today's world I'll admit). It also tends to hide a basic truth about the nature of human relations.

In a massive social collapse, law and public order break down and the truth about human rights is revealed: An individual has rights only as long as he can defend them. This is the subtle logic of violence. It has always been true but it's something to which most of us have never given a moment's thought. It's also a concept that makes some Saints uncomfortable because it contradicts much of the illusions by which we have lived all of our lives. However, unless you understand and accept this basic fact of life, you may not survive the coming challenges.

If a disaster crashes down hard upon us, it will destroy all the illusions and most of the rules we have lived by for the past hundred years or more. It will create harsh new rules. When the fundamental order of a society changes and new rules arise, those who fail to understand the new rules suffer the most.

There's a reason for the information in the above paragraphs: It may save your life. Why? Because it's not just having a weapon that's important, or even knowing how to use one; it's knowing full well why you need to use it and therefore not hesitating to use it when needed. *A gun in your hand is totally worthless against an assailant unless you're fully willing to use it to defend yourself. **You must understand that the new rules brought on by a major disaster may require you to defend your life personally.***

The information here meant for the average Saint; it's essentially one average Saint speaking to another. Most of us are not survivalists and we have not had much experience with guns. We have no particular interest in, and precious little time to learn about, exotic weapons with foreign sounding names. We need basic information about basic weapons that work dependably and don't cost a fortune.

In a bad scenario, it is not likely that things will deteriorate into some kind of violent chaos. The more likely worst case scenario is one in which there may be unrest and martial law in the urban areas and far less order than we're accustomed to everywhere (more akin to New Orleans) but nothing that resembles the Future War in *The Terminator*. Desperate people take desperate chances, the more base emotions become prominent in many people's behavior, and hunger, cold, lust, greed and fear take charge of people's actions. You probably won't have to worry about roving gangs; but your concern will be with one or two people breaking into your house for food or whatever may be available, stealing vegetables from your garden or firewood from your woodpile, etc. This is what you'll need to defend against and this is something you can handle.

The best weapon for home defense is a shotgun with a short barrel. There are three reasons why this is true. First, there is nothing scarier than looking at that big black hole at the end of the barrel of a shotgun when it's pointed at you. Second, when you fire a shotgun at close range it's impossible to miss; you're going to hit what you're aiming at. Third, when you hit someone with a shotgun, he doesn't get up and come at you. A short barrel gun is easier to handle than one with a long barrel.

There are several good basic shotguns on the market. One of the best is a 12 gauge Remington pump 870 Express Magnum with an 18" barrel. It's not fancy and it's not pretty but it will do the job. As someone told me not long ago, just hearing the unmistakable click of a pump shotgun being cocked will scare off most intruders. The Remington costs about \$250 new. Mossberg also makes a good pump 12 gauge, along with several other manufacturers. If there is a good gun shop in your area, stop by and look at what's available. Ask questions; most gun shop employees are very knowledgeable and willing to share that knowledge with you.

The other useful weapon for home or personal defense is a handgun. Although an automatic shoots faster and loads quicker than a revolver, it is a more complex mechanism and may jam occasionally, whereas a revolver almost never jams. Also for a novice, a revolver is less intimidating to hold and shoot. Maybe it's all those Roy Rogers and Gene Autry movies, but somehow a revolver just seems more familiar to someone who is not used to guns.

The best revolver to have is a .357 magnum with a 4 inch barrel. It can fire both .38 and .357 shells (use the .38 ammo for practice because it's cheaper than the .357). A .357 is powerful enough to kill or seriously injure an assailant and it's common enough to be affordable. I'd stick to a well-known brand such as a Smith & Wesson. Taurus makes a good handgun that is less expensive than the very top names. Again, ask at the gun shop.

If the gun is for a small female, the .357 may be

too heavy and awkward to use effectively. In that case a .38 or even a .32 may be a better choice. Remember that a smaller caliber weapon does not have the stopping power of a larger one, so if you have to shoot someone to defend yourself, keep shooting until you empty the gun. Once you've wounded someone, he's going to try to kill you if he possibly can, so you don't want to inflict a minor wound; you must stop him!

No matter which guns you get, be sure to get lots of ammunition. Any ammo you don't use or need could be a great trade item after a disaster. Walmart generally has good prices on ammunition. Gun shows are always a good place to shop for ammo deals.

If you know someone who has a good bit of knowledge and experience with guns, get him to teach you how to shoot safely. It is a terrible mistake to have a gun and not know anything about proper shooting and gun safety. If there is a gun course offered in your area, take it; ask about this at your local gun shop.

Be sure to keep your guns away from your children! Put them where you can get to them quickly if needed but in a place to which they don't have access. There are lockable gun boxes on the market that are quick to get into if you know how, but impossible for a child to open; again, ask at the gun shop.

Finally, there is a cardinal rule about guns that should always be kept in mind:

Never point a gun at someone unless you are completely willing to shoot.

If your assailant senses hesitancy, he'll move quickly and take the gun away from you. Your life may depend upon this so it's essential to accept it completely. Go back and read the opening paragraphs above.

In a disaster the rules have changed; understand that and you will survive; fail to understand that and you will perish.

Clothing

Clothing is something that is not considered often enough by Latter Day Saints in planning for a disaster. You'll find many chat room and discussion board references to food, water, housing, etc., but very few references to clothes. Yet finding suitable clothing will be a very real concern in a long term disaster..

Clothes wear out or your kids grow out of them. In these normal times, you just drive to the mall or Walmart or wherever and buy what you need. There's always plenty available. This might not be true after a major disaster. It takes factories to make clothes; it takes international trade, a reliable banking system, dependable distribution systems, accurate billing systems, sophisticated telecommunications, the power grid, computers, computers, computers! Even in a less than worst case scenario, there will definitely be problems in some or all of these areas. If you want to have clothes for your family in 2006 or later, you will need to get them now.

If you have children, this will take some thought. Will the clothes your oldest child wears become too small before they can be worn out, which means they can be handed down to younger siblings, or has your oldest essentially finished growing? Do you have boys or girls or both? Boys tend to wear out their clothes sooner than girls. Do you live in a cool northern area or a warmer southern one? The best way to figure out your family's clothing needs is to pretend they have nothing whatsoever to wear and you have been given the job of outfitting the entire family from underwear to topcoat. Actually you have been given this job, just not all at once. A disaster changes all that as it changes so many things. The bright side is that you can forget about getting them what's fashionable this year. No one will have the slightest interest in fashion after a disaster ; we'll all be too concerned with getting enough food and keeping warm.

We don't know how long the really nasty times will be. I'm planning on at least 1 year of chaos followed by a couple years of rebuilding. This seems reasonable to me based on what I've learned about a large scale disaster. If you agree with this estimate, you'll need to have *at least* two full years of clothes for your family. I'm thinking in terms of three years of clothes just to be sure. Since you already have clothes for everyone, you have part of this job done. You may have three years worth of clothes for your family in your house right now. The only really tricky part is allowing for growth if you have children.

Make a list with each family member on it and write down what each one needs, beginning with the oldest child. If

the oldest still has some growing to do, figure that there will be hand-me-downs available to younger siblings. Allow at least five long sleeve and five short sleeve shirts per child and five pairs of pants also. The oldest male can always hand down his outgrown shirts and pants to both younger brothers and sisters. Five pairs of underpants and undershirts, five pairs of socks, two sweaters, a jacket and a heavy coat per child should be the minimum. A few dresses and skirts for the girls would be nice. As I said, you already have most of this. The only difference from your normal clothing concerns is the fact that you will need to buy clothes for growing children now instead of next year and the year after.

There may not be much joy in your children's lives for a few years—things will be so terribly different from what they're used to—so have a few nice things tucked away for them, particularly for daughters. Kids are still kids and they love an attractive surprise. There may be some local social events in your area they'd like to look nice for so plan ahead for this, which means don't take them clothes shopping with you.

Shoes may be the worst clothing problem we have. Unless there is a cobbler in your area, which is very rare these days, there will be no way to repair shoes or resole them when they're worn out. The shoe purchase procedure is the same as with your other clothing concerns: figure out what each child will need for two or three years, allowing for growth, buy it now and put it away. Each child will need several pairs of everyday shoes to play in (or work in if things get really bad), plus a pair of nicer shoes for church or whatever social occasions may occur and some sturdy boots for winter snows.

Buy in a similar manner for you and your spouse or any other adults in the family. You don't have to buy everything new for adults or children; go to thrift shops or yard sales and stock up. If you find a good source of inexpensive clothes, buy lots of things in all the average sizes. Remember that most people will not be at all prepared for a crash so any clothes you don't need will be excellent barter items.

Emergency Heating & Cooking

HEATING

Coal stores well if kept in a dark place and away from moving air. Air speeds deterioration and breakdown, causing it to burn more rapidly. Coal may be stored in a plastic-lined pit or in sheds, bags, boxes, or barrels and should be kept away from circulating air, light, and moisture. Cover it to lend protection from weather and sun.

Wood. Hardwoods such as apple, cherry, and other fruit woods are slow burning and sustain coals. Hardwoods are more difficult to burn than softer woods, thus requiring a supply of kindling. Soft woods such as pine and cedar are light in weight and burn very rapidly, leaving ash and few coals for cooking. If you have a fireplace or a wood/coal burning stove, you will want to store several cords of firewood. Firewood is usually sold by the cord which is a neat pile that totals 128 cubic feet. This pile is four feet wide, four feet high, and eight feet long. Some dealers sell wood by the ton. As a general rule of thumb, a standard cord of air dried dense hardwood weighs about two tons and provides as much heat as one ton of coal. Be suspicious of any alleged cord delivered in a 1/2 or 3/4 ton pickup truck.

For best results, wood should be seasoned (dried) properly, usually at least a year. A plastic tarp, wood planks, or other plastic or metal sheeting over the woodpile is useful in keeping the wood dry. Other types of fuels are more practical to store and use than wood or coal.

Newspaper logs make a good and inexpensive source of fuel. You may prepare the logs in the following manner:

Use about eight pages of newspaper and open flat. Spread the stack, alternating the cut sides and folded sides.

Place a 1" wood dowel or metal rod across one end and roll the paper around the rod very tightly. Roll it until there are 6-8 inches left to roll, then slip another 8 pages underneath the roll. Continue this

procedure until you have a roll 4-6 inches in diameter. With a fine wire, tie the roll on both ends. Withdraw the rod. Your newspaper log is ready to use. Four of these logs will burn about 1 hour.

Propane is another excellent fuel for indoor use. Like kerosene, it produces carbon dioxide as it burns and is therefore not poisonous. It does consume oxygen so be sure to crack a window when burning propane.

Propane stores indefinitely, having no known shelf life. Propane stoves and small portable heaters are very economical, simple to use, and come the closest to approximating the type of convenience most of us are accustomed to using on a daily basis.

The storage of propane is governed by strict local laws. In this area you may store up to 1 gallon inside a building and up to 60 gallons stored outside. If you store more than these amounts, you will need a special permit from the fire marshal.

The primary hazard in using propane is that it is heavier than air and if a leak occurs it may "pool" which can create an explosive atmosphere. Furthermore, basement natural gas heating units CANNOT be legally converted for propane use. Again, the vapors are heavier than air and form "pockets." Ignition sources such as water heaters and electrical sources can cause an explosion.

White gas (Coleman fuel). Many families have camp stoves which burn Coleman Fuel or white gasoline. These stoves are fairly easy to use and produce a great amount of heat. However, they, like charcoal, produce vast amounts of carbon monoxide. **NEVER** use a Coleman Fuel stove indoors. It could be a fatal mistake to your entire family.

Never store fuels in the house or near a heater. Use a metal store cabinet which is vented on top and bottom and can be locked.

Kerosene (also known as Range Oil No. 1) is the cheapest of all the storage fuels and is also very forgiving if you make a mistake. Kerosene is not as

explosive as gasoline and Coleman fuel. Kerosene stores well for long periods of time and by introducing some fuel additives it can be made to store even longer. However, do not store it in metal containers for extended time periods unless they are porcelain lined because the moisture in the kerosene will rust through the container causing the kerosene to leak out.

Most hardware stores and home improvement centers sell kerosene in five gallon plastic containers which store for many years. A 55 gallon drum stores in the back yard, or ten 5 gallon plastic containers will provide fuel enough to last an entire winter if used sparingly.

Caution: To burn kerosene you will need a kerosene heater. There are many models and sizes to choose from but remember that you are not trying to heat your entire home. The larger the heater the more fuel you will have to store. Most families should be able to get by on a heater that produces about 9,600 BTUs of heat, though kerosene heaters are made that will produce up to 25,000 to 30,000 BTUs. If you have the storage space to store the fuel required by these larger heaters they are excellent investments, but for most families the smaller heaters are more than adequate. When selecting a kerosene heater be sure to get one that can double as a cooking surface and source of light. Then when you are forced to use it be sure to plan your meals so that they can be cooked when you are using the heater for heat rather than wasting fuel used for cooking only.

When kerosene burns it requires very little oxygen, compared to charcoal. You must crack a window about 1/4 inch to allow enough oxygen to enter the room to prevent asphyxiation. During combustion, kerosene is not poisonous and is safe to use indoors. To prevent possible fires you should always fill it outside. The momentary incomplete combustion during lighting and extinguishing of kerosene heaters can cause some unpleasant odors. To prevent these odors from lingering in your home always light and extinguish the heater out of doors. During normal operation a kerosene heater is practically odorless.

Charcoal. Never use a charcoal burning device indoors. When charcoal burns it is a voracious consumer of oxygen and will quickly deplete the

oxygen supply in your little “home within a home.” Furthermore, as it burns it produces vast amounts of carbon monoxide which is a deadly poison. If you make the mistake of trying to heat your home by burning charcoal it could prove fatal to your entire family. Never burn charcoal indoors.

Cooking

To conserve your cooking fuel storage needs always do your emergency cooking in the most efficient manner possible. Don't boil more water than you need, extinguish the fire as soon as you finished, plan your meals ahead of time to consolidate as much cooking as possible, during the winter cook on top of your heating unit while heating your home, and cook in a pressure cooker or other fuel efficient container as much as possible. Keep enough fuel to provide outdoor cooking for at least 7-10 days.

It is even possible to cook without using fuel at all. For example, to cook dry beans you can place them inside a pressure cooker with the proper amount of water and other ingredients needed and place it on your heat source until it comes up to pressure. Then turn off the heat, remove the pressure cooker and place inside a large box filled with newspapers, blankets, or other insulating materials. Leave it for two and a half hours and then open it, your meal will be done, having cooked for two and a half hours with no heat. If you don't have a large box in which to place the pressure cooker, simply wrap it in several blankets and place it in the corner.

Store matches in waterproof airtight tin with each piece of equipment that must be lit with a flame.

Sterno fuel, a jellied petroleum product, is an excellent source of fuel for inclusion in your back pack as part of your 72 hour kit. Sterno is very light weight and easily ignited with a match or a spark from flint and steel but is not explosive. It is also safe for use indoors. A Sterno stove can be purchased at any sporting goods store and will retail between \$3 and \$8, depending upon the model you choose. They fold up into a very small, compact unit ideal for carrying in a pack. The fuel is readily available at all sporting goods stores and many drug stores. One can of Sterno fuel, about

the diameter of a can of tuna fish and twice as high, will allow you to cook six meals if used frugally. Chafing dishes and fondue pots can also be used with Sterno.

Sterno is not without some problems. It will evaporate very easily, even when the lid is securely fastened. If you use Sterno in your 72 hour kit you should check it every six to eight months to insure that it has not evaporated beyond the point of usage. Because of this problem it is not a good fuel for long-term storage. It is a very expensive fuel to use compared to others fuel available, but is extremely convenient and portable.

Coleman fuel (white gas), when used with a Coleman stove is another excellent and convenient fuel for cooking. It is not as portable nor as lightweight as Sterno, but produces a much greater BTU value. Like Sterno, Coleman fuel has a tendency to evaporate even when the container is tightly sealed so it is not a good fuel for long-term storage. Unlike Sterno, however, it is highly volatile; it will explode under the right conditions and should therefore never be stored in the home. Because of its highly flammable nature great care should always be exercised when lighting stoves and lanterns that use Coleman fuel. Many serious burns have been caused by carelessness with this product. Always store Coleman fuel in the garage or shed, out of doors.

Charcoal is the least expensive fuel per BTU that the average family can store. Remember that it must always be used out of doors because of the vast amounts of poisonous carbon monoxide it produces. Charcoal will store for extended period of time if it is stored in air tight containers. It readily absorbs moisture from the surrounding air so do not store it in the paper bags it comes in for more than a few months or it may be difficult to light. Transfer it to airtight metal or plastic containers and it will keep almost forever.

Fifty or sixty dollars worth of charcoal will provide all the cooking fuel a family will need for an entire year if used sparingly. The best time to buy briquettes inexpensively is at the end of the summer. Broken or torn bags of briquettes are usually sold at a big discount. You will also want to

store a small amount of charcoal lighter fluid (or kerosene). Newspapers will also provide an excellent ignition source for charcoal when used in a funnel type of lighting device.

To light charcoal using newspapers use two or three sheets, crumpled up, and a #10 tin can. Cut both ends out of the can. Punch holes every two inches around the lower edge of the can with a punch-type can opener (for opening juice cans). Set the can down so the punches holes are on the bottom. Place the crumpled newspaper in the bottom of the can and place the charcoal briquettes on top of the newspaper.

Lift the can slightly and light the newspaper. Prop a small rock under the bottom edge of the can to create a good draft. The briquettes will be ready to use in about 20-30 minutes. When the coals are ready remove the chimney and place them in your cooker. Never place burning charcoal directly on concrete or cement because the heat will crack it. A wheelbarrow or old metal garbage can lid makes an excellent container for this type of fire.

One of the nice things about charcoal is that you can regulate the heat you will receive from them. Each briquette will produce about 40 degrees of heat. If you are baking bread, for example, and need 400 degrees of heat for your oven, simply use ten briquettes.

To conserve heat and thereby get the maximum heat value from your charcoal you must learn to funnel the heat where you want it rather than letting it dissipate into the air around you. One excellent way to do this is to cook inside a cardboard oven. Take a cardboard box, about the size of an orange crate, and cover it with aluminum foil inside and out. Be sure that the shiny side is visible so that maximum reflectivity is achieved. Turn the box on its side so that the opening is no longer on the top but is on the side. Place some small bricks or other noncombustible material inside upon which you can rest a cookie sheet about two or three inches above the bottom of the box. Place ten burning charcoal briquettes between the bricks (if you need 400 degrees), place the support for your cooking vessels, and then place your bread pans or whatever else you are using on top of the cookie sheet. Prop a foil-covered cardboard lid over the open side, leaving a large crack for air to get in (charcoal needs a lot of air to burn) and bake your bread, cake, cookies, etc.

just like you would in your regular oven. Your results will amaze you.

To make your own charcoal, select twigs, limbs, and branches of fruit, nut and other hardwood trees; black walnuts and peach or apricot pits may also be used. Cut wood into desired size, place in a large can which has a few holes punched in it, put a lid on the can and place the can in a hot fire. When the flames from the holes in the can turn yellow-red, remove the can from the fire and allow it to cool. Store the briquettes in a moisture-proof container. Burn charcoal only in a well-ventilated area.

Wood and Coal. Many wood and coal burning stoves are made with cooking surface. These are excellent to use indoors during the winter because you may already be using it to heat the home. In the summer, however, they are unbearably hot and are simply not practical cooking appliances for indoor use. If you choose to build a campfire on the ground outside be sure to use caution and follow all the rules for safety. Little children, and even many adults, are not aware of the tremendous dangers that open fires may pose.

Kerosene. Many kerosene heaters will also double as a cooking unit. In fact, it is probably a good idea to not purchase a kerosene heater that cannot be used to cook on as well. Follow the same precautions for cooking over kerosene as was discussed under the section on heating your home with kerosene.

Propane. Many families have propane camp stoves. These are the most convenient and easy to use of all emergency cooking appliances available. They may be used indoors or out. As with other emergency fuel sources, cook with a pressure cooker whenever possible to conserve fuel.

By Greg Pope.

EMERGENCY LIGHTING

Should there be a temporary lapse in electrical power, alternative sources of lighting must be stored in advance. Before the event, this is relatively inexpensive and easy. After the event, it becomes very difficult, perhaps impossible.

In most emergencies with a several day time span (hurricanes, ice storms, etc.) battery operated lighting will often see us through. However, with a major emergency the duration can be much greater. There are many products on the market that will serve well for these longer emergencies.

There are now several solar products that can provide lighting, even after cloudy days. There are solar lanterns, solar flashlights, even solar battery chargers. The solar walkway lamps that line outdoor paths are available in home centers. These can be brought in at night to provide ambient lighting. Solar photovoltaic panels or wind generators, hooked to batteries, can provide lighting and cost as little as \$100 per light. With solar or wind, once the power is restored, you still have free, non-polluting lighting.

Kerosene lanterns and gas lanterns are common choices. With these be sure you have enough fuel stored safely away from the house. Gas lantern are very noisy but give off lots of heat. Kerosene lanterns can smell but scented fuel is available.

Candles should not be ruled out. However, common decorative candles have a short life. Emergency candles can have up to 100 hours of burn time and an indefinite shelf life. Be sure to have a good quality fire extinguisher in each room where candles, kerosene and gas are being used. Most of the alternatives require a fire or flame, so use caution. More home fires are caused by improper usage of fires used for light than for any other purpose. Especially use extra caution with children and flame. Teach them the proper safety procedures to follow under emergency conditions. Allow them to practice these skills under proper adult supervision now, rather than waiting until an emergency strikes.

Cyalume sticks are the safest form of indoor lighting available but very few people even know what they are. Cyalume sticks can be purchased at most

sporting goods stores for about \$2 per stick. They are a plastic stick about four inches in length and a half inch in diameter. To activate them, simply bend them until the glass tube inside them breaks, then shake to mix the chemicals inside and it will glow a bright green light for up to eight hours. Cyalume is the only form of light that is safe to turn on inside a home after an earthquake. One of the great dangers after a serious earthquake is caused by ruptured natural gas lines. If you flip on a light switch or even turn on a flashlight you run the risk of causing an explosion. Cyalume will not ignite natural gas. Cyalume sticks are so safe that a baby can even use them for a teether.

Two-Mantle Gas Lantern

A gallon of Coleman-type fuel utilized with a two-mantle gas lantern has a burning time of approximately 40 hours. Light output is approximately the same as a 200W light bulb. Assuming an operating or burning time of 5 hours per day, the following approximate amounts of fuel would be consumed: White gas may be substituted in some camping equipment, but read and follow the specific instructions of the equipment manufacturer. A gas lantern gives a high intensity light and lots of heat, too—though the pressurized gas delivery system is quite noisy when operating. Two-Mantle Gas Lantern Fuel Consumption

Period	Fuel Consumed per 5 Hours of use.
Day,	1 pint.
Week,	1 gallon.
Month,	4 gallons.
Year,	50 gallons.

Kerosene Lanterns

Given today's technology, a kerosene lantern seems a bit old-fashioned and out of place! However, a kerosene lantern with a 1" wick will burn approximately 45 hours per quart of kerosene, saving lots of natural resources and utilizing approximately one-fourth as much fuel as a gas lantern. Kerosene lanterns are an effective and fairly safe lighting source. There are now scented lamp oils which replace kerosene. This lamp oil is generally available in retail stores. Make sure the oil is approved for use in your lamp.

There is a difference in lighting quantity and quality, as the kerosene lantern is quite dim when compared to the two-mantle gas lantern. The light output of a kerosene lantern is comparable to a 40W-60W light bulb. As a rule of thumb, the typical kerosene lantern burns approximately 1 ounce of fuel per hour. Burning at the rate of 5 hours each day, the following approximate amounts of kero-

sene would be used:

Kerosene Lantern Fuel Consumption	
Period	Fuel Consumed per 5 Hr.
Day,	$\frac{1}{4}$ pint.
Week,	1 quart.
Month,	1 gallon.
Year,	12 gallons.

Kerosene lamps are excellent sources of light and will burn for approximately 45 hours on a quart of fuel. They burn bright and are inexpensive to operate. The main problem with using them is failure to properly trim the wicks and using the wrong size chimney. Wicks should be trimmed in an arch, a "V," an "A" or straight across the top. Failure to properly trim and maintain wicks will result in smoke and poor light.

Aladdin type lamps that use a circular wick and mantle do not need trimming and produce much more light (and heat) than conventional kerosene lamps. These lamps, however, produce a great amount of heat, getting up to 750 degrees F. If placed within 36 inches of any combustible object such as wooden cabinets, walls, etc. charring can occur. Great caution should therefore be exercised to prevent accidental fires.

The higher the elevation the taller the chimney should be. Most chimneys that come with kerosene lamps are made for use at sea level. At about 4500 feet above sea level the chimney should be about 18-20 inches high. If your chimney is not as tall as it should be you can improvise by wrapping aluminum foil around the top of it and extending it above the top. This will enable the light to still come out of the bottom portion and yet provide proper drawing of air for complete combustion. If the chimney is too short it will result in smoke and poor light. Be sure to store extra wicks, chimneys and mantles.

Tallow Candles

Tallow candles burn brighter, longer, and are fairly smoke-free when compared to wax candles. Tallow candles are generally available in specialty stores only, unless you make your own. Wax candles are available almost anywhere housewares are sold. Store tallow candles in a cool, dry location. Candles stored in the freezer will burn slower and without dripping.

Emergency Candles

There are two types of emergency candles available for camping, storage, and emergency purposes.

Candles. Every family should have a large supply of candles. Three hundred sixty-five candles, or one per day is not too many. The larger the better. Fifty-hour candles are available in both solid and liquid form. White

or light colored candles burn brighter than dark candles. Tallow candles burn brighter, longer, and are fairly smoke free when compared to wax candles. Their lighting ability can be increased by placing an aluminum foil reflector behind them or by placing them in front of a mirror. However, candles are extremely dangerous indoors because of the high fire danger—especially around children. For this reason be sure to store several candle lanterns or broad-based candle holders. Be sure to store a goodly supply of wooden matches

Save your candle ends for emergency use. Votive candles set in empty jars will burn for up to 15 hours. Non-candles (plastic dish and paper wicks) and a bottle of salad oil will provide hundreds of hours of candle light.

The type made of hardened wax in a can has the capability of utilizing several wicks simultaneously. The other type is a liquid paraffin-filled bottle with a wick for easy lighting. The liquid paraffin burns without odor or smoke. This candle has a minimum 100-hour burning time and indefinite shelf life.

Tallow Candle Burning Rate

Height	Diameter	Approximate Burning Time in Hours
6"	$\frac{1}{2}$ "	3
6"	1"	8
9"	2"	48

Trench candles can be used as fireplace fuel or as a candle for light. To make trench candles:

1. Place a narrow strip of cloth or twisted string (for a wick) on the edge of a stack of 6-10 newspapers.
2. Roll the papers very tightly, leaving about $\frac{3}{4}$ " of wick extending at each end.
3. Tie the roll firmly with string or wire at 2-4" intervals.
4. With a small saw, cut about 1" above each tie and pull the cut sections into cone shapes. Pull the center string in each piece toward the top of the cone to serve as a wick.
5. Melt paraffin in a large saucepan set inside a larger pan of hot water. Soak the pieces of candle in the paraffin for about 2 minutes.
6. Remove the candles and place on a newspaper to dry.

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2005

Emergency Electric Lighting

Electric lighting has several advantages over other types, and some drawbacks. It's more portable and safer than fire based light. It can be extremely light weight and reliable. It's major drawback is the requirement of a power source. The most portable and available power source we currently have on the market is the traditional battery.

Emergency Lights

<i>Light role</i>	<i>Minimum Recommended</i>	<i>Recommended</i>
EDC	1 per kit	1 per person and kit with spares
Low Level	2 per family	2 per family with spares
Thrower	1 per family	1 per adult
Headlamps	1 per family	1 per adult
Small Lantern	1 per family	2-3 per family
Large Lantern	1 per family	2-3 per family

Note, some lights can serve in more than one role. Especially multi level adjustable lights.

EDC

Short for Every Day Carry. These lights should be small enough that you won't mind carrying it around everywhere with you. You never know when you might need a light in an emergency. There will likely be no power and having a flashlight on you will give you additional flexibility in where you can go and when. You don't need to always always have it with you, but it's nice to have that option. Ideally it will run off a single cell, or two small cells. Having a bright mode is nice, but not essential, it can be just a low mode light, or just a high mode light. This light can also be multi role, act as a low level light and a thrower, maybe even a lantern when standing on it's tail indoors. There are some nice lights out there but they can get expensive quick. If you use flashlights be sure to use krypton or halogen light bulbs in them because they last much longer and give off several times more light than regular flashlight bulbs on the same energy consumption. Store at least two or three extra bulbs in a place where they will not be crushed or broken.

Low Level

This light is what you can get away with when traveling through known territory, around camp, through your house, a night trip to the out house/latrine, reading at home base. Conserves batteries, last a long time. Size is probably not important. This is probably the role that will see the most use, this is the easiest to find and is also the most important.

Thrower

This is your big light. You may need it for search and rescue, a security patrol around a camp site, illuminating an area a long distance away (hence the name, it "throws" light far). It probably won't be in use every day, and it will eat batteries fast so you wouldn't want to run it all the time anyway. It's likely to be a larger light and only carried when a need is anticipated. Probably the least important, but when you need it you need it.

Headlamp

This light will be used for night work or work in the dark where you need both hands free. If you've ever tried to do the dishes by hand, without power, or any other such similar task you will quickly appreciate what a headlamp can do for you. You may not have the ability to ask someone to hold a flashlight for you

as you accomplish a task. It should be reasonably small and use small batteries. It is possible to rig up a flashlight to perform this role, for example, an EDC and a holder for it in a hat. A lantern can also perform this role to a degree, however, an actual headlamp still is a good idea.

Small Lantern

Sometimes you need to light up a room to socialize or you need a small light to read by. It mostly gives light to a small group of people. Other possibilities are using a flashlight in “candle mode”, which is either with the bezel off the light exposing the lamp or just standing the flashlight on it’s tail and letting the light reflect off the ceiling.

Large Lantern

When more light is required than a small lantern provides, allows a group of people to have light in a small, usually stationary, place. Eating a meal at night, or socializing would be good examples.

Types of lamps for lights

Incandescent/Halogen/Krypton

These are not recommended for general flashlight use. They are not very durable, prone to break easily – especially when dropped. They are inefficient, consume batteries rapidly and generally get dim quite quickly with use. Really they are only suitable for use in a thrower type of light, and even then should probably be avoided due to their fragility.

LED

These are excellent for most all uses, more efficient than incandescent/halogen bulbs. Highly durable and only get more efficient as batteries deplete. You get what you pay for with these lights, really nice flashlights can be had. Do some research and get what fits inside your budget and meets your needs. They are getting better every year. Regulated lights are more efficient than the cheaper lights with resistors. As of July 2006, I have in my hands high power production LEDs that are just as efficient as Fluorescents (finally!). So in 4 to 6 months I expect them to be on the shelves. Unfortunately they are expensive currently, this will change with time.

Fluorescent

Probably the best choice for large lanterns on a budget. Last a reasonably long time, they are not very expensive so you should own a few. The major drawback is they cannot be dimmed to save power, and don’t work so well in cold weather.

Self Powered Lights

These are generally not recommended for several reasons. They are usually bulky and prone to mechanical failure. This is especially true since they are very cheaply made, making them more of a novelty item than actually useful. If you’re really interested in these, I would recommend a shake light. They appear quite durable, the mechanical part is only a loose magnet that goes back and forth inside a sealed container. Not prone to breakage, though the light level is low. Be aware that there have been reports of shake lights on the market that have coin cell batteries in them, they look nice and bright when you pick them up. Once the batteries die (a few hours) they run on shake power which is nowhere near as bright as the batteries were.

Solar lights are nice, but I would first buy a solar battery charger and not have to carry the bulk of a solar cell around with me when using the light. Internally a solar light is going to have a battery anyway.

Self powered lights can probably only fill the role of a low level light.

A short course in Battery Chemistries

Primary Cells (single use, disposable cell)

The most common primary cells are Heavy-Duty and Alkaline, Lithium primary cells are also available but they can't always be used in devices that normally take Alkaline and Heavy-Duty batteries. Pure Lithium battery cells put out 3.0 volts rather than the normal 1.5. This requires either a different bulb or a "dummy" empty cell to be used to keep the overall voltage correct. But there are also new low voltage 1.5v Lithium batteries as well.

Rechargeable Cells (multi use cells)

The most common today are probably NiMH cells. NiCd is an older technology. Lithium-ion is a newer technology, though it differs significantly from the more common cells.

<i>Cell Type</i>	<i>Shelf Life</i>	<i>Capacity</i>	<i>Sizes Available</i>	<i>Cycles</i>	<i>Cold Weather</i>
Heavy-Duty	8+ Years	Low	AAA, AA, C, D, 9V	1	Poor
Alkaline	8+ Years	Medium	AAA, AA, C, D, 9V	1	Poor
Lithium (Primary)	15+ Years	High	AAA, AA , C, D	1	Excellent
NiCd	3 Months	Med-Low	AAA, AA, C, D, 9V	1-2K	Good
NiMH	2 Months	Medium	AAA, AA, C, D, 9V	500-800	Poor
Lithium-ion	6 Months	High	R123A, other related sizes	300-500	Excellent

This table is a quick reference to some general comparisons of various cell types.

Other general notes on various cell types. Shelf Life improves if you store the batteries in a cooler environment. After a rechargeable battery loses its charge due to shelf life, a simple recharge will put you back in business. Cold weather is defined as sub-freezing temperatures, and all cell types that got a "poor" rating can be warmed up in a pocket, put in an appliance and be expected to work again until they get too cold.

Battery cells should be treated like fuel. Take care of them, do not get them wet, do not throw them in fires, try not to drop them or get them banged up and they should be quite safe. Get water proof carry cases for your kits for them. You probably shouldn't store cells in devices if they are going to be packed away. If you store quantities of Lithium batteries in a house they should be stored in a fire proof box with vent holes drilled into a side of the box as a safety precaution (do not place vent holes near flammable objects). Do not store them in a tent. Don't get paranoid about Lithiums, you probably use them every day in devices like a cell phone, but you've probably hear a story or two of "exploding" batteries. What they really do is "vent rapidly with flame" (quite rare), use caution and don't buy knock offs.

Primary cells should be in your emergency kits as well as a small reserve for extended on the go emergencies, rechargeable cells will be more useful in a longer term emergency when you can settle down a bit but power still doesn't exist. AA cells are the most available with the best prices, adapters can also be found to make them fit into devices that use C and D batteries. AA rechargeable also don't require nearly as long as D cells to recharge.

Heavy Duty (Single use, Disposable)

Poor, not recommended. Cheap lights come with these batteries, it should also be taken as a sign that the light manufacture has cut every conceivable cost in the production and shipping of his light. Avoid them.

Alkaline (Single use, Disposable)

Good value. Costs are very reasonable, just stay away from poor brands as they are likely to leak and damage your devices and the residue is usually toxic. Duracell, Energizer, Rayovac, and most store-brand names are fine (Costco, Rite-aid). Stay away from Western Family and unknown brands.

Lithium (Single use, Disposable)

Expensive, but great cold weather performance for a primary cell, highest energy density. It would be good to have a few of these around for AA devices. Also in cases where weight, size, and capacity is more of an issue than cost.

NiCd (Rechargeable)

Most durable type of rechargeable cell. There is a reason that in an era of NiMH and Li-ion batteries power tools and other such items that see regular hard use still use NiCDs. You can expect these cells to give you 5 years of use from the date of manufacture, if you care for them. And they do require care, suck them dry once every month or two and they'll hold out the longest. For longer term storage, put them in a cool place at about half charge. Not a bad value, good cold weather performance without a high cost. I would have some of these if you plan on using a standard rechargeable. Toxic, please use care when disposing of these cells.

NiMH (Rechargeable)

Best value and convenience, an excellent value for what you receive with these batteries. They don't hold a charge long on the shelf but for regular battery use, they can't be beat. Some newer cells are available with a low self-discharge property at slightly reduced capacity (see Sanyo Eneloop or Titanium Enduro cells). They don't like the cold very much, so if it's cold outside you can put a flashlight in your pocket where it'll be warmer. Expect up to 3 years effective use from the date of manufacture, longer is possible but probably at reduced performance as the cell deteriorates.

Lithium-Ion (Rechargeable)

Rather exotic and requires special care and attention. Special chargers are required, only really an option when you have a larger power source available to charge off of, like a car or off grid electrical system, or if you know how to build your own solar system to run the charger. Good cold weather performance, good power density (superior to even NiMH). However they deteriorate rapidly with time. Even 1 year will see reduced performance. You've probably noticed this with your cell phone and laptop computer batteries. Not the best long term option.

Lead Acid

Lowest self discharge of the rechargeable cells. Also the cheapest per unit of power. However they are also the least portable being the bulkiest. They can work well for area lighting and lanterns. Also for recharging smaller cells.

Once you have a good idea what you want and have acquired a few items. Run a family home evening off your battery devices only. Spend 1, 2, or even 3 days without the grid electric lights, learn what your needs are and use this information to fill them.

2005 Brandon Mansfield

EMERGENCY SHELTER

In survival as in all aspects of life, it is easier to be organized if we prioritize. The priorities, in order,

are shelter, water, heat, food, signal, and utility. You can live 4-6 weeks without food; 3-5 days without water; but hypothermia will kill you in 30 minutes. Therefore shelter is the first priority!

Shelter may be defined as anything that protects the human element from nature's elements. I will not discuss clothing here, other than to say that a good coat can't be beat, and it is easier to survive in the summer with winter clothes than in the winter with summer clothes.

What You Need

A free-standing dome or A-frame tent is the only realistic option for a mobile shelter in a short-term emergency preparedness kit. There are several things to be aware of in selecting a tent. Construction should be of good quality, breathable materials. The rain fly should extend from the apex of the tent almost to the ground. A small rain fly like those found on many discount shelf specials is unsuitable, because it means the

tent walls are made mostly of waterproof material. The human body passes 1-2 quarts of water vapor daily and if you are in a waterproof tent for an extended period of time that water vapor will condense on the walls. It is for this very reason that tube tents should be avoided like the plague.

A heavy-duty space blanket is recommended to put under the tent in order to protect the tent floor. It is much easier and cheaper to replace a \$12 space blanket than a \$100 tent. Avoid the pocket space blanket—another plague! Their usefulness is limited and they breed a false sense of security. **A sleeping bag** is the most critical piece of survival equipment you can possess, especially in winter. Fires are only 50% effective. You cook your front side while your buns freeze, or your toast your buns and your nose freezes—you just can't win! In a sleeping bag, however, you can efficiently maintain body heat.

A good sleeping bag will have the capability to form a hood. It will have a sizable draft tube along the length of the zipper to prevent snags. Another important feature is the ability to zip two bags together to share body heat or to put a child between parents. Select a synthetic insulation rather than down. Qualofill, Polarguard and some of the new materials recently released are excellent. The advantage of synthetic insulation is that when the bag gets wet, it can be wrung out and will still keep you warm. When down gets wet, the insulation

value drops to nearly nothing. Emergency survival situations rarely occur on warm sunny days, and you can just about bet it will be on a dark, rainy or snowy night when the world comes apart.

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An absolute must in a temperate climate is **a sleeping pad**. Ground cold can suck the heat right out of your body, through your sleeping bag. A closed-cell foam pad will provide the insulation required, but will give little if any comfort. An air mattress of the type you take to the beach or swimming pool will freeze your whole persona during the winter. For true comfort an air mattress such as Thermarest is expensive but worth every cent. For economy, a simple 3/4-length closed cell foam pad is all that you need. Avoid open-cell pads because they soak up water just like a sponge.

In putting together a good short-term preparedness kit, you may think it necessary to initially purchase items that are of inferior quality. Perhaps so, but at the first opportunity the higher quality equipment should be purchased. There is no economy in going second class. Tents and sleeping bags are expensive and should be considered a serious investment. After all, your life and the lives of your family are in the balance!

By Larry Bethers,

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THE SUPPLY TABLE (Master Preparedness List)

This list is based on a **family of two/three adults and two/three children** that want to take their preparedness beyond the simple 96 hour kits and become more fully prepared for whatever may come. The items within each category are listed by "Purchase Priority". The quantities listed are for a 30 day to one-year crisis. Because some items are impossible to store indefinitely or it would not be cost-effective to store the quantities necessary to maintain our current lifestyle, it is assumed that alternate sources or substitutes will be found or changes in lifestyle will occur if the crisis lasts over one year. Quantities could be adjusted for other estimated lengths of crisis.

There are 3 major groupings that are based on the duration of the "Crisis", 30 Days, 90 Days and 1 Year. (*I know the list looks daunting at first glance, but just focus in on one group at a time*). Within each of these three durations, items are prioritized. It should be your goal to Obtain all of the "30 Day" items in sequence from Priority 1 to 3, by April 1st. Then move onto your "90 Day" items in the same manner obtaining them by July 1st, and finally onto your "1 Year" items by October 1st. This will allow you to build up your preparedness in stages, 30 Days first (as these items would be needed in EVERY scenario) 90 Days second (as they build on the 30 day list), and finally your 1 Year equipment that rounds out your preparations.

The purchase priority is **not** how important the item is. I believe everything on this list is important. The purchase priority is how soon the item should be purchased *to avoid shortages should other people decide to start "stocking up" on the same items*. I firmly believe that there will be a wake up call for a lot of people. A priority "1" item should be purchased ASAP. A priority "2" item should be purchased before most people figure out what is going on. Priority "3" items should be available until later. These are common household items which should be manufactured and shipped right up until the last minute. The purchase date is my guideline of when to make purchases. Items with a "Last minute" listing are perishable and you want as long a shelf life as possible. Signs of shortages or panic should be watched closely to avoid missing out on these items. The final three columns indicate whether I think the item would be necessary for a 1 month, three month, one year to indefinite crisis.

Clothing

Keep in mind that a crises will likely be during the winter and adjust this list for your climate. Warm, Waterproof, Windproof clothing. Think *Wool, Gore-Tex, Polarfleece, Polypro, Thinsulate. Avoid Cotton!*

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Bandanas	24 each	3		
<i>(inexpensive shield face, head cover, wash cloth, bandage, sanitary pad)</i>				
Balaclava	1/person	3	4-1-08	30 Day
Boots	2/person	2	4-1-08	30 Day
Boots, (insulated)	1/person	2	4-1-08	30 Day
Bra athletic	2/female	3	4-1-08	30 Day
Clothes line	100 ft	3	4-1-08	30 Day
Clothes pins	250	3	4-1-08	30 Day
Clothes Wringer (hand crank)	1	2	7-1-08	90 Day
Coats	1/person	2	4-1-08	30 Day
Hats	1/person	3	7-1-08	90 Day
Iron-on patches.	2 packages	3	4-1-08	30 Day
Laundry detergent	5 (5gal)	3	4-1-08	30 Day
Long sleeve shirt/high collar	5/person	3	4-1-08	30 Day
Long underwear	3/person	2	4-1-08	30 Day
Needles	Assortment	3	7-1-08	90 Day
Non-electric washing machine	1	1	4-1-08	30 Day
Jean Pants	6/person	3	4-1-08	30 Day
Rain Parka/Rain Pants	2/person	2	4-1-08	30 Day
Safety pins	Assortment	3	7-1-08	90 Day
Sewing patterns	Assortment	3	10-1-08	1 Year

Sewing supplies	Assortment	2	4-1-08	30 Day
Shirts	6/person	3	4-1-08	30 Day
Shoelaces	20	3	7-1-08	90 Day
Snow Jacket	1/person	3	4-1-08	30 Day
Socks heavy	12/person	3	4-1-08	30 Day
Stove iron	1	1	7-1-08	90 Day
Sweats/nightclothes	2/person	3	4-1-08	30 Day
Tennis Shoes	2pair/person	3	4-1-08	30 Day
Thread	Assortment	3	7-1-08	90 Day
Underwear	12/person	3	4-1-08	30 Day
Wash board	2	1	7-1-08	90 Day
Wash tub	2	1	7-1-08	90 Day
Winter gloves	1/person	2	4-1-08	30 Day
Work Gloves	3	2	7-1-08	90 Day
Zippers and buttons	Assortment	3	4-1-08	30 Day

Communications

The phone/address books are of friends and family so that you can look them up after the worst has passed. If phones are not working you may have to travel to their home to check on them.

*Keep these items in waterproof containers. Many survival and camping stores sell flat, water tight pouches. If you have a food vacuum sealer, this is another great use for it!

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Addresses of friends/family	1 set			
CB Radio	1	2	4-1-08	30 Day
Cell phone				
Frequency lists/books	1	2	7-1-08	90 Day
Map of your local area	2	2	4-1-08	30 Day
Phone numbers of friends/family	1 set			
Pre-addressed, stamped postcards	1 set			
Radio (hand cranked)	1	1	4-1-08	30 Day
Road Flares	8	3	7-1-08	90 Day
Short-wave Radio	1	1	7-1-08	90 Day
Signal Flares	12	2	7-1-08	90 Day
Signal Mirror	1/person	3	7-1-08	90 Day
Signal Whistle	2/person	3	7-1-08	90 Day

Documents

bank account numbers,	Now	30 & 90 & Year
birth, death, marriage certificates and divorce decrees,	Now	30 & 90 & Year
charge card account numbers, "lost or stolen" notification numbers	Now	30 & 90 & Year
deeds and contracts,	Now	30 & 90 & Year
house and life insurance policies,	Now	30 & 90 & Year
inventory of valuable household items,	Now	30 & 90 & Year
medical records including immunizations	Now	30 & 90 & Year
passports, where pertinent for each family member	Now	30 & 90 & Year
social security numbers	Now	30 & 90 & Year
stocks and bonds	Now	30 & 90 & Year
Vaccination records	Now	30 & 90 & Year
wills	Now	30 & 90 & Year

Entertainment & Education

Disasters may provide excellent opportunities to share Christ with others so extra scriptures would be a good thing to have.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration	
Bible & scriptures	1/person	3	4-1-08	30 Day	
Bibles & BOM	6	1	4-1-08	30 Day	
Board Games	1 set	3	4-1-08	30 Day	
Books for pleasure reading	Many	3	4-1-08	30 Day	
Book on Edible plants	1	3	10-1-08		1 Year
Card game book	1	3	4-1-08	30 Day	
Cards	4 sets	3	4-1-08	30 Day	
Crayons	2	3	4-1-08	30 Day	
Domino game book	1	3	4-1-08	30 Day	
Dominoes	1	3	4-1-08	30 Day	
Erasers	10	3	4-1-08	30 Day	
Home School Curriculum	1/child	2	10-1-08		1 Year
How to books	Many	1	7-1-08	90 Day	
Hoyle game rule book	1	3	4-1-08	30 Day	
Magnifying Glass	1 each	3	4-1-08	30 Day	
Non-electric pencil sharpener	2	3	4-1-08	30 Day	
Paper	100 pads	3	4-1-08	30 Day	
Paper Clips, assorted sizes	1 box	3	4-1-08	30 Day	
Pencils	100	3	4-1-08	30 Day	
Pencil Sharpner	2	3	7-1-08	90 Day	
Pens	50	3	4-1-08	30 Day	
Reference books		1	7-1-08	90 Day	
Rubber Bands, assorted sizes	1 box	3	4-1-08	30 Day	
Safety Pins, assorted sizes	1 box	3	4-1-08	30 Day	
Toys		3	4-1-08	30 Day	

First Aid Supplies

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration	
Ace bandage	5	3	4-1-08	30 Day	
Band aids	6 large assort	3	4-1-08	30 Day	
Band aids Finger tip	1 large box	3	4-1-08	30 Day	
Band aids Knuckle	1 large box	3	4-1-08	30 Day	
Bandages (Ace) elastic, 4"	2	3	4-1-08	30 Day	
Bandages, gauze, 2", 3", 4"	4 boxes	3	4-1-08	30 Day	
Bandages, gauze, 18" x 36"	1	3	4-1-08	30 Day	
Bandages, burns (Second Skin)	1 box	2	4-1-08	30 Day	
Bandages Triangular	3	3	4-1-08	30 Day	
Birth supply kit	1	3	7-1-08	90 Day	
Burn Dressings (Burn Free)	Assorted	2	4-1-08	30 Day	
Butterfly closures/Leukostrips	1 large box	3	4-1-08	30 Day	
Cold/heat Pack, instant	5 each	3	4-1-08	30 Day	
Cold/heat Pack, reusable	1	3	4-1-08	30 Day	
Cotton Balls	1 box	3	4-1-08	30 Day	
Cotton Swabs	1 large box	3	4-1-08	30 Day	
Eyedropper	1	3	4-1-08	30 Day	
Eye pads	1 large box	3	4-1-08	30 Day	
First aid manual	1	3	10-1-08		1 Year

Gauze 2"	5 rolls	3	4-1-08	30 Day	
Gauze 3"	5 rolls	3	4-1-08	30 Day	
Latex gloves	1 box	3	4-1-08	30 Day	
SAM splint	1	3	10-1-08		1 Year
Scalpel	1 box	3	4-1-08	30 Day	
Scissors, Surgical pointed	1	3	10-1-08		1 Year
Shears	2	3	10-1-08		1 Year
Snake bite kit	1	3	7-1-08		90 Day
Space Blankets	4	3	4-1-08	30 Day	
Sterile pads 4" x 4"	1 large box	3	4-1-08	30 Day	
Sterile pads 5" x 9"	1 large box	3	4-1-08	30 Day	
Surgical tape	10 rolls	3	4-1-08	30 Day	
Thermometer	4	3	4-1-08	30 Day	
Tongue Depressors	6	3	4-1-08	30 Day	
Tweezers	4	3	4-1-08	30 Day	

First Aid, Perishables

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Alcohol	6	3	7-1-08	90 Day
Alcohol Moist Towelettes	100	3	Last minute	30 Day
Analgesic Cream (<i>Camphophenique</i>)	1 tube	2	Last minute	30 Day
Antacid (<i>Mylanta, Tums, Pepto-Bismal</i>)	1 box	2	Last minute	30 Day
Antibiotic (<i>Amoxicillin /Erythromycin/Tetracycline for general infections</i>)	1 set	2	Last minute	30 Day
Anti-Diarrheal (<i>Imodium, Diasorb, Lomotil</i>)	1 box	2	Last minute	30 Day
Anti-fungal (<i>Desenex, Micatin, Tinactin, Lotrimin</i>)	1 box	2	Last minute	30 Day
Antihistamine (<i>Benadryl, Claratyne</i>)	1 box	2	Last minute	30 Day
Antiseptic Ointment (<i>Neosporin</i>)	3 tube	2	Last minute	30 Day
Aspirin	6 (100)	3	Last minute	90 Day
Bee sting ointment	6 tubes	3	Last minute	30 Day
Bicarbonate of Soda	1 box	2	7-1-08	90 Day
Bronco Dialator (<i>Primatine Mist</i>)	1	2	Last Minute	30 Day
Burn Ointment (<i>Hydrocortisone, Derm-Aid</i>)	1 tube	2	Last minute	30 Day
Cold/Flu Tablets (<i>Nyquil</i>)	1 box	2	Last minute	30 Day
Constipation (<i>Ex-Lax, Dulcolax, Durofax</i>)	1 box	2	Last minute	30 Day
Cough Syrup (<i>Robitussen, Dimetap</i>)	1 bottle	2	Last minute	30 Day
Epsom Salts	1 box	2	7-1-08	90 Day
Eye Drops (<i>Visine</i>)	1 bottle	2	Last minute	30 Day
Eye Wash	1 bottle	2	Last minute	30 Day
Hemorrhoid Relief (<i>Preparation H, Anusol</i>)	1 tube	2	Last minute	30 Day
Hydrogen peroxide	6 bottles	3	7-1-08	90 Day
Ibuprofen (<i>Advil, Motrin</i>)	1 box	2	Last minute	30 Day

Itching, Insect/Rash (Caladril, Calamine)	1 bottle	2	Last minute	30 Day
Itching (<i>Dibucaine, Lanacane</i>)	1 tube	2	Last minute	30 Day
Lice (<i>Nix or RID Lice Shampoo</i>)	1 tube	2	Last minute	30 Day
Lip Balm (<i>ChapStick, Blistex</i>)	1 tube	2	Last minute	30 Day
Lubricant, Water Soluble (<i>K-Y Jelly</i>)	1 tube	2	Last minute	90 Day
Meat Tenderizer bites & stings	1 bottle	2	7-1-08	90 Day
Nasal Decongestant (<i>Actifed, Sudafed Sinex</i>)	1 bottle	2	Last minute	30 Day
Nausea, Motion Sickness (<i>Kwells, Dramamine, Meclizine</i>)	1 box	2	Last minute	30 Day
Non-Aspirin Pain Reliever (<i>Tylenol</i>)	1 box	2	Last minute	30 Day
Pain, Fever Reducer (<i>Panadeine, Mobigesic</i>)	1 box	2	Last minute	30 Day
Pain Reliever with Codeine (<i>Tylenol 3</i>)	1 box	2	Last minute	30 Day
Prescriptions	(as needed)	1	Last minute	30 Day
Petroleum Jelly (<i>Vaseline</i>)	1 jar	2	Last minute	30 Day
Poison Ivy/Oak (<i>Neoxyn</i>)	6 bottle	2	Last minute	30 Day
Poison Absorber (<i>Activated Charcoal</i>)	1 bottle	2	Last minute	90 Day
Soap, liquid, antibacterial	1 bottle	3	Last minute	30 Day
Sunburn Relief (<i>Solarcaine</i>)	1 can	2	Last minute	30 Day
Sunscreen (SPF 15 at least)	1 bottle	2	Last minute	30 Day
Vomit Inducer (<i>Ipecac</i>)	1 bottle	2	Last minute	30 Day
Yeast Infection Treatment (<i>Gyne-Lotrimin, Monistat</i>)	1 tube	2	Last minute	30 Day

Food Preparation

The fire place insert would ideally be designed to cook on. The fire grate is for cooking outside over an open fire. Crisco shortening is listed because it can be stored for a long time.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
1 roll Plastic Wrap				
Aluminum foil, Heavy	6 large rolls	3	4-1-08	30 Day
BBQ grill (charcoal/propane)	1	3	7-1-08	90 Day
Boning Knife	2	3	4-1-08	30 Day
Bread Loaf Pan	4	3	4-1-08	30 Day
Butcher Knife	1	3	4-1-08	30 Day
Butter churn	1	2	10-1-08	1 year
Camp Stove	1	2	4-1-08	30 Day
Can opener (hand cranked)	2	3	4-1-08	30 Day
Can Opener, heavy duty	1	3	4-1-08	30 Day
Canning books	1 set	2	7-1-08	90 Day
Cast iron cook set - (<i>Complete!</i>)	1 set	2	4-1-08	30 Day
Cheesecloth	1 roll	3	4-1-08	30 Day
Cheese press	1	2	10-1-08	1 Year
Coffee filters	100	3	4-1-08	30 Day
Coffe maker, metal	1	3	4-1-08	30 Day
Coleman metal dinner plates	1 set	2	4-1-08	30 Day
Coleman Cooler	2	3	4-1-08	30 Day

Corkscrew	1	3	4-1-08	30 Day	
Crock pot, Large	1	1	10-1-08		1 Year
Cultures	1 set	3	Last Minute	90 Day	
Dish Cloths	6	3	4-1-08	30 Day	
Dishwashing liquid	5 gal	3	4-1-08	30 Day	
Dutch Oven, small with lid	1	2	4-1-08	30 Day	
Dutch Oven, large with lid,	1	2	7-1-08	90 Day	
Fire grate	1	1	7-1-08	90 Day	
Fireplace insert	1	1	4-1-08	30 Day	
Grain mill (hand cranked)	1	1	4-1-08	30 Day	
Grater	1	3	4-1-08	30 Day	
Hot Pad	1 set	3	4-1-08	30 Day	
Kettle, huge, for boiling water	1	2	7-1-08	90 Day	
Latex disposable gloves	1 box	2	7-1-08	90 Day	
Mixing Bowl, Large	1 each	3	4-1-08	30 Day	
Mixing Bowl, Small	1 each	3	4-1-08	30 Day	
Molds	1 set	3	4-1-08	30 Day	
Napkins	10	3	4-1-08	30 Day	
Pancake Turners, metal	2	3	4-1-08	30 Day	
Paper cups	100	3	4-1-08	30 Day	
Paring Knife	1	3	4-1-08	30 Day	
Plastic knives, forks, spoons	200	3	4-1-08	30 Day	
Pressure cooker	1	2	7-1-08	90 Day	
Rennet	1	3	10-1-08		1 Year
Rubber dish gloves	4 Sets	3	4-1-08	30 Day	
Sauce Pan, large with lid,	1	3	4-1-08	30 Day	
Sauce Pan, small with lid,	1	3	4-1-08	30 Day	
Scrub pads	50	3	4-1-08	30 Day	
Skillet, large with lid,	1	3	4-1-08	30 Day	
Spoons, large metal	2	3	4-1-08	30 Day	
Spoons, Wooden	2	3	4-1-08	30 Day	
Strainer	1	3	4-1-08	30 Day	
Thermos	1/person	2	4-1-08	30 Day	
Yeast	1 box	3	Last minute	30 Day	
Yogurt culture,	1 box	3	Last Minute	90 Day	
Ziploc Bags - Sandwich	100	3	4-1-08	30 Day	
Ziploc Bags - Storage	50	3	7-1-08	90 Day	
Ziploc Freezer Bags, gallon	2 boxes	3	7-1-08	90 Day	
Ziploc Freezer Bags, quart	2 boxes	3	4-1-08	30 Day	

Food Storage

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration	
1 gal. plastic bags	300	3	7-1-08	90 Day	
Baskets/crates	24	1	10-1-08		1 year
Boiling canner	1	1	10-1-08		1 year
Bucket opener	2	1	10-1-08		1 year
Canning book	1	1	10-1-08		1 year
Canning jars	100	1	10-1-08		1 year
Canning lids	500	1	10-1-08		1 year
Canning salt	20lb	1	10-1-08		1 year
Canning supplies (Misc)	Assortment	1	10-1-08		1 year
Canning Utensils	Assortment	1	10-1-08		1 year
Colander	1	1	10-1-08		1 year

Desiccants	60 (66gm)	1	4-1-08	30 Day	
Food storage buckets	30 (5 gal)	1	7-1-08	90 Day	
Jar lifter	1	1	10-1-08		1 year
Jars	Assortment	1	10-1-08		1 year
Lids	Assortment	1	10-1-08		1 year
Mesh bags	24	1	10-1-08		1 year
Oxygen absorbers	50 (500ml)	1	7-1-08	90 Day	
Parafin Wax	5lb	1	10-1-08		1 Year
Pressure canner	1	1	10-1-08		1 year
Saucepan	2	1	10-1-08		1 year
Saucepot	3	1	10-1-08		1 year
Scale	1	1	10-1-08		1 year
Storage/garden books	Assortment	2	10-1-08		1 year
Timer	1	1	10-1-08		1 year
Tongs to remove jars	2	2	4-1-08	30 Day	
Water storage	10 (5 gal)	1	4-1-08	30 Day	
Water storage	2 (55 gal)	1	4-1-08	30 Day	
Wax for canning					

Fuel & Power

The amount of firewood will depend on your climate and the efficiency of your stove or fireplace. The kerosene is for the lamps under "General Household". Sta-bil is an additive which allows gasoline to be stored longer than normal. The barrel is to transport gasoline in if it can be purchased.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration	
Barrel (55 gal)	1	1	7-1-08	90 Day	
Charcoal	500 lb.	1	4-1-08	30 Day	
Fire starters	2	1	7-1-08	90 Day	
<i>(jelly, ribbon, tablets, impregnated peat bricks, wax-coated pine cones, magnesium block, flint)</i>					
Fire wood	10 cords	2	4-1-08	90 Day	
Fuel filter for generator	1	2	4-1-08	30 Day	
Fuel pump	1	1	4-1-08	30 Day	
Gasoline	500 gal	2	10-1-08		1 Year
Gas cans (5 gal)	6	2	4-1-08	30 Day	
Kerosene	50 gal	2	7-1-08	90 Day	
Kerosene storage barrel	1 (55gal)	2	7-1-08	90 Day	
Lighter Fluid	5 cans	2	4-1-08	30 Day	
Matches	20 (250)	1	4-1-08	30 Day	
Propane	500 gal	2	7-1-08	90 Day	
Spark plug for generator	1	2	4-1-08	30 Day	
Sta-bil	8 qt	1	4-1-08	30 Day	
Starter fluid	5 gal	1	4-1-08	30 Day	
White Gas Coleman (for campstove)	10 (1 gal)	2	4-1-08	30 Day	

Gardening

Non-hybrid seeds will reproduce true to the parent plant. Hybrid seeds may reproduce with a recessive gene. The polyethylene is for covering young plants to maintain warmth and moisture. The styrofoam cups are for coverings seedlings during late winter frosts.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration	
Black polyethylene	1	2	10-1-08		1 year
Bleach	5 gal	2	10-1-08		1 year
Clear polyethylene	1	2	10-1-08		1 year
Garden hoses	2	3	4-1-08	30 Day	

Herb Seeds	Assortment	2	10-1-08	1 year
Hoe	2	3	7-1-08	90 Day
Misters for seedlings	2	2	10-1-08	1 year
Miracle Gro		2	10-1-08	1 year
Non-hybrid seeds	Assortment	1	10-1-08	1 year
Organic fertilizers	Assortment	2	10-1-08	1 year
Perennial flowerseeds	Assortment	3	10-1-08	1 year
Pull wagon	1	3	7-1-08	90 Day
Rototiller	1	2	10-1-08	1 year
Seed starting containers	Assortment	2	10-1-08	1 year
Seed starting medium	Assortment	2	10-1-08	1 year
Thermometers	2	2	10-1-08	1 year
Soil testing equipment.	1	1	10-1-08	1 year
Sprayer/Pumper - 2 gallon size	1	3	7-1-08	90 Day
Styrofoam cups	1000	2	10-1-08	1 year
Watering can	1	2	10-1-08	1 year
Wheel barrel	2	2	10-1-08	1 year
Bug spray. Malathion, Sevin, Dursban and Diazanone. Dursban and Diazanone can have severe side effects in humans, for use outside of house, not necessarily on the garden. Fine for flower gardens. Sevin is safer to use on the vegetables.				

Hardware & Building supplies

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
A few cases of silicone caulk. (If you are like me and your carpentry isn't perfect.)				
Bolts	Assortment	3	7-1-08	90 Day
Bricks, rocks	Assortment	3	10-1-08	1 Year
Cable	100 ft	3	7-1-08	90 Day
Cable clamps	8	3	7-1-08	90 Day
Cement	10 bags	3	10-1-08	1 year
Chains and padlocks.	several	3	7-1-08	90 Day
Chicken wire, barbed wire, etc.	2 rolls	3	10-1-08	1 Year
Duct tape	10 rolls	3	4-1-08	30 Day
Extra axe handles	2	3	10-1-08	1 year
Long polls	10	3	10-1-08	1 Year
Fencing material.	Assortment	3	10-1-08	1 year
Lumber	Assorted	3	10-1-08	1 Year
Mouse traps	5	3	4-1-08	30 Day
Nails	100 lbs.	3	7-1-08	90 Day
Nuts and bolts	Assorted	3	4-1-08	30 Day
Pipe	Assorted	3	4-1-08	30 Day
Plumbing repair supplies	Assorted	3	4-1-08	30 Day
Polyethylene Black	2	3	7-1-08	90 Day
Polyethylene Clear	2	3	7-1-08	90 Day
Pulleys	4	3	7-1-08	90 Day
Rigging book	1	3	7-1-08	90 Day
Rope	Assorted	3	4-1-08	30 Day
Screws	Assorted	3	7-1-08	90 Day
Spare keys to all of your locks.	1 set	2	4-1-08	30 Day
<i>(Better yet, have them all set up to take the same key).</i>				
Spare parts for your wheelbarrow	1 set	3	7-1-08	90 Day
Spare toilet parts	1 set	3	7-1-08	90 Day
Tarps	4	3	4-1-08	30 Day
WD-40	1 gal	3	7-1-08	90 Day

Wire	Assorted	3	4-1-08	30 Day
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Household Items

The water filter is assuming you have a stream or other reliable source of water. The ni-cad batteries are rechargeable for the radio. Other batteries should be sized according to your needs.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Backpack with Frame (for Hauling)	1/person	2	4-1-08	30 Day
Batteries AA	100	1	Last minute	30 Day
Batteries AA, Ni-Cad	8	1	4-1-08	30 Day
Batteries C	20	1	Last minute	30 Day
Batteries C, Ni-Cad	8	1	4-1-08	30 Day
Batteries D	100	1	Last minute	30 Day
Batteries D, Ni-Cad	8	1	4-1-08	30 Day
Battery Charger, SOLAR	2	1	4-1-08	30 Day
Blankets	10	1	4-1-08	30 Day
Camera	1	3	7-1-08	90 Day
Camera batteries	1 set	3	Last minute	90 Day
Camera film	3 rolls	3	Last minute	90 Day
Candles 10 hour	50	1	4-1-08	30 Day
Candles 36 hour	25	1	4-1-08	30 Day
Candles 100 hour (liquid parafin)	25	1	4-1-08	30 Day
Candle holders	1 set	2	4-1-08	30 Day
Candle wax/wick	10lbs	2	7-1-08	90 Day
carpet sweeper hand operated	1	3	4-1-08	30 Day
Clocks wind up	3	3	4-1-08	30 Day
Fanny pack for short excursions	1/person	2	4-1-08	30 Day
Fire extinguishers	4	3	4-1-08	30 Day
Flashlights	5	2	4-1-08	30 Day
Flashlight bulbs	2/light	3	4-1-08	30 Day
Handwarmer, lighter fueled	1	3	4-1-08	30 Day
Kerosene Heater	2	1	4-1-08	30 Day
Kerosene lamps	4	1	4-1-08	30 Day
Kerosene lamp wicks	10	1	4-1-08	30 Day
Lighters (disposable)	50	2	4-1-08	30 Day
Light sticks (12 hour)	18	3	4-1-08	30 Day
Matches stick	20 boxes of 250	2	4-1-08	30 Day
Matches, water/windproof	5 boxes of 20	2	7-1-08	90 Day
Mosquito Netting	1 roll	3	7-1-08	90 Day
Paper towels	100	3	4-1-08	30 Day
Pet Food	as needed	3	4-1-08	30 Day
Permanent Ink Marker	2	3	4-1-08	30 Day
Propane Heater	2	2	4-1-08	30 Day
Sleeping bags	1/person	1	4-1-08	30 Day
Sleeping Bag Mattress Pads	1/person	1	4-1-08	30 Day
Tents (2 person)	2	2	4-1-08	30 Day
Trash bags	10 boxes	3	4-1-08	30 Day
Treadle Sowing Machine	1	2	7-1-08	90 Day
Walkie talkies	1 pair	1	4-1-08	30 Day
Watches	5	3	4-1-08	30 Day
Wool Blankets, heavy	2/person	2	4-1-08	30 Day

Infant Supplies

Baby Food	????	2	Last Minute	30 Day
Baby Clothes	3 sets	1	4-1-08	30 Day
Baby Powder	2 bottles	1	4-1-08	30 Day
Baby Wash	2 bottles	1	4-1-08	30 Day
Blankets	2 each	1	4-1-08	30 Day
Bottles	3 each	1	4-1-08	30 Day
Diaper Cover		1	4-1-08	30 Day
Diapers, disposable (24 count)	26 boxes	1	4-1-08	30 Day
Diaper Rash Ointment	1 bottle	1	4-1-08	30 Day
Formula	? cans	1	Last Minute	30 Day
Lotion	2 bottles	1	4-1-08	30 Day
nursing bras	1 each	1	4-1-08	30 Day
Nursing pads	4 each	1	4-1-08	30 Day
Teething Ring	1 each	1	4-1-08	30 Day
Towelettes, Pre-moistened	2 boxes	1	4-1-08	30 Day
Toys	As needed	1	4-1-08	30 Day

Miscellaneous

Guns are like tools, it's difficult to have to many. The quantity and types of guns required will vary tremendously from one person to another. No amount of supplies will do you any good if someone else takes them from you by force. Self defense is an important consideration and, if wild game is in the area, hunting can provide fresh meat. The maps should be very detailing showing back roads in case major highways are closed or clogged. I always wanted a night vision scope, so I threw it in for good measure. The safe is for storing records, documents, cash, and gold or silver. A burn barrel is for disposing of household garbage and a spark arrestor is a grated top to prevent accidental fires.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
5 gallon emergency toilet	1	2	4-1-08	30 Day
Ant spray concentrate	1	3	4-1-08	30 Day
Binoculars	2	3	4-1-08	30 Day
Book on using compass	1	1	4-1-08	30 Day
Burn barrel	2	3	7-1-08	90 Day
Compass	2	1	4-1-08	30 Day
Fishing tackle	Assortment	3	10-1-08	1 year
Knives	Assortment	1	4-1-08	30 Day
Metal bucket - for charcoals/ashes	1	3	4-1-08	30 Day
Night vision scope	1	1	4-1-08	30 Day
O.D. parachute cord	200ft	3	7-1-08	90 Day
Safe	1	1	4-1-08	30 Day
Spark arrestor	2	3	4-1-08	30 Day
Sponges	10	3	4-1-08	30 Day
Toilet seat	1	3	7-1-08	90 Day
Trash bags - 13 gallon size	1 box	3	4-1-08	30 Day
Trash bags - 33 gallon size	1 box	3	4-1-08	30 Day
Water buckets 5 gal	2	3	4-1-08	30 Day
Glue of various types (wood glue, super glue, weather stripping adhesive, etc.)	several	3	7-1-08	90 Day
Paint	10 gal	3	10-1-08	1 year
Rolls of 10 mil "Visqueen"	3	3	4-1-08	30 Day
Tape (especially duct tape, masking tape, packing tape, etc.)	assortment	3	4-1-08	30 Day
Window screen.	2 Rolls	3	10-1-08	90 Day

Money

*\$1000. in cash and change (during times of disaster charge cards and checks will not be honored**

**Money is always hard to tuck away and pretend it isn't there, but in this instance, it is a necessity. One can't assume to put expenditures on credit cards during a crisis. Think about it. Whenever you make a purchase, it is always verified by a telephoned authorization number. If phone lines are down and these numbers are not obtainable, chances are your purchase won't be allowed.*

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Cash	\$1000/person	1	4-1-08	30 Day
Gold	10oz/person	1	10-1-08	1 Year
Silver	100oz/person	1	7-1-08	90 Day

Personal Toiletries

Solar showers use the sun to heat water for bathing. Lime is used to keep down odors from human waste. Quantities are not given for feminine or baby needs because I am not familiar with them.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
Baby wipes	1 box	3	4-1-08	30 Day
Bar soap	100	3	4-1-08	30 Day
Barber scissors	2 pair	3	4-1-08	30 Day
Birth Control	3 boxes	3	7-1-08	90 Day
Brushes	3/person	3	4-1-08	30 Day
Camping Potty	1	2	4-1-0	30 Day
Chapstick	24	3	4-1-08	30 Day
Combs	3/person	3	4-1-08	30 Day
Contact cleaning supplies	1 set	3	last minute	30 Day
Cotton swabs	4 (500)	3	4-1-08	30 Day
Dental floss	12	3	4-1-08	30 Day
Deodorant (men's)	12	3	4-1-08	30 Day
Deodorant (women's)	12	3	4-1-08	30 Day
Fingernail clippers	1/person	3	4-1-08	30 Day
Fingernail file metal	1/person	3	4-1-08	30 Day
Fluoride Rinse	2 bottles	3	7-1-08	90 Day
Glasses	2 pair	2	7-1-08	90 Day
Insect Repellent	4 cans	3	7-1-08	90 Day
Kleenex	50 boxes	3	4-1-08	30 Day
Lime	100 lbs.	3	7-1-08	90 Day
Liquid Hair Shampoo (Adult)	2 bottles	3	4-1-08	30 Day
Liquid Hair Shampoo (Child)	2 bottles	3	4-1-08	30 Day
Liquid Hand Soap (antibacterial)	5 bottles	3	4-1-08	30 Day
Lotion	12	3	4-1-08	30 Day
Mouthwash	2 bottles	3	7-1-08	90 Day
Panty Liners	1 box	3	4-1-08	30 Day
Razor blades (men's)	30	3	4-1-08	30 Day
Razor blades (women's)	30	3	4-1-08	30 Day
Sanitary Pads	1 box	3	4-1-08	30 Day
Shampoo	24	3	4-1-08	30 Day
Shaving Cream	2 cans	3	4-1-08	30 Day
Solar Shower	2	1	7-1-08	90 Day
Sunglasses	2/person	3	4-1-08	30 Day
Tampons	1 box	3	4-1-08	30 Day
Toenail clippers	3	3	4-1-08	30 Day
Toilet paper	100 rolls	3	4-1-08	30 Day
Toothbrushes	2	3	4-1-08	30 Day
Toothpaste	5 tubes	3	4-1-08	30 Day

Towelettes, Pre-moistened	2 boxes	3	4-1-08	30 Day
Towels	15	3	4-1-08	30 Day
Tweezers, pointed	2	3	4-1-08	30 Day
Wash Cloths & Towel	4/person	3	4-1-08	30 Day

Security Supplies

Common Caliber Ammunition. I've always felt that common caliber ammunition is the best all-around barter item. Top choices are: .22 long rifle, .223 Remington (5.56 mm NATO), .308 Winchester (7.62 mm NATO), .30-06, 12 gauge (2-3/4 inch #4 Buckshot), .45 ACP, and 9mm Parabellum

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
.22 shells	1000	2	7-1-08	90 Day
Gun safe	1	1	4-1-0	30 Day
Guns/Ammo	Assortment	1	4-1-08	30 Day
military rifle bore cleaner	10 1 oz. bottles	2	7-1-08	90 Day
Ammo reloader	1	2	10-1-08	1 Year
Ammo Cans	5	2	4-1-08	30 Day
Gun accessories	1 set/weapon	2	4-1-08	30 Day
Gun cleaning equipment	1 set/weapon	2	4-1-08	30 day
Military web gear	2/person	2	4-1-08	30 Day
<i>(lots of folks may *suddenly* need pistol belts, magazine pouches, et cetera.)</i>				
Perimeter alarm of some sort	1 set	2	4-1-08	30 Day
Solar powered perimeter Lights	5	3	4-1-08	30 day
Waterproof dufflebags ("dry bags")	1/person	2	4-1-08	30 Day

Tools

The generator is for emergencies and occasional use like pumping water from a well. I do not think it is feasible to store enough fuel to run a generator full time to maintain our current lifestyle. A cant hook is a tool for rolling logs so that you can move them in to position to cut them for firewood. This assumes a source of timber to be cut for firewood. A list of hand tools could be as long as the rest of the list. At a minimum it should include pliers, wrenches, screwdrivers, and a hammer. The funnels are for transferring fuel and other liquids from bulk storage containers to daily use containers. A come-a-long is a portable cable winch. It could be used for moving heavy objects like dead cars or fallen trees.

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
1 gallon gas can for mixed gas	1	3	4-1-08	30 Day
10" Wire Cutters	1	3	4-1-08	30 Day
2 cycle oil	6	3	7-1-08	90 Day
24" or 30" Bolt Cutters	1	2	7-1-08	90 Day
Axe	1	3	4-1-08	30 Day
Bar oil	1	3	7-1-08	90 Day
Blades	Assortment	3	4-1-08	30 Day
Bow saw	2	3	4-1-08	30 Day
Bow saw blades	2	3	4-1-08	30 Day
Bungee Straps (variety of lengths)	6	3	4-1-08	30 Day
Bush or Tree Saw	1	3	7-1-08	90 Day
Caulking gun	1	3	4-1-08	30 Day
Chain	1	3	4-1-08	30 Day
Chainsaw	1	3	7-1-08	90 Day
Chainsaw extra chain	2	3	7-1-08	90 Day
Chimney cleaning brush	1	3	10-1-08	1 year
Chisel/Wedge	1	3	4-1-08	30 Day
CO Detector, battery powered	2	3	4-1-08	30 Day
Come-a-long	1	3	4-1-08	30 Day

Crowbar	1	3	4-1-08	30 day	
Drill, Hand-operated	1	3	4-1-08	30 day	
Dust Mask	1box	3	4-1-08	30 day	
Duct/100 MPH Tape	1 box	3	7-1-08	90 Day	
Extra air filter	2	3	7-1-08	90 Day	
Extra spark plug	2	3	7-1-08	90 Day	
Funnels	Assortment	3	4-1-08	30 Day	
Garden fork	2	3	7-1-08	90 Day	
Generator	1	1	4-1-08	30 Day	
Hacksaw	1	3	4-1-08	30 day	
Hammer	1	3	4-1-08	30 Day	
Hand tools	Assortment	3	4-1-08	30 Day	
Hatchet	1	3	4-1-08	30 Day	
Ladder	1	3	4-1-08	30 Day	
Maul	1	3	4-1-08	30 Day	
Oil for generator	12 qt	3	4-1-08	30 Day	
Paint brushes	2	3	10-1-08		1 year
Pick	1	3	4-1-08	30 Day	
Pins	1 box	3	4-1-08	30 day	
Pliers, needle nose	1	3	4-1-08	30 day	
Pliers, regular	1	3	4-1-08	30 day	
Post Hole Digger, auger type	1	3	4-1-08	30 day	
Rope, Nylon	100 feet	3	4-1-08	30 day	
Saw horses	2	3	4-1-08	30 day	
Scissors	2	3	4-1-08	30 day	
Screwdriver, Flat Head	2	3	4-1-08	30 day	
Screwdriver, Phillips	2	3	4-1-08	30 day	
Sharpening files	1	3	4-1-08	30 Day	
Sharpening instruments	1 set	3	7-1-08	90 day	
Sharpening stone	Assortment	3	4-1-08	30 Day	
Shovel, round	2	3	4-1-08	30 Day	
Shovel, sharpshooter	2	3	4-1-08	30 Day	
Shovel, Snow	1	3	4-1-08	30 Day	
Shovel, square	2	3	4-1-08	30 Day	
Sledgehammer	1	3	4-1-08	30 Day	
Smoke Detector, battery powered	2	3	4-1-08	30 day	
Staple Gun and Staples	1	3	4-1-08	30 day	
Swiss Army Knife	1/person	3	4-1-08	30 day	
Tin snips	1	3	4-1-08	30 day	
Tow Chain/Straps	1	3	4-1-08	30 day	
Twine or Heavy String	100feet	3	4-1-08	30 day	
Two man tree saw	1	3	10-1-08		1 year
Vice Grips	1	3	4-1-08	30 day	
Wedge	1	3	4-1-08	30 Day	
welding outfit	1	3	7-1-08	90 Day	
Wench and Cable (come along)	1	3	7-1-08	90 day	
Wire Cutters	1	3	4-1-08	30 day	
Wood Saw	2	3	7-1-08	90 day	
Wood Screws	Assorted	3	4-1-08	30 day	
Wrenches	Assorted	3	4-1-08	30 day	

Transportation

Vehicle maintenance shouldn't be a problem in the short run or the long run if fuel supplies dry up. A "mid-length" crisis could call for some basic maintenance though. Bicycles should come in hand for short trips and to avoid drawing attention to yourself when most people are walking. An old rebuilt car. No electronic ignition. .

Item	Quantity Required	Purchase Priority	Purchase by Date	Planned Duration
12 volt air compressor	1	3	4-1-08	30 Day
Antifreeze	2 gals	3	4-1-08	30 Day
Bicycle	1/person	3	4-1-08	30 Day
Bicycle chain repair kit	1/bike	3	4-1-08	30 Day
bicycle tire repair kit	1/bike	3	4-1-08	30 Day
Bicycle tube hand air pump	1/bike	3	4-1-08	30 day
Fan belts	1set/auto	3	7-1-08	90 Day
Fuses	1 set	3	4-1-08	30 Day
Handlebar Basket	1/bike	3	4-1-08	30 Day
Hi-Lift Jack	1	3	4-1-08	30 Day
Hoses	1set/auto	3	7-1-08	90 Day
Jacks and stands	1 set	3	4-1-08	30 day
Jumper Cables	1	3	4-1-08	30 Day
Manuals	1 set/auto	3	7-1-08	90 day
Oil filter	4	3	7-1-08	90 Day
Oil	24 quarts	3	7-1-08	90 Day
Ramps	1 set	3	7-1-08	90 day
Snow Chains	1set/auto	3	4-1-08	30 day
Spare bicycle tires	2/bike	3	4-1-08	30 Day
Spare bicycle tubes	2/bike	3	4-1-08	30 Day
Spare replacement parts for the car	1 set	3	4-1-08	30 day
Tire pressure gauge	1	3	4-1-08	30 day
Tires and blocks	1/auto	3	4-1-08	30 day
Tire sealer/inflator (can)	2/auto	3	4-1-08	30 Day
Tire wrench	1/auto	3	4-1-08	30 Day
Tools that your particular car needs	1 set	2	4-1-08	30 day
Torx screwdrivers	1 set	3	4-1-08	30 Day
Tow chain	1	3	4-1-08	30 Day
Tow strap	1	3	4-1-08	30 Day
Tube repair kits	1/bike	3	4-1-08	30 Day
Water				
55 gallon water drums	2/person	2	4-1-08	30 day
Bleach - 1 gallon (5.25%)	1	3	4-1-08	30 day
Bung Wrench				
Hand pumps for drum	2	2	4-1-08	30 day
Pool tarp - 11 x 16 ft.	1	3	4-1-08	30 day
Pool water testing kit	1	3	4-1-08	30 day
Water bag (collapsible) - 5 gallon	1	3	4-1-08	30 day
Water can - 5 gallon	2	3	4-1-08	30 day
Water chlorinating granules (pool)	1 box	3	7-1-08	90 day
Water Distiller	1	3	10-1-08	1 Year
Water filter	1	1	4-1-08	30 Day
Water filter, replacement cartridge	1	1	4-1-08	30 Day
Water funnels	2	3	4-1-08	30 day
Water jug bottles, 2qt	2/person	2	4-1-08	30 Day
Water pump	1	1	7-1-08	90 Day

Space Cramp???

(er.. cramped space... where to hide all that Food Storage!)
by Kim Hicken

Storage space got you down? Do you feel as though you are tripping over your food storage? Never fear - there is a light at the end of the storage tunnel! Storage space seems to be a never ending problem these days. Many new homes are built with terrific vaulted ceilings, great views, and NO storage space!!! Older homes can also have a shortage of space. With a little creative thinking, and some planning, Saints can have space to store the important things in your life.

The first thing that must be done, (and this is the very hardest part) is that you must de-junk your home. Saints are all pack-rats to a certain extent. At a speech regarding the de-junking of our homes, the presenter asked how many people present had a watch at home that did not work. Every single person in the room held up his hand. Do YOU have one of these treasures in your home? (Be honest, now!) We all have things in our homes that were once priceless treasures, but have now become a nuisance. Get rid of them! There are probably a million suggestions of ways to de-junk. Choose one that fits with your life style. A book that can help you with this is **Clutter's Last Stand: It's time to de-Junk Your Life by Don Aslett**. Check your local library for this, and other books on this subject.

Once you have gotten rid of some of the non-essentials, you must become creative.

Stand in each room of your home and take a good look around.

- Is there storage space that is currently not being utilized?
- Is there space that is being used inefficiently?
- Are there shelves that could be built taller?
- Are there shelves that are deep that are only filled partially?
- Making efficient use of the storage space you already have may net you enough new space to store quite a bit.
- There are a lot of nice, new plastic storage containers on the market that may help you store things more easily, and stack them a bit deeper. Sturdy cardboard boxes can also help. Grocery stores will generally give you fruit boxes if you ask.

One Saint who is raising four children in a very small turn-of-the-century stone house has come up with some very creative storage space. She built her own couches using a basic toy-box type design. She purchased thick

foam rubber, and made cushions to go on top of the boxes. Then she made coordinating pillows to add more comfort to the couch. The hollow bottoms have given her lots of extra space.

When she moved into the home, the cupboards had space above them. She modified them so that now her kitchen cupboards go all the way to the ceiling. No space has been wasted. She completely utilizes the space under her stairs. An upstairs bedroom built into the attic space still has some space (under the eaves) that she utilizes for additional storage.

Since she does not care for crawling around in dark places, she built small doors into the wall approximately every four feet. When she needs to put something in the space or take something out, she simply reaches in the closest door.

She does not like to move things to vacuum, so she puts many shelves on the walls, and up off the floor. By building shelves in this manner, she has moved miscellaneous family items out of prime food-storage space, allowing her to store more food. In many cases, our best food-storage space is full of things that could be stored elsewhere.

Another Saint who has six children in a modular home has learned to be creative with her space as well. She stood in her rooms and looked around, and before long, she discovered that there was a hollow space between two walls. This was not a huge space, but it was enough to provide her some more storage space. She took the paneling off that portion of the wall, and put a cupboard door on. Cupboard doors are not expensive, nor are they difficult to install. Now she has a storage closet where none existed originally.

The floor in a small bedroom has a trap door in it that allows her to actually go under her home. There she has found a lot of great space to store things that need to be kept cool. Even in the heat of summer, this space is cool. She uses it to store potatoes, and foods that are in air-tight containers. She has buckets of honey, buckets of wheat, and buckets of beans under this room.

One good trick is to use garbage cans as bedside tables. This is done by purchasing regular garbage cans at a discount store. New ones are recommended because they have no odd smells or dirt attached! One

sheet of plywood is then used to cut two circles four to five inches bigger in diameter than the top of the can. The lids to the garbage cans are not used. Let the kids use them as shields when they play. Place the plywood circles over the top of the garbage cans, and then cover your new bedside tables with nice round covers (called “table rounds”) that coordinate with your bedspread. Nobody will know that your lovely bedside tables are actually garbage cans! This provides wonderful food storage space for some of the items that need to be stored in bulk, such as beans or wheat.

Don’t forget the space under your beds! There are lots of food items that can be stored in the small spaces under your beds. Salt, peanut butter, cans of potato flakes, canned vegetables, and cans of shortening can all be stored easily under the beds. They are also easily accessible.

Take a look at your closets. Is there room on the floor of the closet? There are many commercial closet storage systems on the market that can help you more efficiently use your space. But you can also build your own for less expense. Five gallon buckets can be stored on the floor of the closet, and a board put across the top of them to make a handy shelf for shoes and boots. Does the space in the top of the closet go all the way to the ceiling? Five gallon buckets could be stored up there as well, but it is not recommended to store heavy things in them. This may be a good place to store tissue, paper towels, or toilet paper. If you buy your laundry detergent in big buckets, these make terrific storage containers for such items.

One Saint who struggled with a tiny dining area solved two problems with one solution. She built her own benches with hollow bottoms (the toy box design again). She put colorful cushions on top, and then used her own dining room table. Benches generally seat more people than traditional chairs. Now her entire family can fit in her small dining area, and she has extra storage space as well.

Don’t let storage problems scare you! You are smarter than the things you own! A little creativity and elbow grease can go a long way toward providing more storage space in your home. Now roll up those sleeves and take a good look at YOUR home!

Here are a few more ideas sent by Food Storage

Editor, Andrea Chapman:

“I have some ideas for storing in small places. One idea is a little radical, but my husband and I did it and it worked well. We **took apart our bed frame** and used buckets, about 12-16 to hold up our bed. It was a little higher than before, but it looked fine.

I have a friend who used the **#10 cans in boxes** that the fit in 6 at a time. She stacked those and used that under the bed. Also, you can stack those three high and put a table cloth over it for a nice little table in the Living Room or Family room. I have also put food storage in the boys room, in their closet on the floor. Not many little kids use all their closet space.”

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Emergency Sanitation

Care and Use of Water Supplies

If you are asked to shut off the service valve that controls the water supply to your home, or if the taps do not flow following a disaster, turn off all the water outlets. These include taps or faucets, valves on pipes supplying float-controlled equipment such as flush toilets, air cooling equipment, and heating equipment. Then when the water comes on again your home will not be flooded as these flotation devices sometimes stick after they have been allowed to dry out.

Turn off the gas or electricity that supplies your hot-water heater after closing your home water service valve, or when your water supply is interrupted for any other reason. Otherwise, if the limited supply of water remaining in your hot-water storage tank continues to be heated, an explosion may occur. Also, if no more water can reach the tank, continued heat will soon muddy its contents through oxidation and make the water useless for washing or drinking purposes.

If your water service is cut off following enemy attack or other natural disaster, do not try to telephone or otherwise communicate with your local water department or water company. Once service is restored, the water from your faucets may have a strong chlorine taste. Do not worry about this. It is a sign that extra precautions are being taken for your safety.

It is especially important to be sanitary in the storing, handling, and eating of food to avoid digestive upsets or other more serious illnesses.

Be sure to:

- Keep all food in covered containers.
- Keep cooking and eating utensils clean. Diarrhea may result from dish soap that is not thoroughly rinsed from dishes.
- Keep all garbage in a closed container or dispose of it outside the home when it is safe to go out. If possible, bury it. Avoid letting garbage or trash accumulate inside the shelter, both for fire and sanitation reasons.
- Wash hands and utensils frequently.
- Prepare only as much food as will be eaten at each meal.
- Paper cups and plates, paper towels and napkins are helpful if the water supply is cut off.
- Refrigerators and home freezer units should be kept closed as much as possible once the services they depend on are cut off. The food they contain will keep longer if you plan your meals well in advance so that you

won't have to open the doors any more than necessary. If the gas or electric service is not restored within 12 hours, eat or cook the most perishable items in your refrigerator before they spoil. If foods show signs of decomposition, discard them before they contaminate other foods that keep better.

- Food will keep in home freezer units after they are shut off for varying periods depending on the amount and kind of food, the temperature at which it was kept, and the construction of the freezer. Frozen meats and other frozen foods can be preserved for later use by cooking them soon after they have thawed or by quick refreezing before they have completely thawed.

Official instructions regarding food will be issued locally in the event of an emergency. These instructions will tell you the type of disaster and its effect upon milk and other foods. Follow official instructions closely. Don't listen to rumors, and don't pass them on to others.

Laundry and Cleaning Supplies

During times of emergency it is critical that sanitation be strictly observed in the cleaning of clothing, bedding materials, and all kitchen and food preparation utensils. A book entitled *Housecleaning on a Shoestring* is available by writing to the Cooperative Extension Service, Utah State University, Logan, UT 84321. It contains useful recipes to make housecleaning products out of basic ingredients found in the home.

EMERGENCY TOILETS & GARBAGE DISPOSAL

What will you do if your toilet stops flushing and you can't get anyone to take your garbage away? If an emergency causes your toilets or garbage service to stop working you **MUST** find a way to safely dispose of the human waste (sewage) and garbage yourself. **If you don't, you will soon be spending most of your time and energy treating sick people, including yourself.**

The three most important things to do are:

1. Bury or store all garbage and human waste at least 100 feet away from water wells or open water.
2. Keep flies, roaches and animals out of the sewage and garbage;
3. Wash or clean your hands whenever you handle something dirty and **BEFORE** you handle anything that you will be putting into your mouth or someone else's mouth.

TOILETS #1 - If the toilet bowl and seat in your home are still usable (not wrecked) scrub the bowl clean using one part of laundry bleach to ten parts of water (10:1). When clean, drain the bowl and dry it. Line the bowl with a plastic or paper bag. Line the inside of the first bag with a sturdy plastic bag and lay the toilet seat on it to keep it open. Use the toilet as you normally do. After every use, sprinkle the waste with the bleach/water solution mentioned above or cover it with a layer of sawdust, wood shavings, lime, dry dirt, grass clippings, etc. Limiting the liquids that go into the bowl will make it easier to change the bags. When the bag is full or you can't stand the smell anymore, carefully tie the top of the bag tightly closed, remove it and replace with another bag. Dispose of the waste using the instructions below. Other chemicals that can be used in place of liquid chlorine bleach are: HTH (calcium hypochlorite), which is available at swimming pool supply stores and is intended to be used in solution. Following the directions on the package it can be mixed and stored.

Caution: Do not use calcium hypochlorite to disinfect drinking water as it kills all the beneficial bacteria in the intestinal tract and thus causes mild diarrhea. Portable toilet chemicals, both liquid and dry, are available at recreational vehicle (RV) supply stores. These chemicals are designed especially for toilets which are not connected to sewer lines. Use according to package directions. Powdered, chlorinated lime is available at building supply stores. It can be used dry. Be sure to get chlorinated lime, not quick lime which is highly alkaline and corrosive. **Caution:** Chlorinated products which are intended to be mixed with water for use can be dangerous if used dry. You may also use powdered laundry detergent, Lysol, Pinesol, ammonia, or other household cleaning and disinfecting products

#2 - If your toilet bowl is not usable, use a five gallon bucket, wooden box or some other container sturdy enough to sit on. Sit the seat from your toilet on the bucket or make one from layers of heavy cardboard glued together, two boards laid across the top with a gap between them or cut a seat from plywood. Line with bags as outlined in #1 above. Dispose of the full bags using the instructions below.

#3 - If the emergency will only last for a day or two, you can use "cat holes" outside. These are small, onetime personal use holes you dig in the ground and squat over. The hole should be deep enough to cover your waste **at least six inches deep** when filled. Do not do this any closer than **100 feet** from open water or water wells or the germs in the sewage will get into the water.

#4 - If the emergency will last more than a week and your toilet or bucket commode no longer will do the job you need to make a latrine. Use a shovel or post-hole diggers to dig a pit four to six feet deep and about one foot wide. Place a bucket, box, barrel or anything with a hole in it that you can sit on over the pit. Whatever you use **must** cover the pit tightly so that flies cannot get in while no one is using it. The seat and box must be cleaned regularly with the bleach water solution mentioned above and kept tightly covered when not in use. When the pit fills to within eighteen inches of the top, fill the hole in with clean dirt and mound it over. Cover the mound to keep animals from digging it up.

DISPOSING OF WASTES: All wastes must be buried **no closer than 100 feet** from the nearest open water or water well or the germs will get into the water. Buried wastes must be covered with at least eighteen inches of dirt and protected from animals digging it up.

GARBAGE is trash that has food or anything else in it that would make attract insects, rats and other animals. It should not be allowed to accumulate where these pests can get into it. If garbage service is expected to resume in a few days then dry garbage should be tightly sealed in bags or kept in tightly covered garbage cans. Liquid wastes that don't have a lot of fat in them can be poured out outside if kept **more than 100 feet** away from open bodies of water and water wells. Liquids that do have a lot of fat should be buried to prevent attracting flies and roaches.

If garbage service is out for more several weeks and you are unable to store it, then it should be buried. Garbage should be buried **no closer than 100 feet** from open water or water wells. Crush containers to make them smaller. Garbage must be covered by at least eighteen inches of dirt. If burial is not possible then it will have to be burned. To burn garbage you must use a metal barrel with holes in the bottom and a grate or screen over the top to act as a spark arrester to prevent wildfires. Only dry garbage should be burned. Wet garbage should be buried.

If you have a baby in your home, it is best to keep an ample supply of disposable diapers on hand for emergency use. If these are not available, emergency diaper needs can be met by lining rubber pants with cleansing tissue, toilet paper, scraps of cloth, or other absorbent materials. To help insure proper sanitation it is imperative that you store a sufficient supply of disposable diapers, disposable wipes, and plastic garbage can liners. Change infants and toddlers regularly and keep them clean. Dispose of the soiled diapers in the plastic garbage can liners and keep them tightly sealed when not in use to help prevent the spread of disease. Be sure to wash your own hands regularly when working with infants (especially after each diaper change). Typhoid fever, amoebic dysentery, diarrhea, infectious hepatitis, salmonella and giardiasis are diseases that spread rapidly in times of emergency and threaten all, yet are all diseases that can easily be controlled by simply following the rules of good sanitation.

Garbage may sour or decompose, rubbish (trash) will not, but offers disposal problems in an emergency. The following suggestions will make it easier for you to take care of the refuse problem.

Garbage should be drained before being placed in storage containers. If liquids are strained away, garbage may be stored for a longer period of time without developing an unpleasant odor. After straining, wrap the garbage in several thicknesses of old newspapers before putting it into your container. This will absorb any remaining moisture. A tight-fitting lid is important to keep out flies and other insects. Final disposal of all stored garbage and refuse can be accomplished in the following manner, provided there is no danger from radioactive fallout:

1. All stored garbage should be buried if collection service is not restored and if unpaved yard areas are available—keep a shovel handy for this purpose. Dig a hole deep enough to cover it with at least 18-24 inches of dirt, which will prevent insect breeding and discourage animals from digging it up.

2. Other rubbish may be burned in open yard areas (if permission is granted by authorities under existing conditions) or left at dumps established by local authorities. Can should be flattened to reduce their bulk. Do not deposit ashes or rubbish in streets or alley ways without permission. Such material may interfere with the movement and operation of fire-fighting and other emergency equipment.

Disposal of Garbage and Rubbish

Generators

Generator Basics

Generators are shaft-driven machines that produce electric power. Broadly speaking, they range in size and capacity from the tiny devices used as sensors to the extremely large machines used at commercial power plants. The term “alternator” is also used and means essentially the same thing. The term “generator set” or “genset” is sometimes used to describe a generator along with a gasoline or diesel engine or other power source.

This article covers the use of generators to provide standby power in an emergency for a single family or small group.

Generators are rated in terms of the amount of power they can produce. This is measured in Watts (W) or Kilowatts (kW). A Kilowatt is equal to 1,000 Watts. Some household items list their power requirement in Watts, such as light bulbs and small appliances. Others only list Amperes (abbreviated A or Amps). Most household electrical loads (including all cord-connected appliances that plug into a standard outlet) run on 120 Volts, and since $\text{Watts} = \text{Amps} \times \text{Volts}$, you can determine Watts by multiplying the amp requirement by 120. Large heating and cooling appliances, and well pumps, sometimes use 240 Volts. This can be determined from the nameplate. For these loads, wattage is determined by multiplying amps by 240.

Generator Types

Commercially available generators useful for small-scale standby power fall into these categories:

Type	Wattage	Price Range
Small portable units marketed primarily for camping	Generally less than 2 kW	\$400-\$600
Midsize portable units	3-5 kW.	\$400-\$2,000
Large trailer-mount units without engines, driven by a tractor PTO	15-60 kW	\$2,000-\$5,000
Large trailer-mount units designed for construction or industrial use	10 kW or more..	
Large standby units designed for permanent installation.	5-40 kW or more	\$4,000-\$12,000
Costs vary depending on ruggedness, reliability, and features.		

The more expensive units typically include features like:

- Better quality engines, with pressure lubrication, cast iron cylinder blocks (or cast iron sleeves), oil filters, and electronic ignition. The primary benefit of these is longevity, although the better engines may be somewhat more reliable.
- Larger fuel tank for long, unattended runs.
- Low oil shutdown to prevent engine damage
- Electric start
- Built in battery charger for 12V car batteries
- Quieter design, achieved through better mufflers, soundproofing, and lower operating RPM
- Ground fault circuit interrupters (GFCI) for safety
- Wheels. Even the smaller generators are heavy.

There are a wide variety of brands available. All of them work, and most are adequate for occasional standby use.

The generators that are driven by a farm tractor are a good buy if you already own one or more farm tractors. Unlike car and truck mount generators, tractor-driven ones produce ample power. Tractors are better suited to continuous, stationary operation than cars and trucks.

Generator Uses

Generators can be useful in a long-duration power outage by providing power to run essential equipment, such as refrigerators, freezers, lighting, water pumps, sump pumps, and furnaces. They are also useful for providing power where it is inconvenient, costly, or impossible to bring commercially produced power.

Sizing

Determining the exact size generator required for a household involves adding up the wattage required by each load, including the starting power required by the largest motor and any others that will be started at the same time. It is difficult to get accurate results since starting current requirements often vary and because nameplate ratings sometimes overstate the power required.

If a generator is too small for its load, the voltage will drop. This can cause damage to the generator, the load, or both. Circuit breakers and thermal protectors may trip and prevent damage, but cannot be relied upon. Do not connect loads to the generator that are too large for its capacity.

If you only want to run a few critical items, you can use this chart as a guide:

Generator size	Loads typically supported
1000W or less	Lights, radio, battery chargers, clocks, fax, or computer
1500W	Above items, also small manual defrost freezer or refrigerator
3500W 240V	Same as 1500W, plus ½ H.P. well pump (if 240V)
3500W 120V	Most refrigerators and freezers, clothes washer, gas clothes dryer, sump pump, ½ H.P. furnace blower, ½ H.P. well pump (if 120V), nearly any plug-connected appliance with a standard 120V plug
5000W 240V	Same as 3500W, plus most well pumps up to 2 H.P.
15,000W 240V	Will run all the loads in most households including electric water heaters, dryers, well pumps, and ranges; will run many central air conditioning units. Electric heat systems need to be considered case by case as many larger systems use more power than even a big generator like this produces.

Measuring the Load

Sometimes it helps to measure the amount of power a particular piece of equipment (or an entire household) uses. This may be the only way to determine power requirements accurately if there is no nameplate listing the power required. Clamp-on ammeters are available at most building supply stores for about \$50-\$100 that will measure the number of amps flowing through a wire. They usually include an attachment that you can use for cord-and-plug connected devices.

More sophisticated ammeters that measure starting current are available but are costly (\$400) and require some expertise to use.

Electrical Hookup

There are three ways to hook up generators:

- n Plug in loads directly, using extension cords if necessary.
- n Transfer switch
- n Suicide wiring

Plugging in loads to the generator's outlets directly is the simplest and works OK when only a few small loads are used. This method is used in remote areas and for construction, where no electric wiring is present. It also works in standby situations for running a handful of things, say, a freezer, refrigerator, sump pump, and a couple lights. Generators must be operated outdoors unless specifically designed for indoor operation. Those designed for indoor use have an exhaust system that vents outside. Since the generator

is usually outside and the load is inside, extension cords are needed. Be sure they're big enough. Most of the orange extension cords sold use 16 gauge wire and are rated for 13 amps. These are fine for a couple of small appliances but create a fire hazard when used for heavier loads.

Transfer switches

Transfer switches allow you to connect a load to either the generator or the commercial power source simply by flipping a switch. They are the only reasonable and safe alternative for running an entire house from a generator. They are also the only way to run equipment that can't be unplugged, such as furnace blowers, well pumps, and the like. Different configurations are available that allow switching of all or part of a household's electrical circuits. They are expensive and must be installed by an electrician or other qualified person. Some examples:

Transfer switches that have 4-6 different handles, each of which switches a single circuit, are available for around \$200 from many retailers that sell generators. They wire into the house's breaker or fuse panel. You only hook up the circuits that you will need in an emergency, which reduces the cost, and you can switch them one at a time so all the motors don't start at once. Some designs include an ammeter so you can see how much power you're using.

Some designs, including one from Square D that I have seen, use circuit breakers to perform the switching and have an interlock so you can only turn on one circuit breaker – either the generator breaker or the commercial power breaker. I have seen these for as little as \$60 plus the cost of the circuit breakers. Again you only hook up the circuits that you think you will need in an emergency. These panels hook up to your main breaker panel as a sub-panel.

Large transfer switches switch the power to a house or group of buildings and are wired between the meter socket and breaker (or fuse) panel. These cost \$300-\$600 depending on capacity. They are costly to install as well.

Automatic transfer switches will start the generator

and switch the load to it without intervention. Some standby systems have these built in. One catalog I have lists a 200A model as costing almost \$2,000. Telephone companies, hospitals, radio and TV stations, and the like use larger versions of these.

Transfer switches are wired with a large, flexible cord and plug for use with portable generators. The cord and plug are not normally included with the transfer switch and must be purchased separately. Welding supply companies are a good, inexpensive source for the heavy gauge wire required.

If you plan to connect the generator to building wiring, consider the transfer switch part of the cost of the generator.

Suicide wiring

Any method of connecting a generator to a building's electrical system, other than by using a transfer switch, falls under the category of suicide wiring.

You can be killed. And you can kill an electric lineman if you fail to isolate your generator from the power company's lines, by causing electricity to back-feed into the commercial power system. You can also burn up your generator or your house. It is also against the law in many jurisdictions.

Plan ahead. Buy a transfer switch. Get it installed. Don't use suicide wiring.

Safety

Here's some basic advice on generator safety. Read the instructions for your generator or check with a dealer or licensed electrician for authoritative safety rules.

1. Follow the safety instructions that come with the generator.
2. Keep the generator outside so you don't breathe carbon monoxide and die. Protected locations, such as a garage with the garage door open, are helpful if the weather is bad.
3. Follow whatever grounding instructions come with the generator. Generators should be grounded but the recommendations for how this is done vary depending on manufacturer.
4. You can get a bad shock by touching a wet power cord or plug while the generator is running. Shut off the engine before fiddling with the power connections

if it is wet out.

5. Don't refuel a hot engine. If you refuel at night, use a source of light that won't ignite the gas. The cyalume sticks work well for this.
6. Don't overload extension cords.
7. Use a transfer switch.
8. Store gasoline outside, in a safe container.

More accidents happen during power outages than occur when power is available, particularly fires. Here are some general tips for safety during power outages:

1. Don't leave candles or oil or gasoline lanterns burning unattended.
2. Realize that smoke and carbon monoxide detectors will not work without power.
3. Have fire extinguishers at hand.
4. Have some water drawn up in buckets or pans to use in case the water supply fails.

Fuels and Fuel Storage

Most portable generators run on gasoline. But gasoline is a poor choice for standby use, because it is unsafe to store in residential areas and is prone to deterioration when stored for any length of time.

Gasoline is extremely flammable and should not be stored in any quantity in a house or garage. There is no safe way to store gasoline in a building. Building and zoning codes, and insurance requirements, vary; some municipalities prohibit permanently installed gasoline tanks and limit the size of portable ones.. In the author's area gasoline suppliers recommend that bulk storage tanks be at least 10' away from garages and other buildings. Some of the author's acquaintances store gasoline in 5 gallon cans in a little building not much larger than a doghouse, that is used for nothing else and is a long way from all the other buildings.

Gasoline can be stored in full, sealed containers for 1-2 years or more without deterioration, provided that high temperatures are avoided. Air, water, and heat all contribute to deterioration.

The author uses a commercial fuel preserving additive in the gas tank for his generator, but there is no consensus on misc.survivalism that such additives materially improve the storage life of gasoline.

Some, mostly larger, generators are available with diesel engines. These engines are, as a rule, noisier

than gasoline engines and are more difficult to start in cold weather. For standby use, they may be worth having because of fuel storage considerations.

Diesel fuel and kerosene are much safer to store than gasoline. It is still common to store fuel oil, which has similar properties, indoors in houses in quantities up to 250 gallons. Again, building and zoning codes and insurance rules may limit the amount or method of storage. These products should not be stored in red cans because of the potential for confusion with gasoline. These fuels can be stored 2-3 years before they deteriorate. Midsize and larger generators designed for permanent installation and standby use are available for use with LP gas or natural gas. The engines are like gasoline engines in most respects but replace the carburetor with a mixing system designed for LP or natural gas. LP gas standby generators are widely used in industrial/commercial settings. The chief benefit is that LP gas can be stored indefinitely without deterioration. LP gas conversion kits are available for many small generators.

Readiness

There are no statistics available, but anecdotal evidence suggests that generators frequently fail to start when they are needed, even in industrial settings where regular maintenance and testing is performed. Electric start generators sometimes fail to start because the battery is dead. Batteries that are continuously trickle-charged may start the engine while being charged but fail when the charger is turned off, as in an actual emergency. Battery terminals also have a way of getting corroded. Stale gasoline can contribute to starting problems, especially in cold weather. Using starting fluid will sometimes make up for this.

Spare parts and supplies should be kept on hand. At a minimum, some extra motor oil, suitable starting aids, air and oil filters (if used), and a spark plug should be available. You should periodically operate your generator, and hook up whatever loads you plan to use, to make sure that everything is ready if needed. Once a month is probably often enough to catch most problems.

How Practical Is a Generator?

The author has had to resort to using the generator during a couple of long-duration power outages. Severe weather can be extremely disruptive to power systems and the unlucky individuals whose own lines are knocked down in a storm end up at the end of the power company's list for repairs. Power losses can be costly if you stand to lose the contents of your freezer, or if cold weather and no heat threatens to freeze pipes.

On the other hand, unless you can afford a fully automatic, permanently installed system, you had better be able-bodied. It's work to pull out the generator and start it and hook it up even if you have a good setup.

Big generators are noisy. Everyone in the neighborhood will know that you're running one.

You may wish to consider running the generator during only part of a 24-hour period. Most refrigerators and freezers will maintain temperature if operated 50% of the time, depending on ambient temperature, condition of the door seal, and how often the door is opened.

Fuel availability is a thorny issue. Gas stations require electricity to be able to pump gas. The author is fortunate enough to live in a setting where it is possible to store ample quantities of fuel to run the generator for a week or more. Even the worst power outages are ordinarily corrected after a week, two at the most.

Those of you concerned about other TEOTWAWKI scenarios should consider other alternatives that do not rely on fuel availability.

Other Ways to Produce Electricity

Several companies sell inverters that produce 120V electricity using the power from a car or truck's battery and alternator. These are not suitable for most standby uses because the output power is too low. The largest car and truck alternators produce no more than 2000 watts, and this only at high engine speeds. The really big inverters – 2000W and over, capable of running a refrigerator – are expensive, big, heavy, and require

heavy cabling to the battery. The logistics of operating a vehicle while stationary must also be considered: how do you secure the vehicle, potential for damage due to low oil or high temperature while unattended, potential for transmission bearing damage due to extended idling, poor fuel economy.

There are some belt-driven and PTO-driven generators for cars and trucks that have similar problems. In addition, most of these units must be operated at a specific speed. Unless the vehicle is equipped with an engine governor, this is difficult.

Uninterruptable power supplies (UPS) are designed primarily for use with computers and communications equipment. They generally are designed for short-duration outages, 15 minutes or less.

Solar, hydroelectric, and wind generators are a topic in their own right and are beyond the scope of this FAQ. Many products marketed for use with alternative power systems are also useful for standby use. It might make sense in some cases to have low-voltage DC wiring for lights that can be operated from batteries in an emergency.

Non-electric Alternatives

There are a number of low-tech techniques that can reduce your dependence on electricity. Some are effective by themselves, and others will reduce the size generator you need or the hours you need to run it.

Use something besides electricity for the primary source of heat. Although any modern central heating system requires some electricity to operate, you can run a natural gas, LP gas, or oil-fired furnace from a generator of modest size. Electric heat systems can't be operated except by very large generators.

Replace electric appliances with gas. Houses that are served by a natural gas supplier rarely have gas outages and electric outages at the same time (except possibly in earthquake-prone areas). LP gas is stored in tanks and is independent of electrical and other utilities. A gas stove can be used without electricity if the burners are lit with a match. Most gas water heaters don't require electricity at all (except for horizontal exhaust and other power-vented units).

Have a wood stove or fireplace insert that is capable

of heating your house. Have enough wood on hand to be able to use it in a power outage.

A wide variety of non-electric lighting is available. Aladdin lamps, which burn kerosene and produce a bright light, are practical and safer to use inside than gasoline lanterns. Lamps that operate on LP gas supplied through pipes are available. They mount permanently to a wall or ceiling, and are bright, safe, and cheap to operate. Inexpensive kerosene wick lamps are widely available and produce more light than candles.

LP gas and kerosene operated refrigerators and freezers are available. Some will also operate on electricity. Full-size units are expensive but no more so than a good generator installation. Smaller refrigerators, such as those used in RVs, are available too – though some require a 12V DC power source to operate the controls and ignition system even when running on LP gas.

By Steve Dunlop.

Thoughts On Disaster Survival, *Post Katrina...*

The follow information was provided via several emails by a friend heavily involved in the New Orleans disaster of hurricane Katrina, during the course of the disaster itself. Many of the comments were LIVE to that moment in time....

I've had over 30 people staying with me since Sunday, evacuating from New Orleans and points south in anticipation of Hurricane Katrina. Only two families were my friends they told other friends of theirs that they knew a place where they could hole up, and so a whole bunch arrived here! I didn't mind, because there were six RV's and travel trailers, so we had enough accommodation. However, I've had the opportunity to see what worked - and what didn't - in their evacuation plans and bug-out kits, and I thought a few "lessons learned" might be appropriate to share here.

1. Have a bug-out kit ready at all times. Many of these folks packed at the last minute, grabbing whatever they thought they'd need. Needless to say, they forgot some important things (prescription medications, important documents, baby formula, diapers, etc.). Some of these things (e.g. prescriptions) obviously can't be stocked up against possible emergency need, but you can at least have a list in your bug-out kit of what to grab at the last minute before you leave!

2. Renew supplies in your bug-out kit on a regular basis. Batteries lose their charge. Foods have an expiration date. So do common medications. Clothes can get moldy or dirty unless properly stored. All of these problems were found with the folks who kept backup or bug-out supplies on hand, and caused difficulties for them.

3. Plan on needing a LOT more supplies than you think. I found myself with over 30 people on hand, many of whom were not well supplied and the stores were swamped with literally thousands of refugees, buying up everything in sight. I had enough supplies to keep myself going for 30 days. Guess what? Those supplies ended up keeping 30-odd people going for two days. I now know that I must plan on providing for not just myself, but others in need. I could have been selfish and said "No, these are mine" - but what good would that do in a real disaster? Someone would just try to take them, and then we'd have all the resulting unpleasantness. Far better to have extra supplies to share with others, whilst keeping your own core reserve intact (and, preferably, hidden from prying eyes!).

4. In a real emergency, forget about last-minute purchases. As I said earlier, the stores were swamped by thousands of refugees, as well as locals buying up last-minute supplies. If I hadn't had my emergency supplies already in store, I would never have been able to buy them at the last minute. If I'd had to hit the road, the situation would have been even worse, as I'd be part of a stream of thousands of refugees, most of whom would be buying (or stealing) what they needed before I got to the store.

5. Make sure your vehicle will carry your essential supplies. Some of the folks who arrived at my place had tried to load up their cars with a humongous amount of stuff, only to find that they didn't have space for themselves! Pets are a particular problem here, as they have to have air and light, and can't be crammed into odd corners. If you have to carry a lot of supplies *and* a number of people, invest in a small luggage trailer or something similar (or a small travel trailer with space for your goodies) - it'll pay dividends if the S really does HTF.

6. A big bug-out vehicle can be a handicap. Some of the folks arrived here with big pick-ups or SUV's, towing equally large travel trailers. Guess what? - on some evacuation routes, these huge combinations could not navigate corners very well, and/or were so difficult to turn that they ran into things (including other vehicles, which were NOT about to make way in the stress of an evacuation!). This led to hard feelings, harsh words, and at least one fist-fight. It's not a bad idea to have smaller, more maneuverable vehicles, and a smaller travel trailer, so that one can "squeeze through" in a tight traffic situation. Another point a big SUV or pickup burns a lot of fuel. This is bad news when there's no fuel available! (See point 10 below.)

7. Make sure you have a bug-out place handy. I was fortunate in having enough ground (about 1.8 acres) to provide parking for all these RV's and trailers, and to accommodate 11 small children in my living-room so that the adults

could get some sleep on Sunday night, after many hours on the road in very heavy, slow-moving traffic. However, if I hadn't had space, I would have unhesitatingly told the extra families to find somewhere else - and there *wasn't* anywhere else here, that night. Even shops like Wal-Mart and K-Mart had trailers and RV's backed up in their parking lots (which annoyed the heck out of shoppers trying to make last-minute purchases). Even on my property, I had no trailer sewage connections, so I had to tell the occupants that if they used their onboard toilets and showers, they had to drive their RV's and trailers somewhere else to empty their waste tanks. If they hadn't left this morning, they would have joined long, long lines to do this at local trailer parks (some of which were so overloaded by visiting trailers and RV's that they refused to allow passers-by to use their dumping facilities).

8. Provide entertainment for younger children. Some of these families had young children (ranging from 3 months to 11 years). They had DVD's, video games, etc. - but no power available in their trailers to show them! They had no coloring books, toys, etc. to keep the kids occupied. This was a bad mistake.

9. Pack essentials first, then luxuries. Many of these folks had packed mattresses off beds, comforters, cushions, bathrobes, etc. As a result, their vehicles were grossly overloaded, but often lacked real essentials like candles, non-perishable foods, etc. One family (both parents are gourmet cooks) packed eighteen (yes, EIGHTEEN!!!) special pots and pans, which they were going to use on a two-burner camp stove... They were horrified by my suggestion that under the circumstances, a nested stainless-steel camping cookware set would be rather more practical. "What? No omelet pan?" Sheesh...

10. Don't plan on fuel being available *en route*. A number of my visitors had real problems finding gas to fill up on the road. With thousands of vehicles jammed nose-to-tail on four lanes of interstate, an awful lot of vehicles needed gas. By the time you got to a gas station, you were highly likely to find it sold out - or charging exorbitant prices, because the owners knew you didn't have any choice but to pay what they asked. Much better to leave with a full tank of gas, and enough in spare containers to fill up on the road, if you have to, in order to reach your destination.

11. Have enough money with you for at least two weeks. Many of those who arrived here had very little in cash, relying on check-books and credit cards to fund their purchases. Guess what? Their small banks down in South Louisiana were all off-line, and their balances, credit authorizations, etc. could not be checked - so many shops refused to accept their checks, and insisted on electronic verification before accepting their credit cards. Local banks also refused (initially) to cash checks for them, since they couldn't check the status of their accounts on-line. Eventually (and very grudgingly) local banks began allowing them to cash checks for not more than \$50-\$100, depending on the bank. Fortunately, I have a reasonable amount of cash available at all times, so I was able to help some of them. I'm now going to increase my cash on hand, I think... Another thing - don't bring only large bills. Many gas stations, convenience stores, etc. won't accept anything larger than a \$20 bill. Some of my guests had plenty of \$100 bills, but couldn't buy anything.

12. Don't be sure that a disaster will be short-term. My friends have left now, heading south to Baton Rouge. They want to be closer to home for whenever they're allowed to return. Unfortunately for them, the Governor has just announced the mandatory, complete evacuation of New Orleans, and there's no word on when they will be allowed back. It will certainly be several weeks, and it might be several months. During that period, what they have with them - essential documents, clothing, etc. - is all they have. They'll have to find new doctors to renew prescriptions; find a place to live (a FEMA trailer if they're lucky - thousands of families will be lining up for these trailers); some way to earn a living (their jobs are gone with New Orleans, and I don't see their employers paying them for not working when the employers aren't making money either); and so on.

13. Don't rely on government-run shelters if at all possible. Your weapons WILL be confiscated (yes, including pocket-knives, kitchen knives, and Leatherman-type tools); you will be crowded into close proximity with anyone and everyone (including some nice folks, but also including drug addicts, released convicts, gang types, and so on); you will be under the authority of the people running the shelter, who WILL call on law enforcement and military personnel to keep order (including stopping you leaving if you want to); and so on. Much, much better to have a place to go to, a plan to get

there, and the supplies you need to do so on your own.

14. Warn your friends not to bring others with them!!! I had told two friends to bring themselves and their families to my home. They, unknown to me, told half-a-dozen other families to come too - “He’s a good guy, I’m sure he won’t mind!” Well, I did mind... but since the circumstances weren’t personally dangerous, I allowed them all to hang around. However, if things had been worse, I would have been very nasty indeed to their friends (and even nastier to them, for inviting others without clearing it with me first!). If you are a place of refuge for your friends, make sure they know that this applies to them ONLY, not their other friends. Similarly, if you have someone willing to offer you refuge, don’t presume on his/her hospitality by arriving with others unforwarned.

15. Have account numbers, contact addresses and telephone numbers for all important persons and institutions. My friends will now have to get new postal addresses, and will have to notify others of this their doctors, insurance companies (medical, personal, vehicle and property), bank(s), credit card issuer(s), utility supplier(s), telephone supplier(s), etc. Basically, anyone who sends you bills, or to whom you owe money, or who might owe you money. None of my friends brought all this information with them. Now, when they need to change postal addresses for correspondence, insurance claims, etc., how can they do this when they don’t know their account numbers, what number to call, who and where to write, etc.?

16. Have portable weapons and ammo ready to hand. Only two of my friends were armed, and one of them had only a handgun. The other had a handgun for himself, another for his wife, a shotgun, and an evil black rifle - MUCH better! I was asked by some of the other families, who’d seen TV reports of looting back in New Orleans, to lend them firearms. I refused, as they’d never handled guns before, and thus would have been more of a danger to themselves and other innocent persons than to looters. If they’d stayed a couple of days, so that I could teach them the basics, that would have been different but they wouldn’t, so I didn’t. Another thing - you don’t have to take your entire arsenal along. Firearms for personal defense come first, then firearms for life support through hunting (and don’t forget the skinning knife!). A fishing outfit might not be a bad idea either (you can shoot bait!). Other than that, leave the rest of your guns in the safe (you *do* have a gun safe, securely bolted to the floor, don’t you?), and the bulk ammo supplies too. Bring enough ammo to keep you secure, but no more. If you really need bulk supplies of guns and ammo, they should be waiting for you at your bug-out location, not occupying space (and taking up a heck of a lot of weight!) in your vehicle. (For those bugging out in my direction, ammo supply will NOT be a problem...)

17. Route selection is very, very important. My friends (and their friends) basically looked at the map, found the shortest route to me (I-10 to Baton Rouge and Lafayette, then up I-49 to Alexandria), and followed it slavishly. This was a VERY bad idea, as something over half-a-million other folks had the same route in mind... Some of them took over twelve hours for what is usually a four-hour journey. If they’d used their heads, they would have seen (and heard, from radio reports) that going North up I-55 to Mississippi would have been much faster. There was less traffic on this route, and they could have turned left and hit Natchez, MS, and then cut across LA on Route 84. This would have taken them no more than five or six hours, even with the heavier evacuation traffic. Lesson think outside the box, and don’t assume that the shortest route on the map in terms of distance will also be the shortest route in terms of time.

18. The social implications of a disaster situation. Feedback from my contacts in the LSP and other agencies is very worrying. They keep harping on the fact that the “underclass” that’s doing all the looting is almost exclusively Black and inner-city in composition. The remarks they’re reporting include such statements as “I’m ENTITLED to this stuff!”, “This is payback time for all Whitey’s done to us”, and “This is reparations for slavery!”. Also, they’re blaming the present confused disaster-relief situation on racism “Fo sho, if Whitey wuz sittin’ here in tha Dome waitin’ for help, no way would he be waitin’ like we is!” No, I’m not making up these comments... they are as reported by my buddies. This worries me very much. If we have such a divide in consciousness among our city residents, then when we hit a SHTF situation, we’re likely to be accused of racism, paternalism, oppression, and all sorts of other crimes just because we want to preserve law and order. If we, as individuals and families, provide for our own needs in emergency, and won’t share with others (whether they’re of another race or not) because we don’t have enough to go round, we’re likely to be accused of

racism rather than pragmatism, and taking things from us can (and probably will) be justified as “Whitey getting his just desserts”. I’m absolutely not a racist, but the racial implications of the present situation are of great concern to me. The likes of Jesse Jackson, Al Sharpton, and the “reparations for slavery” brigade appear to have so polarized inner-city opinion that these folks are (IMHO) no longer capable of rational thought concerning such issues as looting, disaster relief, etc.

19. Implications for security. If one has successfully negotiated the danger zone, one will be in an environment filled, to a greater or lesser extent, with other evacuees. How many of them will have provided for their needs? How many of them will rely on obtaining from others the things they need? In the absence of immediate State or relief-agency assistance, how many of them will feel “entitled” to obtain these necessities any way they have to, up to and including looting, murder and mayhem? Large gathering-places for refugees suddenly look rather less desirable... and being on one’s own, or in an isolated spot with one’s family, also looks less secure. One has to sleep sometime, and while one sleeps, one is vulnerable. Even one’s spouse and children might not be enough... there are always going to be vulnerabilities. One can hardly remain consciously in Condition Yellow while bathing children, or making love! A team approach might be a viable solution here .

20. Too many chiefs, not enough Indians” in New Orleans at the moment. The mayor has already blown his top about the levee breach: he claims that he had a plan in place to fix it by yesterday evening, but was overruled by Baton Rouge, who sent in others to do something different. This may or may not be true... My LSP buddies tell me that they’re getting conflicting assignments and/or requests from different organizations and individuals. One will send out a group to check a particular area for survivors but when they get there, they find no-one, and later learn that another group has already checked and cleared the area. Unfortunately, in the absence of centralized command and control, the information is not being shared amongst all recovery teams. Also, there’s alleged to be conflict between City officials and State functionaries, with both sides claiming to be “running things” and some individuals in the Red Cross, FEMA, and other groups appear to be refusing to take instructions from either side, instead (it’s claimed) wanting to run their own shows. This is allegedly producing catastrophic confusion and duplication of effort, and may even be making the loss of life worse, in that some areas in need of rescuers aren’t getting them. (I don’t know if the same problems are occurring in Mississippi and/or Alabama, but I wouldn’t be surprised if they were.) All of this is unofficial and off-the-record, but it doesn’t surprise me to hear it. Moral of the story if you want to survive, don’t rely on the government or any government agency (or private relief organization, for that matter) to save you. Your survival is in your own hands - don’t drop it!

21. Long-term vision. This appears to be sadly lacking at present. Everyone is focused on the immediate, short-term objective of rescuing survivors. However, there are monumental problems looming, that need immediate attention, but don’t seem to be getting it right now. For example: the Port of Louisiana is the fifth-largest in the world, and vital to the economy, but the Coast Guard is saying (on TV) that they won’t be able to get it up and running for three to six months, because their primary focus is on search and rescue, and thereafter, disaster relief. Why isn’t the Coast Guard pulled off that job now, and put to work right away on something this critical? There are enough Navy, Marine and Air Force units available now to take over rescue missions.

Another example there are over a million refugees from the Greater New Orleans area floating around. They need accommodation and food, sure but most of them are now unemployed, and won’t have any income at all for the next six to twelve months. There aren’t nearly enough jobs available in this area to absorb this workforce. What is being done to find work for them, even in states remote from the problem areas? The Government for sure won’t provide enough for them in emergency aid to be able to pay their bills. What about mortgages on properties that are now underwater? The occupants both can’t and won’t pay; the mortgage holders will demand payment; and we could end up with massive foreclosures on property that is worthless, leaving a lot of folks neck-deep in debt and without homes (even damaged ones). What is being done to plan for this, and alleviate the problem as much as possible? I would have thought that the State government would have had at least the skeleton of an emergency plan for these sorts of things, and that FEMA would have the same, but this doesn’t seem to be the case. Why weren’t these things considered in the leisurely days pre-disaster, instead of erupting as immediate and unanswered needs post-disaster?

22. Personal emergency planning. This leads me to consider my own emergency planning. I’ve planned to

cover an evacuation need, and could probably survive with relative ease for between two weeks and one month but what if I had been caught up in this mess? What would I do about earning a living, paying mortgages, etc.? If I can't rely on the State, I for darn sure had better be able to rely on myself! I certainly need to re-examine my insurance policies, to ensure that if disaster strikes, my mortgage, major loans, etc. will be paid off (or that I will receive enough money to do this myself). I also need to provide for my physical security, and must ensure that I have supplies, skills and knowledge that will be "marketable" in exchange for hard currency in a post-disaster situation. The idea of a "team" of friends with (or to) whom to bug out, survive, etc. is looking better and better. Some of the team could take on the task of keeping a home maintained (even a camp-type facility), looking after kids, providing base security, etc. Others could be foraging for supplies, trading, etc. Still others could be earning a living for the whole team with their skills. In this way, we'd all contribute to our mutual survival and security in the medium to long term. Life might be a lot less comfortable than prior to the disaster, but hey - we'd still have a life! This bears thinking about, and I might just have to start building "team relationships" with nearby [people of like mind]!

23. The "bank problem." This bears consideration. I was at my bank this morning, depositing checks I'd been given by my visitors in exchange for cash. The teller warned me bluntly that it might be weeks before these checks could be credited to my account, as there was no way to clear them with their issuing banks, which were now under water and/or without communications facilities. He also told me that there had been an endless stream of folks trying to cash checks on South Louisiana banks, without success. He warned me that some of these local banks will almost certainly fail, as they don't have a single branch above water, and the customers and businesses they served are also gone - so checks drawn on them will eventually prove worthless. Even some major regional banks had run their Louisiana "hub" out of New Orleans, and now couldn't access their records. I think it might be a good idea to have a "bug-out bank account" with a national bank, so that funds should be available anywhere they have a branch, rather than keeping all one's money in a single bank (particularly a local one) or credit union. This is, of course, over and above one's "bug-out stash" of ready cash.

24. Helping one's friends is likely to prove expensive. I estimate that I'm out over \$1,000 at the moment, partly from having all my supplies consumed, and partly from making cash available to friends who couldn't cash their checks. I may or may not get some of this back in due course. I don't mind it - if I were in a similar fix, I hope I could lean on my friends for help in the same way, after all! - but I hadn't made allowance for it. I shall have to do so in future, as well as planning to contribute to costs incurred by those who offer me hospitality under similar circumstances.

25. People who were prepared were frequently mobbed/threatened by those who weren't. This was reported in at least seven incidents, five in Mississippi, two in Louisiana (I suspect that the relative lack of Louisiana incidents was because most of those with any sense got out of Dodge before the storm hit). In each case, the person/family concerned had made preparations for disaster, with supplies, shelter, etc. in good order and ready to go. Several had generators ready and waiting. However, their neighbors who had not prepared all came running after the disaster, wanting food, water and shelter from them. When the prepared families refused, on the grounds that they had very little, and that only enough for themselves, there were many incidents of aggression, attempted assault, and theft of their supplies. Some had to use weapons to deter attack, and in some cases, shots were fired. I understand that in two incidents, attackers/would-be thieves were shot. It's also reported that in all of these cases, the prepared families now face threats of retribution from their neighbors, who regarded their refusal to share as an act of selfishness and/or aggression, and are now threatening retaliation. It's reportedly so bad that most of the prepared families are considering moving to other neighborhoods so as to start afresh, with different neighbors.

Similar incidents are reported by families who got out in time, prepared to spend several days on their own. When they stopped to eat a picnic meal at a rest stop, or an isolated spot along the highway, they report being approached rather aggressively by others wanting food, or fuel, or other essentials. Sometimes they had to be rather aggressive in their turn to deter these insistent requests. Two families report attempts being made to steal their belongings (in one case, their vehicle) while over-nighting in camp stops on their way out of the area. They both instituted armed patrols, with one or more family members patrolling while the others slept, to prevent this. Seems to me to be a good argument to form a "bug-out team" with like-minded, security-conscious friends in your area, so that all concerned can provide mutual security and back-up.

My take I can understand these families being unwilling to share the little they had, particularly in light of not knowing when supplies would once again be available. However, this reinforces the point I made in my “lessons learned” post last week plan on needing much more in the way of supplies than you initially thought! If these families had had some extra food and water in stock, and hidden their main reserve where it would not be seen, they could have given out some help to their neighbors and preserved good relations. Also, a generator, under such circumstances, is a noisy (and bright, if powering your interior lights) invitation saying “This house has supplies - come and get them”. I suspect that kerosene lanterns, candles and flashlights might be a more “community-safe” option if one is surrounded by survivors.

26. When help gets there, you may get it whether you like it or not. There are numerous reports of aggressive, overbearing behavior by those rescuers who first arrived at disaster scenes. It’s perhaps best described as “I’m here to rescue you - I’m in charge - do as I say - if you don’t I’ll shoot you”. It appears that mid-level State functionaries and Red Cross personnel (the latter without the “shoot you” aspect, of course) were complained about most often. In one incident, a family who had prepared and survived quite well were ordered, not invited, to get onto a truck, with only the clothes on their backs. When they objected, they were threatened. They had pets, and wanted to know what would happen to them and they report that a uniformed man (agency unknown) began pointing his rifle at the pets with the words “I’ll fix that”. The husband then trained his own shotgun on the man and explained to him, in words of approximately one syllable, what was going to happen to him if he fired a shot. The whole “rescuer” group then left, threatening dire consequences for the family (including threats to come back once they’d evacuated and torch their home). The family were able to make contact with a State Police patrol and report the incident, and are now determined that no matter how much pressure is applied, they will not evacuate. They’ve set up a “shuttle run” so that every few days, two of them go upstate to collect supplies for the rest of the family, who defend the homestead in the meantime.

Another aspect of this is that self-sufficient, responsible families were often regarded almost with suspicion by rescuers. The latter seemed to believe that if you’d come through the disaster better than your neighbors, it could only have been because you stole what you needed, or somehow gained some sort of unfair advantage over the “average victims” in your area. I’m at a loss to explain this, but it’s probably worth keeping in mind.

27. There seems to be a cumulative psychological effect upon survivors. This is clear even - or perhaps particularly - in those who were prepared for a disaster. During and immediately after the disaster, these folks were at their best, dealing with damage, setting up alternative accommodation, light, food sources, etc. However, after a few days in the heat and debris (perhaps worst of all being the smell of dead bodies nearby), many found their ability to remain positive and “upbeat” being strained to the limit. There are numerous reports of individuals becoming depressed, morose and withdrawn. This seemed to happen to even the strongest personalities. The arrival of rescuers provided a temporary boost, but once evacuated, a sort of “after-action shell-shock” seems to be commonly experienced. I don’t know enough about this to comment further, but I suspect that staying in place has a lot to do with it - there is no challenge to keep moving, find one’s survival needs, and care for the group, and one is surrounded by vivid reminders of the devastation. By staying among the ruins of one’s former life, one may be exposing oneself to a greater risk of psychological deterioration.

28. There is widespread frustration over the lack of communication and empathy by rescuers and local/State government. This is partly due to the absence of electricity, so that TV’s were not available to follow events as they unfolded but it’s also due to an almost deliberate policy of non-communication by rescuers. There are many accounts of evacuees wanting to know where the bus or plane was going that they were about to board, only to be told “We don’t know”, or “To a better place than this”. Some have found themselves many States away from their homes. Other families were arbitrarily separated upon rescue and/or evacuation, and are still scattered across two or three States. Their efforts to locate each other are very difficult, and when they request to be reunited at a common location, all of those with whom I have contact report a blanket refusal by the Red Cross and State officials to even consider the matter at this time. They’re being informed that it will be “looked into” at some future date, and that they may have to pay the costs involved if they want to join up again. This, to families who are now destitute! I’m very angry about this, but it’s so widespread a problem that I don’t know what can be done about it. I hope that in future, some means will be implemented to prevent it happening again. Lesson learned never, EVER allow yourselves to be separated as a family, even if it means

waiting for later rescue and/or evacuation. Insist on this at all costs!

29. Expect rescuers (including law enforcement) to enforce a distinctly un-Constitutional authority in a disaster situation. This is very widely reported, and is very troubling. I hear repeated reports from numerous States that as evacuees arrive at refugee centers, they and their belongings are searched without Constitutional authority, and any personal belongings seen as potentially suspicious (including firearms, prescription medication, etc.) are confiscated without recourse to the owner. I can understand the point of view of the receiving authorities, but they are acting illegally, and I suspect there will be lawsuits coming from this practice. Another common practice reported on the ground in the disaster areas is for people to be ordered to evacuate, irrespective of their needs and wishes - even those folks who were well-prepared and have survived in good shape. If they demur, they are often threatened and bullied in an attempt to make them abandon their homes, pets, etc. Lesson learned in a disaster, don't expect legal and Constitutional norms to be followed. If you can make it on your own, do so, without relying on an unsympathetic and occasionally overbearing rescue system to control you and your destiny.

30. Don't believe that rescuers are all knights in shining armor who will respect your property. There have been numerous reports of rescuers casually appropriating small items that took their fancy in houses they were searching. Sometimes this was blatant, right in front of onlookers, and when protests were made, the response was either threatening, or a casual "Who's going to miss it now?". Some of our field agents report that this happened right in front of their eyes. Another aspect of this is damage caused to buildings by rescuers. I've had reports of them kicking in the front door to a house, or a window, instead of trying to obtain access with as little damage as possible; climbing on clean, highly-polished tables with hobnailed boots in order to get at an attic hatch to check for survivors; etc. When they left the house, often the door or window was left open, almost a standing invitation to looters, instead of being closed and/or secured. When the families concerned get home, they won't know who caused this damage, but they will certainly be angered by it. I think that if one evacuates one's home, it might be a good idea to leave a clearly-visible notice that all residents have evacuated, so as to let would-be rescuers know that this house is empty. On the other hand, this might make it easier for looters, so what you gain on the swings, you lose on the roundabouts...

31. If you choose to help, you may be sucked into a bureaucratic and legal nightmare. Example: a local church in the beginning stages of the crisis offered its hall to house evacuees. Local and State officials promptly filled it up with over 100 people. Their "social skills" proved extremely difficult to live with... toilets were blocked, restrooms left filthy, graffiti were scrawled and/or carved on the walls, arguments and disputes were frequent (often escalating to screaming matches, sometimes to physical violence), evacuees roamed the neighborhood (leading to all sorts of reports of petty theft, vandalism, etc.), church workers were subject to aggressive begging and demands, etc. Requests to the authorities to provide better security, administrative assistance, etc. apparently fell on deaf ears - the crisis was so widespread and overwhelming that a small facility such as this seems to have been very low on the priority checklist. After two days of this, with complaints from the neighbors becoming more and more insistent, the church informed local officials that it wanted the evacuees removed at once, if not sooner. They were promptly subject to bureaucratic heavy-handedness (including threats to withhold previously-promised reimbursement for their expenses); threats of lawsuits for daring to insinuate that the evacuees were somehow "lower-class" in their conduct, and for alleged racism, slander, and general political incorrectness; and threats of negative publicity, in that officials threatened to put out a press release denouncing the church for its "elitist" and "un-co-operative" attitude in a time of crisis. The church initially caved in to this pressure, and allowed the evacuees to stay but within a couple more days, the pressure from neighbors and from its own members became impossible to bear, and they insisted on the evacuees being removed to a Red Cross shelter. I'm informed that repairs to their hall will cost over \$10,000. This is only one example among many I could cite, but it makes the point clear - if you offer your facilities to authorities, you place yourself (to a certain extent) under their control, and you're potentially liable to a great deal of heavy-handed, insensitive bureaucratic bullying. Those of you in the same position as this church (i.e. with facilities you could make available) might wish to take note.

32. Law enforcement problems will often be "glossed over" and/or ignored by authorities. In many cities housing evacuees, there have been private reports of a significant increase in crime caused by their presence

but you'll find that virtually all law enforcement authorities publicly deny this and/or gloss over it as a "temporary problem". This is all very well for publicity, but it ignores the increased risk to local residents. I've been tracking crime reports in about a dozen cities, through my contacts with local law enforcement and the Louisiana State Police. All the LEO's I speak with, without exception, tell me of greatly increased crime, including rape, assault, robbery, shoplifting, vandalism, gang activity, etc. However, you won't see these reports in the news media, and will often see senior LE figures actively denying it. The officers with whom I speak are angry and bitter about this, but they daren't "go public", as their jobs would be on the line if they did so. They tell me that often they're instructed not to report certain categories of "incident" at all, so as not to "skew" or "inflate" the "official" crime figures. I've also heard reports from Texas, Alabama and Tennessee of brand-new high-end motor vehicles (e.g. Cadillacs, Lincolns, BMW's, etc.) with New Orleans dealer tags being driven through various towns, on their way North and West. The drivers were described as "gang-bangers" (and sundry less complimentary terms). However, there have been no reports of stolen vehicles from New Orleans, because there are no workers to check out dealer lots, or report thefts, and no working computers to enter VIN's, etc. into the NICS database of stolen vehicles - so officers have had no choice but to let these vehicles proceed. Draw your own conclusions.

33. Your personal and/or corporate supplies and facilities may be commandeered without warning, receipt or compensation. I've had numerous reports from in and near the disaster zone of individuals (e.g. boat-owners, farmers with barns, tractors, etc.) and corporate groups (e.g. companies with heavy equipment, churches with halls, etc.) finding an official on their doorstep demanding the use of their facilities or equipment. If they demurred, they were told that this was an "emergency situation" and that their assistance was being required, not requested. Some of them have lost track of the heavy equipment "borrowed" in this way, and don't know where it is, whether or not it's still in good condition, and when (if ever) it will be returned - and in the meantime, they can't continue their normal operations without this equipment. Others have had their land and facilities effectively confiscated for use by rescue and relief workers, storage of supplies, etc. In some cases, in the absence of their owners, the property of the individuals and groups concerned (e.g. farm gasoline and diesel supplies, the inventory of motor vehicle dealers, suppliers of foodstuffs, tarpaulins, etc.) have been commandeered and used by law enforcement and relief workers, without permission, receipts, reimbursement, etc. Protests have been met with denials, threats of arrest, insinuations of being "uncaring" and "un-co-operative", etc. Lesson learned if you've got what officials need in a time of crisis, forget about Constitutional protections of your property! Sure, you can sue after the fact, but if you need your goods and facilities for your own survival, you're basically SOL. Those of us who stockpile necessities for potential crises like this might want to consider concealing our stockpiles to prevent confiscation and if you need certain equipment for your own day-to-day use (e.g. tractors for farmers, generators, etc.), you might have a hard time retaining possession of these things. This problem applies to relief workers also I've had several reports of private relief workers (e.g. those sent in by churches, etc.) having their vehicles and supplies commandeered by "official" relief workers, without compensation or receipt, and being kicked out of the disaster area with warnings not to return. The fact that the "private" workers were accomplishing rather more than the "official" workers was apparently of no importance.

34. If you look like you know what you're doing, you may be a target of those less prepared. There have been many, many reports of individuals who were more or less prepared for a disaster being preyed upon by those who were not prepared. Incidents range from theft of supplies, through attempts to bug out with these persons (uninvited), to actual violence. It's genuinely frightening to hear about these incidents, particularly the attitude of those trying to prey on the prepared they seemed to feel that because you'd taken steps to protect yourself and your loved ones, you had somehow done so at their expense, and they were therefore "entitled" to take from you what they needed. There's no logical explanation for this attitude, unless it's bred by the utter dependence of many such people on the State for welfare, Social Security, Medicare/Medicaid, etc. Since they've always been dependent on others, and regarded this as an "entitlement", in a disaster situation, they seem to automatically assume that they're "entitled" to what you've got! In one case, the family's pet dog was held hostage, with a knife at its throat, until the family handed over money and supplies. In two cases, families were threatened with the rape of their women unless they co-operated with the aggressors. In four cases that I know of, children were held hostage to ensure co-operation. There have also been reports of crimes during the bug-out process. Families sleeping in their cars at highway rest areas were a favorite target, including siphoning of gas from their tanks, assaults, etc. The lessons to be learned from this are obvious. One family can't secure itself against these threats without great difficulty. It's best to be "teamed up" with neighbors to secure your neighborhood as a whole, rather than be

the one house with facilities in an area filled with those less prepared. If you're in the latter situation, staying put may not be a safe option, and a bug-out plan may be vital. When bugging out, you're still not safe from harm, and must maintain constant vigilance.

35. Those who thought themselves safe from the disaster were often not safe from refugees.

There have been many reports of smaller towns, farms, etc. on the fringe of the disaster area being overrun with those seeking assistance. In many cases, assistance was demanded rather than requested, and theft, looting and vandalism have been reported. So, even if you think you're safe from the disaster, you may not be safe from its aftermath.

36. Self-reliance seems to draw suspicion upon you from the authorities.

I've mentioned this in a previous e-mail, but I've had many more reports of it from those who survived or bugged out, and it bears re-emphasizing. For reasons unknown and unfathomable, rescue authorities seem to regard with suspicion those who've made provision for their safety and have survived (or bugged out) in good shape. It seems to be a combination of "How could you cope when so many others haven't?", "You must have taken advantage of others to be so well off", and "We've come all this way to help, so how dare you not need our assistance?" I have no idea why this should be the case... but there have been enough reports of it that it seems to be a widespread problem. Any ideas from readers?

37. Relief workers from other regions and States often don't know local laws.

This is a particular problem when it comes to firearms. I've had many reports of law enforcement officers sent to assist in Louisiana from States such as New Jersey, California, etc. trying to confiscate firearms on the streets, etc., when in fact the armed citizens were legally armed, under local law. One can't reason with these officers in the heat of the moment, of course, and as a result, a number of people lost their firearms, and have still not recovered them (and in the chaos of the immediate post-disaster situation, they may never do so, because I'm not sure that normal procedures such as logging these guns into a property office, etc. were followed). I understand that in due course, steps were taken to include at least one local law enforcement officer in patrols, so that he could advise officers from other areas as to what was legal, and what wasn't. Also, in Louisiana, law enforcement is conducted differently than in some other States, and officers from other States who came to assist were sometimes found to be domineering and aggressive in enforcing a law enforcement "authority" that doesn't normally apply here. So, if you're in a disaster area and help arrives from elsewhere, you may find that the help doesn't know (or care) about local laws, norms, etc. Use caution!

38. Relief organizations have their own bureaucratic requirements that may conflict with your needs.

A good example is the Red Cross. In many cases, across three States, I've had reports that locals who needed assistance were told that they had to register at a particular Red Cross shelter or facility. The help would not come to them they had to go to it. If they wished to stay on their own property, they were sometimes denied assistance, and told that if they wanted help, they had to move into the shelter to get it. Also, assistance was often provided only to those who came in person. If you left your family at home and went to get food aid, you might be denied aid for your whole family because there was no evidence that they existed - only the number that could be physically counted by relief workers (who would not come to you, but insisted you come to them) would be provided with food. Needless to say, this caused much anger and resentment.

I hope that these "lessons learned" are of use to you. I'm more and more convinced that in the event of a disaster, I must rely on myself, and a few friends, and never count on Government or relief organizations for the help I'll need. Also, I'm determined to bug out for a fairly long distance from a disaster in my home area, so as to be clear of the post-disaster complications that may arise. Once again (as it has countless times throughout history), we see that to rely on others (let alone Government) for your own safety and security is to invite complications at best, disaster at worst.

Protecting Yourself From Terrorism

BEFORE

Learn about the nature of terrorism and how to protect yourself.

- 1 Terrorists often choose targets that offer little danger to themselves and areas with relatively easy public access.
- 2 Terrorists look for visible targets where they can avoid detection before or after an attack such as airports, large cities, major events, resorts, and high-profile landmarks.
- 3 Learn about the different types of terrorist weapons including explosives, kidnaping, highjackings, arson, shootings, and nuclear, biological and chemical weapons.
- 4 Prepare to deal with a terrorist incident by adapting many of the same techniques used to prepare for other crises.
- 5 Be alert and aware of the surrounding area. The very nature of terrorism suggests that there may be little or no warning.
- 6 Take precautions when traveling. Be aware of conspicuous or unusual behavior. Do not accept packages from strangers. Do not leave luggage unattended.
- 7 Learn where emergency exits are located. Think ahead about how to evacuate a building, subway or congested public area in a hurry. Learn where staircases are located.
- 9 Notice your immediate surroundings. Be aware of heavy or breakable objects that could move, fall or break in an explosion.

Preparing for a Building Explosion

The use of explosives by terrorists can result in collapsed buildings and fires. People who live or work in a multi-level building can do the following:

- A. Review emergency evacuation procedures.
Know where fire exits are located, in a dark and dusty atmosphere.
- B. Keep fire extinguishers in working order. Know where they are located, and how to use them.
Learn first aid and become CERT trained.
- C. Keep the following items in a designated place on each floor of the building:
 - 1 Portable, battery-operated am/fm radio and extra batteries.
 - 2 Several flashlights and extra batteries and/or light sticks.
 - 3 First aid kit and manual.
 - 4 Several hard hats, work gloves, whistle, and dust masks.
 - 5 Fluorescent tape to rope off dangerous areas.
 - 6 Extra water.
 - 7 A gas mask with extra filters.

Bomb Threats

If you receive a bomb threat, get as much information from the caller as possible. Keep the caller on the line and record everything that is said. Notify the police and the building management.

After you've been notified of a bomb threat, do not touch any suspicious packages. Clear the area around the suspicious package and notify the police immediately. In evacuating a building, avoid standing in front of windows or other potentially hazardous areas. Do not restrict sidewalk or streets to be used by emergency officials. Move out of the way!

DURING

In a building explosion, get out of the building as quickly and calmly as possible.

If items are falling off of bookshelves or from the ceiling, get under a sturdy table or desk.

If there is a fire:

- A. Stay low to the floor and exit the building as quickly as possible.
- B. Cover nose and mouth with a damp cloth.
- C. When approaching a closed door, use the palm of your hand and forearm to feel the lower, middle and upper parts of the door. If it is not hot, brace yourself against the door and open it slowly. If it is hot to the touch, do not open the door - seek an alternate escape route.
- D. Heavy smoke and poisonous gases collect first along the ceiling. Stay below the smoke at all times.

AFTER

- 1 *Remain calm* and be patient. **Think** through the consequences of all your actions.
- 2 Follow the advice of local emergency officials.
- 3 Listen to your radio or television for news and instructions.
- 4 If the disaster occurs near you, check for injuries.
 - Give first aid and get help for seriously injured people.
- 5 Follow procedures for “General Post Emergency and Disaster Response” (see page 2).
- 6 Confine or secure your pets.

If you are trapped in debris:

- 1 Use a flashlight or a light stick. Try to avoid using matches - in case of a gas leak.
- 2 Stay in your area so that you don't kick up dust. Cover your mouth with a damp (if available) handkerchief or clothing.
- 3 Tap on a pipe or wall so that rescuers can hear where you are. Use a whistle if one is available. Shout only as a last resort—shouting can cause a person to inhale dangerous amounts of dust.

Note:

Untrained persons should not attempt to rescue people who are inside a collapsed building. Wait for emergency personnel to arrive.

Chemical Agents

- A. Chemical agents are poisonous gases, liquids or solids that have toxic effects on peoples, animals or plants. Most chemical agents cause serious injuries or death.
- B. Severity of injuries depends on the type and amount of the chemical agent used, and the duration of exposure.
- C. Were a chemical agent attack to occur, authorities would instruct citizens to either seek shelter where they are and seal the premises or evacuate immediately. Exposure to chemical agents can be fatal. Leaving the shelter to rescue or assist victims can be a deadly decision. There is no assistance that the untrained can offer that would likely be of any value to the victims of chemical agents.

Biological Agents

- A. Biological agents are organisms or toxins that have illness-producing effects on people, livestock and crops.
- B. Because biological agents cannot necessarily be detected and may take time to grow and cause a disease, it is almost impossible to know that a biological attack has occurred. If government officials become aware of a biological attack through an informant or warning by terrorists, they would most likely instruct citizens to either seek shelter where they are and seal the premises or evacuate immediately.
- C. A person affected by a biological agent requires the immediate attention of professional medical personnel. Some agents are contagious, and victims may need to be quarantined. Also, some medical facilities may not receive victims for fear of contaminating the hospital population.
- D. Quarantining yourself in your own home might be the best solution when professional help is unavailable.

other preparedness considerations

- A. Be prepared—keep a gas mask handy at home, at work (especially in high-rise office buildings where the mask can help you escape in smoky or dusty conditions), and in the trunk of your car. A gas mask by your bedside is a good option.
- B. If you fear you have been exposed to biological agents (Anthrax, plague, Tularemia, Brucellosis, Q fever, smallpox, viral encephalitis, or hemorrhagic fever, etc.) do the following during the one to six day incubation period before symptoms arise.

NOTE: *This is the authors own personal list taken from many sources of good effective planning and advice for situations in which you cannot or do not wish to recur to conventional antibiotic treatment, or when such treatment is not available. Implement these suggestions at your own risk. The author makes no medical claims or guarantees of effectiveness. Your success against these agents will vary according to exposure, the prior state of your immune system, and many other factors.*

Do NOT begin antibiotic treatment until symptoms appear. *Early or excessive use of antibiotics will destroy the natural bacterial flora in your intestinal tract and render your immune system less effective.*

- A. Stop eating your normal, cooked food diet.
- B. Begin a very light diet (almost light fasting) of raw fruits and vegetables and juices (no commercial products with artificial or natural sweeteners).
- C. Drink a lot of water, but do not drink water from public water supplies; avoid chlorine or fluoride. It is recommended installing a water purifying system in your home before a major biological attack occurs. Once it does, there will be a run on equipment. Have several bottles of aerobic-type oxygen liquid on hand for water purification. Oxygen-based purifiers are far safer and better than chemicals or bleach.
- D. Taking the following natural and herbal anti-bacterial and anti-viral capsules could help:
 - ⌘ Natural Vitamin C with bio-flavanoids—1000 mg every two hours, along with natural juice or fruit. If diarrhea develops, cut dose in half. If symptoms of aches or fever begin, take hourly.

- 1 Raw garlic (crush into tomato juice)—one small clove every six hours.
- 2 Colloidal silver solution—one dropper full or 10 sprays every six hours.
- 3 Olive leaf extract—one capsule three times a day.
- 4 Echinacea—one capsule three times a day.
- 5 Grape seed extract (or other high-potency anti-oxidant)—one capsule six times a day.
- 6 Goldenseal—one capsule three times a day.

E. Use melaleuca (Tea Tree Oil) as a salve for all lesions, open wounds, or sores.

1. If you begin to have symptoms, begin antibiotic treatment immediately, under the care of a physician, if available. Chances are high that despite government assurances, there may not be enough antibiotics to go around in a major biological attack, so it is important to live healthily and stockpile natural alternatives. Learn to live with alternative remedies before your life depends on them since it takes some skill and sensitivity to learn to recognize your own body's feedback signals giving you hints about what it needs. Remember, too, that natural solutions only work well when your body is NOT loaded down with food, especially junk food or cooked food, which have no live enzymes.
2. Leave any area where infection is growing. Find temporary housing in rural areas. It is best to make arrangements with friends and relatives beforehand. This is important to avoid continual exposure even to low levels of contaminants. Wear your gas mask in the car when leaving town. Don't worry about looking silly—it may save your life.
3. If you can't leave the area, follow the previous suggestions for "sheltering in place". When in public wear a gas mask as long as you can do so without undue stress. You must remove it to eat and drink, unless it has a built in water straw. Remember most gas mask cartridges are good for no more than 24 hours, usually even less than this.

2006, By Kenneth Moravec

Homeland Security Advisory System

The Homeland Security Advisory System was designed to provide a comprehensive means to disseminate information regarding the risk of terrorist acts and other threats to and/or against federal, state, and local authorities and to the American people. This system provides warnings in the form of a set of graduated “Threat Conditions” that increase as the risk of the threat increases. At each threat condition, federal departments and agencies would implement a corresponding set of “Protective Measures” to further reduce vulnerability or increase response capability during a period of heightened alert.

Although the Homeland Security Advisory System is binding on the executive branch, it is voluntary to other levels of government and the private sector. There are five threat conditions, each identified by a description and corresponding color.

The greater the risk of a terrorist attack, the higher the threat condition. Risk includes both the probability of an attack occurring and its potential gravity.

Threat conditions are assigned by the Attorney General in consultation with the Assistant to the President for Homeland Security. Threat conditions may be assigned for the entire nation, or they may be set for a particular geographic area or industrial sector. Assigned threat conditions will be reviewed at regular intervals to determine whether adjustments are warranted.

Threat Conditions and Associated Protective Measures

There is always a risk of a terrorist threat. Each threat condition assigns a level of alert appropriate to the increasing risk of terrorist attacks. Beneath each threat condition are some suggested protective measures that the government and the public can take, recognizing that the heads of federal departments and agencies are responsible for developing and implementing appropriate agency-specific Protective Measures:

Low Condition (Green)

This condition is declared when there is a low risk of terrorist attacks. Members of the public can:

- 1 Develop a household disaster plan and assemble a disaster supply (72 hour) kit.
- 2 Develop a years supply of water, food, sanitary need, medical needs and fuel where possible.
- 3 Become CERT and first aid trained

Guarded Condition (Blue)

This condition is declared when there is a general risk of terrorist attacks. Members of the public, in addition to the actions taken for the previous threat condition, can:

- 1 Update their disaster supply (72 hour) kit;
- 2 Review their household disaster plan;
- 3 Hold a household meeting to discuss what members would do and how they would communicate in the event of an incident;
- 4 Develop a more detailed household communication plan;
- 5 Apartment residents should discuss with building managers steps to be taken during an emergency; and
- 6 People with special needs should discuss their emergency plans with friends, family or employers.

Elevated Condition (Yellow)

An Elevated Condition is declared when there is a significant risk of terrorist attacks. Members of the public, in addition to the actions taken for the previous threat condition, can:

- 1 Be observant of any suspicious activity and report it to authorities;
- 2 Contact neighbors to discuss their plans and needs;
- 3 Check with school officials to determine their plans for an emergency and procedures to reunite children with parents and care-givers; and
- 4 Update the household communication plan.

High Condition (Orange)

A High Condition is declared when there is a high risk of terrorist attacks. Members of the public, in addition to the actions taken for the previous threat conditions, can:

- 1 Review preparedness measures (including evacuation and sheltering) for potential terrorist actions including chemical, biological, and radiological or nuclear attacks;
- 2 Avoid high profile or symbolic locations; and
- 3 Exercise caution when traveling.

Severe Condition (Red)

A Severe Condition reflects a severe risk of terrorist attacks. Under most circumstances, the protective measures for a Severe Condition are not intended to be sustained for substantial periods of time. Members of the public, in addition to the actions taken for the previous threat conditions, can:

- 1 Avoid public gathering places such as sports arenas, holiday gatherings, or other high risk locations;
- 2 Follow official instructions about restrictions to normal activities;
- 3 Contact your employer to determine status of work;
- 4 Listen to the radio and TV regularly for possible advisories or warnings; and
- 5 Prepare to take protective actions such as sheltering-in-place or evacuation if instructed to do so by public officials.
- 6 This is a good day to take a sick day or vacation day from work.



Preparing for a Pandemic Influenza Outbreak

The Self Imposed Reverse Isolation (SIRQ) Plan

1) Protecting the Family – Building a Safe Haven

- a. Protecting the family from the influenza virus is central to the plan.
- b. This requires that families sequester themselves from the outside world in order to avoid infection.
 - i. Children should not go to school or play with friends.
 - i. Parents should work from home as much as possible.
 - iii. The family should not attend public events (sporting events, cultural events, religious services, etc.).
 - iv. If family members do have to leave sequestration, they must be educated and committed to maintaining protection.
- c. Parents
 - i. Must establish their home as a protected cell.
 - ii. Must understand that as long as their family is sequestered they are safe, but safety is only good AS LONG AS EVERY FAMILY MEMBER REMAINS SAFE AND DOES NOT BRING THE INFECTION HOME.
 - iii. Must understand the importance of not allowing children to interact with others outside the family during the time the plan is in place.
 - iv. Must know how to remain safe when they leave the home:
 - 1. Protective equipment,
 - 2. Protective methods of interacting in an infectious environment.
 - v. Must have their homes prepared for a disruption in services.
- d. Children
 - v. Are at high risk for transmission of disease because of less than ideal hygiene, close contact with others in closed environments, inadequate hand washing, etc.
 - vi. Need to be sequestered in family groups.
 - vii. Need to be isolated from others who are potentially infected.
 - viii. Need to be trained in methods of protecting themselves from infection at their level.

2) Protecting the Individual

- a. During an influenza pandemic, any individual that has to interact with the outside world must consider all they come in contact with as being infected.
- b. Individuals must know how to interact in such an environment:
 - i. Need education and training about how to protect themselves.
 - ii. Need protective equipment to allow them to interact.

3) Protecting the Community

- a. Community leadership must support the SIRQ plan and strongly encourage its implementation:
 - i. Educating leaders, families and individuals about the plan.
 - i. Implementation of reverse quarantine protection early (BEFORE THE INFECTION HITS THE COMMUNITY).
 - ii. Cancellation of schools, meetings, public venues, etc. (BEFORE THE INFECTION STARTS)
 - iii. Identify key services and individuals essential to these services:
 - 1. Provide or strongly encourage personal protection use in all essential sectors early.
 - 1. Plan on contingencies
 - b. Must provide venues for education of individuals and families.
 - a. Should facilitate obtaining protective equipment for individuals or groups.
 - b. Must lead by example.

This plan can be implemented without government or community support. A family or individual could use this plan and protect themselves as long as they are willing to keep themselves separate.

Facts about Avian Influenza

Key Facts About Avian Influenza (Bird Flu) and Avian Influenza A (H5N1) Virus

This fact sheet provides general information about bird flu and information about one type of bird flu, called avian influenza A (H5N1) that is infecting birds in Asia and has infected some humans. Also see the Frequently Asked Questions (FAQs) on the World Health Organization (WHO) website.

What is avian influenza (bird flu)?

Bird flu is an infection caused by avian (bird) influenza (flu) viruses. These flu viruses occur naturally among birds. Wild birds worldwide carry the viruses in their intestines, but usually do not get sick from them. However, bird flu is very contagious among birds and can make some domesticated birds, including chickens, ducks, and turkeys, very sick and kill them.

Do bird flu viruses infect humans? Bird flu viruses do not usually infect humans, but several cases of human infection with bird flu viruses have occurred since 1997.

How are bird flu viruses different from human flu viruses?

There are many different subtypes of type A influenza viruses. These subtypes differ because of certain proteins on the surface of the influenza A virus (hemagglutinin [HA] and neuraminidase [NA] proteins). There are 16 different HA subtypes and 9 different NA subtypes of flu A viruses. Many different combinations of HA and NA proteins are possible. Each combination is a different subtype. All known subtypes of flu A viruses can be found in birds. However, when we talk about “bird flu” viruses, we are referring to influenza A subtypes chiefly found in birds. They do not usually infect humans, even though we know they can. When we talk about “human flu viruses” we are referring to those subtypes that occur widely in humans. There are only three known A subtypes of human flu viruses (H1N1, H1N2, and H3N2); it is likely that some genetic parts of current human influenza A viruses came from birds originally. Influenza A viruses are constantly changing, and they might adapt over time to infect and spread among humans.

What are the symptoms of bird flu in humans?

Symptoms of bird flu in humans have ranged from typical flu-like symptoms (fever, cough, sore throat and muscle aches) to eye infections, pneumonia, severe respiratory diseases (such as acute respiratory distress), and other severe and life-threatening complications. The symptoms of bird flu may depend on which virus caused the infection.

How does bird flu spread?

Infected birds shed flu virus in their saliva, nasal secretions, and feces. Susceptible birds become infected when they have contact with contaminated excretions or surfaces that are contaminated with excretions. It is believed that most cases of bird flu infection in humans have resulted from contact with infected poultry or contaminated surfaces. The spread of avian influenza viruses from one ill person to another has been reported very rarely, and transmission has not been observed to continue beyond one person.

How is bird flu in humans treated?

Studies done in laboratories suggest that the prescription medicines approved for human flu viruses should work in preventing bird flu infection in humans. However, flu viruses can become resistant to these drugs, so these medications may not always work. Additional studies are needed to prove the effectiveness of these medicines.

What is the risk to humans from bird flu?

The risk from bird flu is generally low to most people because the viruses occur mainly among birds and do not usually infect humans. However, during an outbreak of bird flu among poultry (domesticated chicken, ducks, turkeys), there is a possible risk to people who have contact with infected birds or surfaces that have been contaminated with excretions from infected birds. The current outbreak of avian influenza A (H5N1) among poultry in Asia and Europe (see below) is an example of a bird flu outbreak that has caused human infections and deaths. In such situations, people should avoid contact with infected birds or contaminated surfaces, and should be careful when handling and cooking poultry. For more information about avian influenza and food safety issues, visit the World Health Organization website. In rare instances, limited human-to-human spread of H5N1 virus has occurred, and transmission has not been observed to continue beyond one person.

What is an avian influenza A (H5N1) virus?

Influenza A (H5N1) virus – also called “H5N1 virus” – is an influenza A virus subtype that occurs mainly in birds. Like all bird flu viruses, H5N1 virus circulates among birds worldwide, is very contagious among birds, and can be deadly.

What is the H5N1 bird flu that has been reported in Asia and Europe?

Outbreaks of influenza H5N1 occurred among poultry in eight countries in Asia (Cambodia, China, Indonesia, Japan, Laos, South Korea, Thailand, and Vietnam) during late 2003 and early 2004. At that time, more than 100 million birds in the affected countries either died from the disease or were killed in order to try to control the outbreak. By March 2004, the outbreak was reported to be under control. Beginning in late June 2004, however, new outbreaks of influenza H5N1 among poultry were reported by several countries in Asia (Cambodia, China [Tibet], Indonesia, Kazakhstan, Malaysia, Mongolia, Russia [Siberia], Thailand, and Vietnam). It is believed that these outbreaks are ongoing. Most recently, influenza H5N1 has been reported among poultry in Turkey and Romania. Human infections of influenza A (H5N1) have been reported in Cambodia, Indonesia, Thailand, and Vietnam.

What is the risk to humans from the H5N1 virus in Asia and Europe?

The H5N1 virus does not usually infect humans. In 1997. However, the first case of spread from a bird to a human was seen during an outbreak of bird flu in poultry in Hong Kong, Special Administrative Region. The virus caused severe respiratory illness in 18 people, 6 of whom died. Since that time, there have been other cases of H5N1 infection among humans. Recent human cases of H5N1 infection that have occurred in Cambodia, Thailand, and Vietnam have coincided with large H5N1 outbreaks in poultry. The World Health Organization (WHO) also has reported human cases in Indonesia. Most of these cases have occurred from contact with infected poultry or contaminated surfaces; however, it is thought that a few cases of human-to-human spread of H5N1 have occurred.

So far, spread of H5N1 virus from person to person has been rare and has not continued beyond one person. However, because all influenza viruses have the ability to change, scientists are concerned that the H5N1 virus one day could be able to infect humans and spread easily from one person to another. Because these viruses do not commonly infect humans, there is little or no immune protection against them in the human population. If the H5N1 virus were able to infect people and spread easily from person to person, an influenza pandemic (worldwide outbreak of disease) could begin. No one can predict when a pandemic might occur. However, experts from around the world are watching the H5N1 situation in Asia very closely and are preparing for the possibility that the virus may begin to spread more easily and widely from person to person.

How is infection with H5N1 virus in humans treated?

The H5N1 virus currently infecting birds in Asia that has caused human illness and death is resistant to amantadine and rimantadine, two antiviral medications commonly used for influenza. Two other antiviral medications, oseltamavir and zanamavir, would probably work to treat flu caused by the H5N1 virus, but additional studies still need to be done to prove their effectiveness.

Is there a vaccine to protect humans from H5N1 virus?

There currently is no commercially available vaccine to protect humans against the H5N1 virus that is being seen in Asia and Europe . However, vaccine development efforts are taking place. Research studies to test a vaccine to protect humans against H5N1 virus began in April 2005, and a series of clinical trials is underway. For more information about the H5N1 vaccine development process, visit the National Institutes of Health website.

What is the risk to people in the United States from the H5N1 bird flu outbreak in Asia and Europe ?

The current risk to Americans from the H5N1 bird flu outbreak in Asia is low. The strain of H5N1 virus found in Asia and Europe has not been found in the United States . There have been no human cases of H5N1 flu in the United States . It is possible that travelers returning from affected countries in Asia could be infected if they were exposed to the virus. Since February 2004, medical and public health personnel have been watching closely to find any such cases.

What does CDC recommend regarding the H5N1 bird flu outbreak?

In February 2004, CDC provided U.S. health departments with recommendations for enhanced surveillance (“detection”) in the U.S. of avian influenza A (H5N1). Follow-up messages, distributed via the Health Alert Network, were sent to the health departments on August 12, 2004 , and February 4, 2005 ; both alerts reminded health departments about how to detect (domestic surveillance), diagnose, and prevent the spread of avian influenza A (H5N1). The alerts also recommended measures for laboratory testing for H5N1 virus. CDC currently advises that travelers to countries with known outbreaks of influenza A (H5N1) avoid poultry farms, contact with animals in live food markets, and any surfaces that appear to be contaminated with feces from poultry or other animals. CDC does not recommend any travel restrictions to affected countries at this time. For more information, visit Travelers’ Health.

What is CDC doing to prepare for a possible H5N1 flu pandemic?

CDC is taking part in a number of pandemic prevention and preparedness activities, including:

- Providing leadership to the National Pandemic Influenza Preparedness and Response Task Force, created in May 2005 by the Secretary of the U.S. Department of Health and Human Services.
- Working with the Association of Public Health Laboratories on training workshops for state laboratories on the use of special laboratory (molecular) techniques to identify H5 viruses.
- Working with the Council of State and Territorial Epidemiologists and others to help states with their pandemic planning efforts.
- Working with other agencies such as the Department of Defense and the Veterans Administration on antiviral stockpile issues.
- Working with the World Health Organization (WHO) and Vietnamese Ministry of Health to investigate influenza H5N1 in Vietnam and to provide help in laboratory diagnostics and training to local authorities.
- Performing laboratory testing of H5N1 viruses.
- Starting a \$5.5 million initiative to improve influenza surveillance in Asia .
- Holding or taking part in training sessions to improve local capacities to conduct surveillance for possible human cases of H5N1 and to detect influenza A H5 viruses by using laboratory techniques.
- Developing and distributing reagents kits to detect the currently circulating influenza A H5N1 viruses.
- Working together with WHO and the National Institutes of Health (NIH) on safety testing of vaccine seed candidates and to develop additional vaccine virus seed candidates for influenza A (H5N1) and other subtypes of influenza A virus.

Recommendations for Avian Influenza

All patients who present to a health-care setting with fever and respiratory symptoms should be managed according to recommendations for Respiratory Hygiene and Cough Etiquette and questioned regarding their recent travel history.

Patients with a history of travel within 10 days to a country with avian influenza activity and are hospitalized with a severe febrile respiratory illness, or are otherwise under evaluation for avian influenza, should be managed using isolation precautions identical to those recommended for patients with known Severe Acute Respiratory Syndrome (SARS). These include:

Standard Precautions

Pay careful attention to hand hygiene before and after all patient contact or contact with items potentially contaminated with respiratory secretions.

Contact Precautions

Use gloves and gown for all patient contact.

Use dedicated equipment such as stethoscopes, disposable blood pressure cuffs, disposable thermometers, etc.

Eye protection (i.e., goggles or face shields)

Wear when within 3 feet of the patient.

Airborne Precautions

Place the patient in an airborne isolation room (AIR). Such rooms should have monitored negative air pressure in relation to corridor, with 6 to 12 air changes per hour (ACH), and exhaust air directly outside or have recirculated air filtered by a high efficiency particulate air (HEPA) filter. If an AIR is unavailable, contact the health-care facility engineer to assist or use portable HEPA filters.

Use a fit-tested respirator, at least as protective as a National Institute of Occupational Safety and Health (NIOSH)-approved N-95 filtering facepiece (i.e., disposable) respirator, when entering the room.

These precautions should be continued for 14 days after onset of symptoms or until either an alternative diagnosis is established or diagnostic test results indicate that the patient is not infected with influenza A virus. Patients managed as outpatients or hospitalized patients discharged before 14 days with suspected avian influenza should be isolated in the home setting.

Is the world adequately prepared for this pandemic ?

No.

Quarantine, Quarantine, Quarantine

I have been ask repeatedly on how to quarantine properly and so this is being written to take care of that question.

I guess the first thing we need to consider is why we are quarantining. Remember quarantine is due to a biological event and not a chemical or nuclear. For these last two you should be sheltering in place.

A proper quarantine will protect you from what ever it is you are trying to protect against henceforth there will be different stages of quarantine.

1. The first and most basic stage is to go home lock the doors and stay there. DO NOT try to seal up your home with duct tape and plastic as you will not have enough oxygen to breath within a very short time. This method is used for chemical events where you need to be indoors for a very short period of time. Most quarantines will last days if not weeks and months. At this stage you can actually go out in to your front yard or back yard and breathe the air just fine just as long as you do not breathe someone else's air that might be infected with an airborne communicable disease or virus. This could include certain animals and insects all depending on what the biological is. All infected people should remain a good distance (minimum 20 feet) away from you and anyone else sheltering with you. Anyone (again including certain animals) that has been in a possibly infected area should be kept separate (quarantined separate) from you until they have sough proper medical attention (if it is available) and been cleared or they have run the course of waiting the required length of time to be sure that symptoms will or will not show up. Remember in most biologicals symptoms do not show up for several days. For mothers and other care givers wishing to attend infected persons, especially children, during this time a full biological protection mask, gown, and gloves should be used and then disposed of properly. This really should be avoided at all costs but trying to tell a mother she cannot care for her children is sometimes near to impossible. Exposure time should be set at a bare minimum.

The proper shielding garments to be worn would be a disposable non-breathable (Tyvek) suit (available at most paints stores), a tight fitting (with two straps) N-95 or N-100 dust mask, and latex or rubber gloves. All of this needs to be disposable. A better face mask with biological filters is suggested.

It is important to remain quarantined for the suggest length of time that the certain biological requires. This will vary from biological to biological. This means no going to the store or to work or church or school or . . . STAY HOME.

2. The second stage is for more serious conditions where being around certain biologicals, even on the other side of a locked door, posses a more serious problem. Usually at this stage a gas mask with a biological filter is needed instead of a simple N-95 dust mask. Be wary of official warnings as when to move to this level.

3. The third stage is the most serious and nothing other than a level one suit is required. Again be wary of official warning as when to move to this level although the common citizen should never be involved with such procedures that would require this level.

What more can I say about this other than . . . STAY HOME.

If you prepare now you can do this. It really is not that hard.

QUARANTINING for Epidemics or Other Biological Problems

FACTS ABOUT THE AVIAN FLU

1-2 days incubation period

Abrupt onset of fever ($> 101^{\circ}\text{F}$), chills, myalgia, headache, followed by cough and upper respiratory symptoms.

Abdominal symptoms are not the flu.

5-6 days of restricted activity, 3 days bedridden.

Contagiousness last approx. 6 total days = 1 day before onset and 5 days after onset

Tamiflu and Relenza help a lot, but are difficult to obtain (prescription only, and the U.S. is out)

Over 50% of Avian flu cases thus far have been terminal.

Getting a pneumonia shot every 10 years helps you to not have the flu turn into bacterial pneumonia. Viral pneumonia is not affected by the shot, but it is usually not as serious as bacterial pneumonia.

There are between 20,000 and 40,000 deaths in the U.S. annually from the flu (not Avian).

In some ways, the young and healthy are at just as great or greater risk with the Avian flu as the elderly and infants. The magnitude of their immune response worsens the symptoms.

A pandemic won't occur until the spread becomes person to person. It's still bird to person.

It will probably take 6-8 months after the onset of a pandemic before a vaccine is available.

In-place sheltering for something like a chemical attack is extremely short-term (1-2 hours) and requires an absolutely airtight room. This is not the case when the problem is biological. It is extremely unlikely that we will experience a dangerous cloud of biological contamination blowing our way. More likely is that the problem will be an outbreak of some disease that comes either through contaminated food or water, or via contaminated people.

If this should occur QUARANTINING will be required. This means that you, if you are sure you haven't been exposed, will stay in your home for the length of the community life of the disease. This could as long as 3+ months — the authorities will tell you when it's safe to stop the quarantine. During quarantining, you can use your tap water, heat and electricity, go out to the wood pile and garage, but you must not come in contact with other people (like neighbors) that you can't be certain have not been exposed.

If you are sure you have been exposed, call a public health official about precautions to take. If you don't know whether you've been exposed or not, do separate quarantining of yourself from the rest of your family members — perhaps in the garage or in a specially set-apart room in your house, until you are sure one way or the other.

The present threat of an Avian Flu pandemic is an example of an event that could occur requiring us to quarantine for a longer of time. Below is a list of things that would be wise to have ready in your home in case of such a need. Note, the Avian Flu is still bird to person and won't become a pandemic until it crosses the person-to-person barrier.

The Church has long recommended a year supply be kept on hand; but if that is too much for you to deal with at this time, start with a 3 month supply. If that is too much, do a 1 month supply. The numbers below represent a 3 month supply for 1 adult. Essential items are listed first and items of lesser importance afterwards. Of course, smaller children require less, and you can estimate for them based on these numbers.

Essentials — 3 month list for 1 adult:

- 100 total lbs. of grains (wheat, oats, rice, popcorn*, millet, quinoa, barley, rye, pastas...)
- 15 total lbs. of legumes (split peas, pinto beans, kidney beans, lentils, chili beans...)
- 2 #10 cans of powdered milk
- 2 qts. cooking oil or shortening
- 15 lbs. sugar or honey
- 1 lb. of salt
- 25 gal. water (= 2 weeks supply) [Public water shouldn't be contaminated in a flu epidemic, so your tap water should still be safe, but it can only be intelligent to have water storage on hand for all contingencies.]

Secondary but important items:

- 1 lb. yeast
 - ½ lb. baking powder
 - ½ lb. baking soda
 - 10 lbs. pasta
 - 1 qt. vinegar
 - 2 large jars peanut butter
 - 24 cans tuna fish & other canned meats (turkey, sardines, salmon, chicken, beef...)
 - 12-24 cans chili
 - any other foods or items that you regularly eat and will hope you have on hand if you can't go to the store for 3 months (canned or dehydrated fruits and vegetables such as peaches, apples, plums, apricots, tomatoes, green beans, onions, corn, alfalfa seeds for sprouting, sprouting barley seeds..., spaghetti sauce, butter, frozen orange juice..., condiments... i.e. a 3-MONTH SUPPLY OF THE FOOD YOU EAT!)
 - toilet paper (12-20 rolls)
 - feminine hygiene and diapers
 - vitamins, medicines, and 3 months of your prescription medications
 - laundry soap, hand soap, dish soap, shampoo, conditioner, deodorant, and other toiletries...
 - ½ gal. Clorox
 - keep your cars' gas tanks more than half full at all times
 - see if you can work from home, but if you absolutely have to go out, use latex gloves and an N-95 dust mask
 - keep enough money in your account to be able to pay your bills until you can return to work
- *Popcorn will make much better cornmeal when ground than whole yellow corn, but you have to have a strong wheat grinder that can grind grains as hard as popcorn. Not all are. Plus, popcorn pops!

Biological and Chemical Agent Dispersion

Facts About Biological and Chemical Agents

1. Nerve gas and many other deadly gases cannot be sensed.
2. Some of the symptoms of nerve gas poisoning are as follows:
 - a A feeling of tightness or constriction in the chest.
 - b The onset of an unexplained runny nose.
 - c Small, pin-point size pupils.
 - d A drawing, slightly painful sensation in the eyes or unexplained dim vision.
 - e Difficulty breathing.
 - f Increased salivation and excessive sweating.
 - g Nausea, vomiting, and abdominal cramps.
 - h Generalized muscular twitching, jerking, and staggering.
 - i Headaches, drowsiness, a sense of confusion, and a possible coma.
 - j Death.
3. Biological agents are organisms or toxins that can kill or incapacitate people, livestock, and crops. They can be dispersed by aerosols, animal carriers, and food and water contamination.
4. Chemical agents are poisonous gases, liquids, or solids that have toxic effects on people, animals, or plants. They can be released by bombs, sprayed by aircraft and boats, and used to contaminate air, food, and water supplies.
5. In the event of a biological or chemical attack, you might be instructed to either take immediate shelter where you are and seal the premises or evacuate the area immediately. Follow the Instructions !!!
6. Become aware of the DOT warning placards used for in-transit hazardous materials

What to do *DURING* a Biological or Chemical Dispersion

1. What you should do is to evacuate the area for the amount of time that the authorities say. If an official evacuation is declared, **LEAVE IMMEDIATELY !**
2. In the event of an industrial accident or terrorist attack or other similar problem a broadcast might be made on the EAS (Emergency Alert System) following a general alert signal. It will be broadcasted on the radio, television, loudspeakers, and/or wide area broadcast systems. An example message would be as such: "Attention! Attention! A threat of (nerve gas contamination, radioactive contamination, or whatever the threat is) exists!" The direction of the cloud and the estimated time of arrival and path will be announced along with defensive action that each citizen should take.
3. If you have immediate access to a gas mask or scuba or scba equipment, use it and then proceed to evacuate. If it is not immediately available do not go looking for it. It will be too late. If you can wear your PPE (Personal Protective Equipment) which includes: long-sleeved shirt, long pants, gloves, and a gas mask, so you can be as protected as much as possible.
4. Take your 72-hour kit. Lock your home or office.
5. Use travel routes specified by local authorities—don't use shortcuts because certain areas may be impassable or dangerous.

6. Listen to local authorities. Your local authorities will provide you with the most accurate information specific to an event in your area. Staying tuned to local radio and television, and following their instructions is your safest choice.
7. There should be **no** reason to stay behind when an official evacuation order is announced. But if the situation arises that you cannot evacuate, or you are asked to **“shelter in place”** the following are listed some precautions that can be made. If you are advised by local officials to **“shelter in place”**.

In-Place Sheltering

Authorities have long recognized that it would be extremely difficult to evacuate whole counties in the event of a disaster such as a bio-chemical hazard/incident or chemical spill. The population is too great with too few exit routes. Evacuation is preferable when possible, but if it isn't an option, people can do what is called “in-place sheltering” with some simple preparation. This means that a person sets up a shelter in their own home until the air-borne hazard passes, which could be in several hours or many days.

“In place sheltering” involves two types of sheltering.

- a Sealing yourself indoors
- b Quarantining yourself indoors

Listen for OFFICIAL information to see what kind you need to do.

To seal yourself indoors there are some special considerations to take other than just locking the doors. IN ADVANCE, select a room in your home where you would do the in-place sheltering. An upstairs and interior room is best, as some chemical hazards are heavier than air and travel along the ground and will enter basement shelters. Then make a list and keep it handy of what you will keep in that room or put there quickly if you have to shelter there. You will need to have:

Necessary:

- a 200 sq. ft. (1 roll) plastic sheeting (4 mill is better than 3 mill but you can use down to 2 mil)
- b 1 or 2 rolls of duct tape
- c A battery powered radio or TV to check for OFFICIAL news
- d Important personal medications for you and your family
- e A flashlight or light stick - incase you loose power - do not use candles or lanterns that burn valuable oxygen

Optional:

- a A port-a-potty, (5 gal. bucket lined with heavy duty lawn/leaf garbage bags and some RV/ holding tank toilet chemical or a pail of dirt and a lid or plastic snap-on toilet seat.
- b Books, games, or other diversions (do not count on videos you will be covering your outlets)
- c A FRS and/or ham radio to get information from local authorities - this does not displace official information sources - *REMEMBER* rumors are not official information.
- d A telephone or cell phone
- e Water or something to drink
- f Food to munch on but not salty foods

It's is better to have this planned in advance and readily accessible than to have to think it up and find it on the spot. Depending on the distance you are from the bio-chemical hazard/incident you could have as little a 5 minutes and as much time as an hour but not much more than that. Hazardous fumes, vapors and smoke follow the wind patterns. In most areas this is 2 - 3 miles per hour except around canyons and seashores then

it can be anywhere from 2 to 40 miles per hour. Most people can walk 2 - 3 miles per hour. SO, if you are not in the immediate path of danger you will have time to get to a place and shelter there. So run - don't walk. To calculate where a good place is, figure any where you can normally, walk to in 5 minutes, realizing that in the event of a incident panic and chaos set in. You will need to plan on been "sealed in" your place for a minimum ONE hour in the absence of official information or longer. Mother nature does a good job of cleaning up chemical hazards/incidents using normal wind patterns and sunlight. This means that most of the dangerous levels of toxic problems sealed against for about an hour.

NOTE: You may still need to stay quarantined indoors for a much longer time just not "sealed in". Our homes cannot provide us with sufficient oxygen to seal ourselves in for long periods of time. You WILL die of asphyxiation if you try this, so don't. Besides it is next to impossible to seal an entire house in a reasonable amount of time, so choose a single room large enough with oxygen for all the intended occupants. Side note: full size dogs use twice the amount of oxygen as a full grown adult so you determine if Fido is worth saving.

First:

Turn on a radio or TV for official information.

Second:

You will need to turn off all mechanical or electrical operated air intake or air exchange to your home, business, school, or church, etc., namely your furnace (and gas main shut off) or air conditioner, chimney flue dampers and any fans. Do not take the time to get on your roof to cover vents and/or chimney openings.

Third:

Close, lock and secure your home (windows, doors, animal entries, etc.).

Fourth:

1. Gather your family and any pets you want to save and the listed supplies into your selected room, and using the plastic sheeting and duct tape, make the room as air-tight as possible.
2. Wet some (soaking wet) towels and jam them in the cracks under the doors. Where possible select a room large enough to maximized the amount of oxygen you will have until it is safe to come out.
3. Cover over windows, heat vents, light switches, power sockets, fire places, baseboard gaps, light fixtures, and entire door frames with duct tape and/or plastic. It is best to have these pre-cut, well in advance to cover every opening. You can in advance, caulk some cracks and small air leaks into that room.
4. *To determine oxygen needs and occupancy have everyone in the room in a standing position stretch their arms out fully. If they can do this with out touching anyone else's outstretched arms/fingers there is enough oxygen for one hour. (i.e. a 8 foot by 6 foot typical bathroom holds enough oxygen for 2 adults and one child under 6 years of age.*
5. Then limit activity and oxygen usage.
6. If the power goes out do not use lanterns or candles. This uses valuable oxygen. Light sticks or flashlights are a better source of light.
7. Stay inside you sealed shelter until you are told, *officially*, it is safe to leave. Realize you may still need to stay indoors, quarantined, for a longer amount of time. In the absence of official information you should leave your shelter after one hours time if you have only allotted yourself an hours worth of air.

Note: *Sheltering in place after a nuclear incident is different see the “Nuclear Disaster and Warfare” section of this booklet for more details.*

Quarantining yourself includes:

1. Gather your family to your home and lock all doors and window.
2. Turn on a radio or TV for official information.
3. Once you have locked yourself in do NOT open the door until you get OFFICIAL information that it is safe to leave.
4. You must guard yourself from ALL contact from all people *and* animals and some insects that have become infected. This may include those near and dear to you. You may have to put down your pets!

Note:

Quarantining yourself does not include or involve sealing yourself in with any kind of duct tape or plastic.

WHAT To Do *AFTER* a Biological or Chemical Dispersion

1. Follow the instructions of local and government authorities !
2. If you evacuated, do not return home until it is determined safe to do so.
3. If you feel or suspect you have been affected by the situation contact the local hospital to see if they are receiving patients, if so go get help. Some biological poisonings will require quarantine. If you are turned away by a hospital or treatment center quarantine yourself in your home for the time told to you by the authorities.
4. If you find that others have been affected you may still want to quarantine yourself for 2 weeks or longer depending on the extent of the problem.

2006, By Kenneth Moravec

Common other Biological / Chemical Agents

name	suggested quarantine	symptoms / comments	treatment
Aflatoxin	2 days	liver cancer	None
Anthrax (bacterium)	14 days	spores - malaise, fatigue, cough, respiratory distress, fever, cyanosis, dyspnea, diaphoresis, stridor, toxemia	antibiotics Ciprofloxacin tetracycline
Botulinum (toxin)	0 days	weakness, dizziness, dry mouth nausea, vomiting, difficulty swallowing and talking, blurred vision, drooping eyelids, progressive paralysis, cyanosis, respiratory distress	oxygen, antitoxin
Brucellosis	2 days	joint and muscle dysfunction	
Chlorine	2 days	eye and skin burns on contact, broncho-spasm, cyanosis	treat for burns, CPR, artificial ventilation
Cholera	6 -7 days	toxemia, vomiting, diarrhea, dehydration, shock	re-hydration, tetracycline erythromycin
Clostridium	2 days	Perfringens - gaseous rotting of the flesh	
Plague (bacterium)	90-100 days	bubonic, septicemia, pneumonic, high fever, chills, toxemia, headache, pneumonia, hemoptysis, malaise, meningitis, dyspnea, stridor, cyanosis, respiratory failure, death	antibiotic, streptomycin doxycycline Chloramphenicol Ciprofloxacin
Q-Fever	0 days	fever, chills, headache, severe sweats, malaise, fatigue, skin rash, respiratory problems	tetracycline doxycycline
Ricin (toxin)	0 days	fever, nausea, vomiting, bloody diarrhea, abdominal cramps, difficulty breathing, kidney failure, circulatory collapse - paralysis	therapy for acute lung injury and pulmonary edema, activated charcoal, fluids, gastric lavage
Salmonella	2 days	diarrheal illness, headache, abdominal pain, nausea	re-hydration Ciprofloxacin
Small Pox (virus)	30 days	malaise, fever chills, vomiting, headache, 2-3 days later: flat red spots change to pus filled lesions on skin and mouth and throat	intravenous hydration, nutrition pain control, antiviral drugs
Staphylococcal Enterotoxin B	2 days	SEB - fever, chills, shortness of breath, nausea, vomiting	artificial ventilation
Tularemia (bacterium)	30 days	septicemia, pneumonic, high fever, chills, headache, hemoptysis, malaise, meningitis, dyspnea, stridor, cyanosis, respiratory failure, death	antibiotics

Common Nerve, Blood, Chocking and Blister Agents

chemical	comments	treatment
GA	Tabun	atropine, pralidoxime, CPR. remove victim from area and wash entire body especially hair with soapy water
GB	Sarin - colorless liquid - evaporates quickly	atropine, pralidoxime, CPR, remove victim from area and wash entire body especially hair with soapy water
GD	Soman	atropine, pralidoxime. CPR, remove victim from area and wash entire body especially hair with soapy water
VX	thick oil like liquid	atropine, pralidoxime, CPR, remove victim from area and wash entire body especially hair with soapy water
H	distilled nitrogen mustard gas - blistering and burning of eyes and skin	irrigation of eyes and skin, CPR
HD, HS	mustard gas - blistering and burning of eyes and skin	irrigation of eyes and skin, CPR
HT	phosgene gas - Carbonyl Chloride	irrigation of eyes and skin, CPR
AC	Hydrogen Cyanide - lighter than air - asphyxiation	CPR, artificial ventilation
CK	Cyanogen Chloride - heavier than air - asphyxiation	CPR, artificial ventilation
MDI	Methyl Isocyanate - heavier than air - respiratory distress, skin rash, eye irritation	irrigation of eyes and skin induce vomiting

Nuclear - Chemical Decontamination Kit

- 1 5 or 6 gallon bucket with lid
- 1 - 2 Spray Bottle (s).
- 1 Bulb Syringe.
- 2 Large Bath Towels.
- 4 - 8 Wash-Cloths
- 1 pkg. Baby Wipes
- 1 Small bottle of liquid soap.
- 1 Small bottle of shampoo.
- 1 - 4 39 gallon size (1 mil) yard bag(s)
- 1 - 4 Twist ties.

** apart from "Decon Kit" but helpful and maybe necessary.*

Before entering your shelter after a nuclear or chemical incident you need to decontaminate your entire body.

A. Carefully open and arrange your decon kit in such a way that you can reach ev erything and still keep all possible contamination in one localized area.

B. Step into the large basin or 39/55 gallon bag so it can catch all water and decontamination com ing off of your bod y.

C. Carefully strip off all of your clothes. Yes all of them. This is not a fashion show or a time to worry about modesty rather a time to worry about saving your life. Put ALL of your clothes in a 39/55 gallon bag. You m ay have to cut your clothes off. Speed is an issue. The faster the better.

D. Remove ALL jewelry, eyeglasses, and plastic coated pictures, identification cards, etc. you may want to save and put them aside. These to will have to be decontaminated with water so realize you will not be able to save non-plastic coated papers or cloth items.

E. Shower completely with an *outside* shower or hose.

NOTE: If you do not have and outside shower or hose then do the following:

A Open a spray bottle and fill it with water and spray your entire body head to toe with emphasis on all the hair on your body, wherev er it is. Your hair must be cleaned well.

B Take one washcloth and blot down (do not wipe the contamination into your pores) your entire body head to toe, not forgetting the genital areas and orifices, then the face then the rest of the body. Place the wash cloth in the 39/55 gallon bag.

c Open the spray bottle again and fill it with 2 tablespoons of bleach - If it is a chemical incident. If it is nuclear incident straight water is okay. Spray your entire body again. Be careful around eyes, ears, nose, and mouth not to do this area if you are using the bleach solution. You do not need bleach in those parts.

D Fill the small basin water and with the liquid soap, shampoo, the remaining water in the spray bottle, and a DIFFERENT wash cloth. Soap up and

scrub your entire body, especially cracks and crevasses, your jewelry and id cards you want to save. You cannot save cloth or paper items.

E Fill up your spray bottle one or more times and rinse down your body completely.

F. Open the baby-wipes package and use one or more to clean around your eyes, nose, mouth and ears.

G. Dry off completely and step out of the large basin or bag. Place all towels, washcloths, and other cleaning instruments into the 39/55 gallon bag.

H. If it is a nuclear incident, with the Rad meter, take readings over your entire body AWAY from your decontamination basin and contaminated clothes and water. You need to bring the radiation level down to 1 R. or less. If the radiation level has not decreased continue washing until it does.

I. Repeat the process if necessary using clean towels and washcloths.

J. Seal up the 39/55 gallon plastic bag with the wire tie and place as far away from the shelter door as possible with out risking further contamination.

K. Once you are “clean” you may enter your shelter and put on some clean clothes.

2006, By Kenneth Moravec

Nuclear Disaster and Warfare

Facts about nuclear disasters

1. Radiation

- a. Radiation kills and is **not** perceptible to the human senses.
- b. Radiation sickness and radiation poisoning are **not contagious**.
- c. Radiation in perfect circumstances can last more than 20 years.
- d. Radiation under normal circumstances decays or dies very fast (about 14 -21 days).
- e. The most vulnerable to radiation poisoning are young children, elderly, and sick.
- f. Measurement and Time Limitations
 - 1) Radiation is measured in Roentgens (R.).
 - 2) You receive ½ to 1 R. from the x-rays your dentist takes.
 - 3) The human body can receive up to 400 R. and still live (see the “Radiation and Contamination Effect Chart” in this section) although after 400 R. will cause serious damage.

2. Explosion

- a. Most deaths occur due to being exposed to the explosion (which includes the blast, wind, radiation, heat, and light) or due to collapsed buildings or fires. The wind caused by the blast is approximately 200 mph or more from the center of the blast out to about 12 miles.
- b. Even during the worst possible time for a nuclear device to explode (a week day at noon in the middle of winter), it is estimated that only approximately 2% of the actual population would be killed in the explosion. The rest of the casualties would result from radiation sickness and injuries sustained in the days and months to follow.
- c. **Never** look at an explosion, it will blind you (within about 20 miles). The light “flash” can still be seen up to 50 miles away. Do not look at it no matter what the distance.
- d. The entire detonation of a nuclear device only lasts a few seconds.
- e. Radiation levels for the explosion can reach up to 5000 R. or more.

3. Decontamination

- a. Decontamination of radiation contaminated objects includes washing everything.
- b. **Never** burn, boil, or dust off contaminated objects. This only puts the radiation back into the air. You cannot get rid of radiation by burning it.
- c. Any contaminated object that cannot be washed properly (i.e. sponges, cakes, breads, berries, and other porous materials, etc.) should be disposed of.

4. Fallout

- a. “Fallout” is dust, dirt, or particles from an explosion that have radiation molecules on or in them.
- b. A public fallout shelter is a building or structure designated by the government that is said to provide ample protection from radiation and also supposedly has enough supplies in it to house, feed, and provide sanitary needs for the amount of persons allowed into the shelter, although most public fallout shelters are **not** stocked.
- c. Fallout shelter building and shielding materials include: (with a protection factor (PF) of 4 and/or a shielding factor (SF) of .05)

36" of wheat	or	24" of rice	or
18" of wood	or	14" of books or magazines	or
9" of empty concrete blocks	or	7" of dirt, water, or gravel	or
5" of solid bricks or sand	or	4" of concrete, glass, or aluminum	or
1½" of steel or iron	or	¾" of lead	

- d. You can find minimal protection in a full basement of a residential type home. (SF .5)
- e. Food and water are unaffected by direct radiation, other than being cooked.
However, they can still be contaminated by fallout.
 - 1 Fallout-exposed canned or bottled food items are safe and should be washed off before being opened.
 - 2 Fallout-exposed solid foods can be eaten, but the outer ¼ inch should be peeled or cut off and disposed of after being washed off.
 - 3 Fallout-exposed porous foods should never be consumed.
 - 4 Fallout-exposed water is okay to drink, but it should be filtered extensively first (not boiled) to be sure that all fallout particles are not consumed.
- f. Within the first two weeks after the last explosion, protective “fallout” clothing should be worn outside at all times and shed before entering a fallout shelter. Protective fallout clothing includes:
 - 1 Headgear or a full brimmed hat with hair completely covered
 - 2 Boots or sturdy shoes
 - 3 Heavy or thick clothing including gloves (long sleeved shirts and long pants)
 - 4 A dust or gas mask or some other form of respiratory protection to ensure that fallout particles are not inhaled.
- g. After five weeks it is safe to be outdoors for up to 14 hours a day. There has been no real study that is available to the public that states when a person could be outdoors for up to 24 hours a day but most of us are not outside more than 4-5 hours anyway.
- h. After a nuclear disaster, before planting crops again you should wait at least 2½ weeks, scrape off or plow at least 18 inches under the top 3 to 5 inches of top soil, and then plant.

What to do to **PREPARE FOR** a nuclear disaster

1. Follow procedures for “General Emergency and Disaster Preparations” (see page 1).
2. Obtain Thyro-Block tablets or some other form of (KI) potassium-iodide or potassium-iodate.
3. Understand the warning signals given by the government and local authorities, what they mean, and how to respond to them.
 - a. The EMERGENCY ALERT SYSTEM (EAS) is broadcast over sirens, radio, television and the internet and lasts for about 10 seconds. After you hear or see this turn on your radio or television to get the **official** message from your local authorities on what to do and where to go. With this signal or message you will usually have time to evacuate the area or seek adequate shelter. Listen to it !
 - b. If you live in an area that has a wide area broadcast system - WABS (most major cities do) a wavering siren will sound. This usually does not give you any instructions. After you hear or see this turn on your radio or television to get the official message from your local authorities on what to do and where to go.
 - c. If you live in an area that does not have a wide area broadcast system or EAS when political tensions begin to rise be attentive to the radio and television news broadcasts as to what to do.
*******REMEMBER** a rumor is not a warning !*****
 - d. If you hear a rumor, do not start packing but rather find official information.
4. Nuclear detonations create EMP’s (electromagnetic pulse) which burn out some electric and most electronic

equipment rendering computers, televisions, stereos, ATM machines, most newer vehicles (1970 to present), etc. incapacitated. EMP's have no direct affect on living things. Although it would be difficult to protect everything, there are a few things you can do which will help before (not during) a nuclear detonation.

- a. Unplug all electric and electronic equipment.
- b. Disconnect all telephones, answering machines, modems, etc.
- c. Lower or disconnect all antennas on home, handheld, and vehicle radios, shortwave, CB's, HAM radios, etc longer than 12".

What to do *DURING* a nuclear disaster

1. *Remain calm !* **Think** through the consequences of all your actions.
2. Time limitations:
 - a. 24 hours or more: Evacuate and take your family with you BUT only if you have a safe place to go to. Remember roads will be jam-packed and you will not get far
 - b. 30 minutes to 24 hours: Evacuate to a shelter nearby or your home, if close by, immediately. Do not wait for your family. Go!
 - c. 5 minutes to 30 minutes: Do not evacuate. Go to the nearest fallout shelter.
 - d. 30 seconds to 5 minutes: If you do not have time to find adequate shelter, are at work, school, or church, etc., get under a desk, behind a sturdy wall, to the basement, behind a white wall, or to the center-most part of the building and brace yourself as for an earthquake.

Before you decide to evacuate think and be sure you are able and want to get on the highways with everyone else trying to do the same. You will see massive delays and traffic.

3. If you are going to evacuate, and have time, remember to turn off all utilities, close your curtains, and lock your house.
4. Do not forget to take your 72-hour kit with you, if you can get to it in time without risking your safety or the safety of others.
5. If you do not have time to go to a shelter and you are at home, follow the instructions in this section for "Things To Do At Home In The Event Of A Nuclear Attack" .
6. Do not bring pets into any public shelter. They will not be allowed.
7. Do not bring pets into your own shelter or basement unless you have at least a three week food supply for them and proper sanitary measures. It is usually best to leave most pets and farm animals in a garage, shed, or barn with an ample supply of food and water. They have a tendency to survive radiation exposure much better than humans. However, do not leave dogs with other dogs or with any other animals or locked inside. Dogs have a tendency to go wild and will even turn on their own masters under these circumstances.
8. If you are in your vehicle and do not have time to seek proper shelter, stop your vehicle, get out, and lie on the ground face down, preferably in a ditch or culvert or behind or in some other form of protection.
9. If you are outdoors and do not have time to seek proper shelter and have no form of protection around you, lie on the ground face down.

10. If you are caught in the open stay down low until the blast is over, about three seconds. Seek indoor shelter as soon as possible. The blast wave goes out from the center of the explosion and then is sucked back in which causes the mushroom-shaped cloud. So expect two blast waves.
11. **Never** look at the blast. It **will** blind you.
12. If you can feel, hear, or see the blast, you **are** in danger. There may be other blasts.

How to prepare your home basement to act as a fallout shelter

1. First of all this is a minimal protection fallout shelter and also it is *NOT* a blast shelter.
2. You will need to start with a full basement home. If you have a half, daylight, or walkout basement you will need to do extra protection on those exposed walls or parts of walls out of the ground. By starting with a full basement you use the dirt on the four sides of the basement wall as minimal protection. The main worry is overhead.
3. By filling up window wells with dirt, sand, books, or other dense materials - this will help. You can do this either from the outside or if you are out of time from the inside - on the window ledges. The glass in the windows offers no protection.
4. The next step is to build up the overhead protection. You can do this by getting under a sturdy table, workbench, bookshelves with a door across them, doors leaned against the outer basement wall, etc. and then piling on top of the structure dense materials such as materials listed in the first part (Fallout) of this section # 4c. You can do this also to main floor over the part of the basement you are in.
5. Be sure when you are done fortifying overhead that you fortify around you on all four sides. The first seven hours after each blast are the most important. This does not mean you can come out of your improvised shelter for long periods of time but if you need to stretch your legs for a minute (emphasis on the minute) you can as long as you stay in the basement.
6. Be sure that you do not seal your self in so tight that you do not have air to breath. *This is not where you use duct tape and plastic.*
7. Remember you need to stay in your shelter for up to 14 days or longer. You will need both sanitation measures, water and food. The more you can do to prepare before a nuclear event the better - even if it is just putting needed materials and supplies in one place so they are easy to grab and use.

On the next page are a few examples from FEMA manuals on how you can build these expedient shelters. For more details on these pictures contact the author.

2006, By Kenneth Moravec

What to do *AFTER* a nuclear disaster

1. Begin taking Thyro-Block tablets or some other form of potassium-iodide/iodate according to the instructions on the bottle. It is actually best to start this before or as soon as you get an official warning.
2. It is recommended that if you are within the 350 mile “downwind” radius of an explosion that you stay indoors in a fallout shelter or basement for at least two weeks. This, by the way, under most probable scenarios would cover the entire U.S.A.
3. If you are outside the 350 mile “downwind” radius of an explosion, stay indoors at least 5 - 6 days and then venture out only for short periods of time only if needed.
4. As you begin to leave your shelter, do it for short periods of time only to get rid of sewage and trash.
5. As time goes by, you will be able to leave your shelter for longer periods of time. (See the “Radiation Contamination and Effect Table”) Turn on a battery-powered radio for official broadcasts on what to do.
6. After 3 weeks you will need to start your life over again. Remember food production and water filtration should most likely be on the top of your priority list.
7. Most likely everything outside of protected areas will need to be washed, cleaned, or peeled. Never burn or dust off items because it only puts the fallout back into the air.
8. Exposed or contaminated dry items stored in paper bags or other dry containers should be placed in uncontaminated containers, if you plan to use them.
9. Exposed washable loose items, such as fruits and vegetables, should be washed, then cut or peel the outer ¼ inch off.
10. Under no circumstance should exposed porous items (i.e. breads, cakes, lettuce, broccoli, berries, etc.) be eaten.
11. If you think you have fallout on you, discard your outer garments and wash your skin and hair thoroughly.
12. If you insist on going outside in a fallout-contaminated area, put on your protective clothing, as described earlier in this section. Make sure your hair is covered well. If you have long hair put it up or chop it off.
13. Gasoline and other petroleum products will most likely be scarce, so save them and use them wisely. Remember, most vehicles will probably not operate without mechanical adjustments due to the EMP.
14. As with any civil disturbance, war, or any other disaster, the “have-nots” will become ever so noticeable. Those who “have-not” usually band together to loot, steal, rape, and kill those who have more than they. The police and other protective agencies, if they exist at all, will most likely have their hands full and will not be able to offer very much assistance. Arming yourself might be a wise idea. Self protection may be a necessity, **BUT** in no way is the author of this booklet suggesting self-appointed militia or vigilantism. These groups tend to become just as bad as the bands and mobs of “have nots.” Forming a neighborhood watch is probably your best alternative.

- militias NO - neighborhood watch YES -

Radiation Dosage Table

Animals & Plants	Maximum average amount of radiation dosage (r.)
pig, dog, cat	300
goat	350
human	400
monkey, mouse	450
sheep	540
fish	550
cow, horse, rat	630
rabbit	800
chicken	1,000
insect	5,000 +
turtle	5,000 +
bacteria, virus	100, 000 +
onions	2,000
oats	3,300
barley, rye, wheat, corn	4,300
fruits, grasses	5,000
potatoes	12,000
cabbage , spinach	14,000
tomatoes	15,000

Although fallout shelters that bear signs similar to the one at the right are often abandoned and not supplied they still offer protection from fallout and radiation sources. If you find that you need to use one you can feel safe in there use but do not depend on them being stocked with any food, water, sanitary or medical supplies.

So do not forget your 72-hour kit and all the food and water you can gather when looking to use a fallout shelter. Don't forget your sanitation supplies and more water.



Things to do at home in the event of an imminent nuclear attack

THIS LIST IS IN ORDER OF IMPORTANCE.

If time permits, check all of the things on the list.

If time does not permit, start from the top and work down.

1. Do not panic.
2. **Think** through the consequences of all your actions.
3. Gather your family together.
4. Turn on a television or battery powered radio (for official broadcasts).
5. Begin taking a "Thyroid Blocking Agent (Potassium Iodide - KI)" follow the instruction on the bottle.
6. Go to the basement or lowest or center-most part of the house or building.
7. Build a shelter. (if one does not already exist) - See preceding pages for sheltering materials.
8. Turn off the gas or propane.
9. Turn off the electricity.
10. Fill all tubs, basins, and empty containers (preferably with lids) with water.
11. Turn off the water.
12. Bring filled water containers all non-perishable foods into your shelter (enough for 3 weeks).
13. Bring sanitation measures and items into your shelter.
14. Bring clothing, bedding, and sanitary supplies into your shelter.
15. Close and lock all windows and doors.
16. Fill all basement window wells with sand, dirt, books, or any other dense material. Either from the outside or inside on the window ledge depending on how much time you have.
17. Turn off and cover chimneys, air conditioners, vents, etc. to prevent fallout from coming inside.
18. Close all drapes, curtains and blinds to reflect the flash of the blast and discourage burglars.
19. Go to or send one person to the nearest food store with all available cash to buy all of the non-perishable food that they can, if you do not have a food storage in place.
20. Disconnect or lower all antennas, over 12", and unplug all electric and electronic equipment.

21. Bring into your shelter an axe, pry-bars, and shovel (in case you have to dig your way out).
22. Bring into your shelter legal documents.
23. Board up all windows and doors.
24. Prepare your house as if you were preparing for a tornado or hurricane and an earthquake.
25. Pick all ripe (not green) fruit and bring into shelter for immediate consumption.
26. Cover all outside fuel sources (i.e. firewood, coal, etc.) with plastic or heavy canvas.
27. Dig a deep hole down-hill from your water sources and future garden spots for waste disposal.
28. Empty and unplug all refrigerators and freezers of food (either discard it or eat it) and leave it open (to prevent mildew, a can of open ground coffee will help.).
29. Secure all breakables, pictures, water heaters, china closets, vases, etc.
30. Bring in or secure all lawn furniture, toys, and equipment.
31. Fill all cars, trucks, ATV's, motorbikes, chainsaws, etc., with fuel.
32. Move and lock up cars and trucks into garages or carports, or other secured areas then disconnect and remove the battery and any C.B. or HAM radios and bring them inside.
33. Gather together all gardening supplies into one secure place.
34. Cover all furniture, carpets, and rugs with plastic or dust cloths.
35. Take a good bath. It may be your last for a while.
36. Eat a good hot meal. It may also be your last for a while.
37. Recheck food, water, sanitary supplies, bedding, and clothing in your shelter.

2006, By Kenneth Moravec