

The Lost Book of



Preserving Food Naturally

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Introduction

We all need food; that's a basic fact of life. While you may be able to survive without food for a while, you'll eventually use up your body's energy reserves and need to eat more. This has caused a large portion of human activity throughout history to be dedicated to meeting that basic need. Growing food has become one of the world's major industries. More than that, it's not only growing food that has become important, but processing, preserving, distributing and selling that food as well.

All food comes from nature, in one way or another. Even in our modern world of GMOs (genetically modified organisms) and cross-breeding of species, food is still a natural substance. Everything we eat comes from plant life or animal life, even those things which have chemicals thrown in.

But the same natural processes which cause food to grow also cause it to spoil. We humans are not the only things that want to eat the food that we produce. Insects, rodents and bacteria need that food to survive as well; and when they get into our food, they tend to render it unsuitable for human consumption.

This has led to the need for developing various means for preserving the foods that we eat. Any method we use for preserving food is intended to keep those insects, rodents and bacteria from eating the food, but more than anything, they are intended to keep bacteria from eating it. Most "spoilage" and decomposition of food is accomplished by bacteria eating that food.

As far back in recorded history as you look, you'll find mention of food being preserved in a variety of means. Ancient tombs around the world have been opened, to find dried grains and other food preserved along with the bodies of kings and priests. This food had been left for them to eat on their journey through the afterlife. Interestingly enough, in

many cases, the food has survived the centuries, in better shape than the bodies it was buried with.

Today, food preservation has changed dramatically. While we still use the old methods of food preservation, most of the foods you can buy in the supermarket are preserved with chemicals. These chemicals kill the bacteria which would otherwise eat the food, supposedly rendering the food safe for use. But those chemicals aren't much better for human bodies, than they are for bacteria. The only reason we don't see them causing more damage, is that our bodies are much bigger than those of bacteria. So the impact of those chemicals is much less.

Yet there is a trend in society to move away from artificial preservatives and move more towards natural means of preserving food. More and more people are becoming distrustful of those chemicals, preferring to consume foods with ingredients that they can pronounce. While the junk food industry is in no danger of losing all their sales, their customer base is slowly dwindling.

Part of this is due to the mistrust of GMOs, which have never been fully tested. We find that people on both ends of the political spectrum distrust those foods and are unhappy with the idea of being used as lab rats in an experiment to find out if they are safe.

At the same time, more and more people are seeking to preserve food at home, either due to a return to growing their own foods for health reasons or as a part of preparing for a disaster. Should a TEOTWAWKI (the end of the world as we know it) event strike the country, such as a loss of the electrical grid, the ability to preserve food may be an essential skill for surviving in a post-disaster world.

Yet few people today have the knowledge to preserve food in the home. This knowledge, which was commonplace in the time of our grandparents, has become a rarity today. We



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have become so accustomed to consuming what others produce, that overall, we have forgotten how to be producers ourselves.

This book is about returning to those old ways. We will discuss the various means which you can use to preserve food in your own home. Armed with this information, you could create a fully-stocked pantry, ready for any disaster, even if that's just making it through the winter.

The Roots of Food Preservation

Since the foods we eat grow naturally, we have to accept that they have a natural growing cycle. This means that there will always be seedtime and harvest, regardless of where we live or what sort of food we want to eat. Even animals have a seedtime and harvest, although that is usually totally outside of our control.

In hot climates, you can harvest food from nature year round. Southern Mexico, for example, is a very fruitful area, with most people having a variety of fruit trees on their property. Some of those, like bananas, give fruit year-round, while others only give fruit in their season. But between the two of those, you can find something to eat, pretty much any time of the year.

But things are much different in the colder climates of Europe and the Northern United States. There, you may only have a short growing season of three to four months. During that time, you must plant, harvest, hunt, gather and preserve enough food to get you through the cold winter months. If you don't, chances are that you will starve to death before spring comes around again.

This makes food preservation critical in the colder climates, explaining why many of our natural food preservation techniques originate there. But we cannot ignore that the people of Egypt and the Mayans of Mesoamerica, both of which were in hot climates, dried grains for use and storage.

While the Mayans may not have needed to preserve food to get through the cold winter, they did have to deal with the hurricane season. Hurricanes, with their high winds, will strip trees of their fruit and flatten crops that have not been harvested. Likewise, the Nile River, which the Egyptians counted on to water their crops, had a dry season when they couldn't grow food. So even in these supposedly ideal growing climates, there was a need to preserve food.

The Enemies of Our Food

As anyone who has pets knows, we are not the only ones who consume the things we consider food. Animals of all kinds want to eat the same things that we do, regardless of their size. Gardeners fight this all the time, with birds, insects and even possums getting into their gardens to eat their fresh growing produce. However, most food spoilage is not due to pets or even rodents, rather it is due to bacteria and insects.

But bacteria, insects and rodents aren't the only enemies of any food that we try to store. Heat, light and oxygen can damage it too. Enough heat can cause food to cook while it is stored. Oxygen causes certain foods to oxidize, especially when it is combined with heat. That oxidation can change the nutritional value of the food, but it usually just changes its appearance.

The whole idea of preserving food is to keep these enemies of our food from damaging the food we are storing away for a rainy (or cold) day. Many methods have been developed over the centuries, which allow the storage of just about any type of food for prolonged periods of time, just as long as the food is properly prepared or "preserved" for storage. Except for fresh fruit, vegetables, meats and dairy, just about everything you find in your local grocery store has been preserved in one way or another.

Why Preserve Your Own Food?

There are many reasons why you might want to preserve your own food. The aforementioned problem of GMOs is merely one. But there are much better reasons for preserving food at home; such as freshness. Most of the foods we buy at the grocery store are harvested early, to help prevent the possibility of them going bad before they are preserved. Between that, transportation and the queuing of the food at the factory, you aren't getting the freshest possible food.

On the other hand, if you preserve your own food, you can literally go from the garden to the can. You can smoke meats as soon as the animal is slaughtered. You can ensure that

the food you are preserving is at its peak ripeness and preserved before it can begin to deteriorate.

Not only that, but you can choose the specific varieties of food that you preserve. Commercial farms grow varieties of produce that provide them with the maximum yield, all ripening at the same time. While that may be necessary for a commercial farm to be productive and profitable, it is not the best for ensuring flavor and nutrition. Other varieties, usually the heirloom varieties of those fruits and vegetables, generally have better flavor and nutrition.

It's clear that preserving your own food will help ensure that you are feeding your family the best possible meals. The flavor, freshness and nutrition you can pack into your own preserved foods will always be better than what you can get in commercial foods. But there's a still more important reason to preserve your own food; that's survival.

None of us know what tomorrow may hold. Our technology driven society depends heavily on electronics and the electricity that drives those electronics. This is our greatest vulnerability. If an enemy were to take out our electrical grid, either through the use of a high-altitude EMP (electromagnetic pulse), cyber-warfare or active terrorist attacks, it would bring our country to its knees.

All three of these are very real possibilities. We have enemies today who are working hard at developing the ability to do them. North Korea has announced their intention to attack us with an EMP; China and Russia are constantly "tickling" the control systems to our electrical grid, and have already shown they can gain access to our power plants. Not only that, a power substation in San Juan, California was taken out by a man with a rifle, which is believed to have been a test to see if it could be done by terrorists.

Should any of these attacks materialize, our country would come to a screeching standstill. According to the report of the EMP Commission, an EMP or similar loss of the

grid would result in the deaths of as much as 90% of our population within the first year. Most of those people would die of starvation. Without the ability to feed yourself and your family, you could become one of those fatalities.

So learning how to preserve food is an important survival skill. As long as you are dependent on the food distribution network to feed you, you are at risk. Being able to grow your own food and then preserve what you grow, could very well make the difference between life and death for your family.

Salt & Sugar - Nature's Preservatives

Modern food-processing plants use a wide variety of chemical preservatives to kill bacteria and prevent food going bad. But there is no need for all those chemicals, whose names we can't pronounce. Nature herself has provided us with preservatives which we can use to keep food from spoiling; salt and sugar.

Both salt and sugar work by essentially the same method, although they are not normally used for the same foods. Sugar is usually only used as a preservative for fruit, while salt is used for pretty much everything else. So you are much more likely to encounter salt being used as a preservative, than sugar.

All life needs some salt, especially animal life. But the amount of salt needed to preserve life is minimal. You and I have salt in our bodies. The amount of salt is critical, as too little salt makes it difficult for our bodies to hold in enough water and too much salt makes it so that we retain excessive water. An excess of salt can also cause a variety of health problems.

But we aren't concerned about how much salt is in the body; we're concerned about using salt for a preservative. In that regard, we need to understand osmosis.

Osmosis is the scientific term for a natural process in which water (or another solvent) passes through a semi-permeable membrane, to equalize the concentration of the

solution on both sides of that membrane. So, water will move from a low-concentration area, across the semi-permeable membrane, to a high-concentration area, until the concentration is the same on both sides.

For the purpose of food preservation, the concentration we are referring to come from either salt or sugar. If there is more salt on one side of a membrane, than there is on the other side, water will move through the membrane to equalize the levels. Since cell walls are semi-permeable membranes, this works with all vegetables, fruit and meats. It also works with bacteria.

You can see the results of this by doing a simple experiment. Take a piece of raw meat and put it on a plate, drying the surface with a paper towel. Then sprinkle a liberal coating of salt onto the meat, allowing it to sit. Within a few minutes, the salt will be wet, having drawn water out of the meat.

Bacteria are single-cell organisms. As such, they are also surrounded by semi-permeable membranes. The space between the various parts of the cells, just like the cells in our bodies, is filled with water. So, when salt comes into contact with bacteria, it draws water out of the bacteria, just like it draws it out of meat or any other food. When it draws enough water out of the bacteria, the bacteria dies.

While the main idea behind osmosis is that the water passes across the membrane, salt will pass across the membrane in the opposite direction, increasing the salt level in the cells of the food. This is an important part of the preservation process, as that protects the food from further infestations of bacteria. As long as the level of salt in the food is high enough to draw water out of any bacteria that comes into contact with the food, it will kill the bacteria.

This is why so many preserved foods are salty. While modern food processing plants use chemical preservatives, they also use salt. It is the salt, more than the chemicals, which



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protect the food from bacterial. The chemicals mostly preserve the appearance of the food.

Chapter 1: Drying Food to Preserve It

Drying food is probably the oldest known means of preserving it, going back millennia. Most grains are dried before use, often on the stalk. This probably gave our early ancestors the idea of drying other grains, such as corn, which are not dried on the stalk. Dried grains could be stored and often were, to provide a food source during drought.

One of the earliest recorded cases of this is found in the Bible. During the 19th Century BC, Pharaoh had a pair of dreams, which warned of coming drought. These dreams were interpreted by a Hebrew slave, Joseph, who was a prisoner at the time. This caused Pharaoh to promote Joseph, making him Prime Minister of Egypt so that he could prepare the nation for the coming drought. Joseph accomplished this by placing a levy on the grain that was grown and storing up that grain to get them through the coming hard times.

Grains are still dried today, although unless you are planning on growing grain in your backyard, you are unlikely to end up drying your own. This is handled at the commercial level, where most of those grains are also ground into flour.

However, many other foods are dried today, both commercially and at home. Most foods can be dried, including meats, vegetables and fruits. The process of drying the foods provides a natural defense against bacteria. If the foods are then properly stored to protect them from insects and rodents, they will keep for an extended time.

How does drying food preserve it? Bacteria need a moist environment to survive. As we discussed when I was talking about salt, the loss of enough water will cause bacteria to die. Just as osmosis will cause water to cross a membrane to equalize chemical or mineral levels across the membrane, it will also cross a membrane when the moisture levels are different. This makes dried food is a very inhospitable environment for bacteria to live in.

Dehydrating vs. Freeze Drying

Most dried foods throughout history have been dehydrated. This is a process where sunlight or heat are used to draw the moisture out of the food. Of the two, sunlight has historically been more common, although modern dehydration techniques use heat.

Freeze drying is a newer process, which has been developed for use with foods that don't dehydrate well. Some fruits, like berries, don't turn out well when dehydrated, but are shriveled and hard. While they can be rehydrated, they really can't be eaten as they are. Freeze drying provides an option in those cases, providing dried foods that appear more appetizing (because they look more like the moist version) and are edible without rehydration.

Freeze drying can also be used for some foods that one would not expect to be able to be dried, like ice cream. The invention of freeze drying coffee revolutionized the coffee industry, providing a means of making instant coffee that tasted almost as good as fresh brewed.

While it is possible to freeze dry foods at home, the equipment is considerably more expensive than dehydrating. The three-step process for freeze drying is also more complicated. It consists of freezing the food, then placing it in a vacuum chamber. Low heat is applied, along with the vacuum. This causes the water crystals to evaporate directly in a process known as sublimation. After this, the food undergoes secondary drying, in which remaining water is removed under higher temperature.

In a survival situation, freeze drying probably wouldn't be effective, because it requires much more electricity than dehydrating does. Since dehydrating food can be accomplished with nothing more than solar power, it would be much more effective in a survival situation.

Drying Fruits & Vegetables

Home dehydration can be accomplished with a commercially manufactured dehydrator, of which there are many models on the market. While it is theoretically possible to dehydrate in a normal kitchen oven, the temperature control doesn't go low enough for proper dehydration. So in order to use it, you need to be manually controlling the temperature by turning the oven on and off or by opening and closing the oven door.

Typically, the lower cost dehydrators have a heating element in the bottom, with a series of trays that can be stacked one above the other. This provides uneven drying times, as the trays which are closer to the heating element receive more heat. Most people who use these end up juggling the trays, restacking them throughout the process to try and make everything dry evenly.

Better dehydrators use a side-mounted heating element with a fan. This forces the heat throughout the cabinet, much like a convection oven. In doing this, the heat is much more evenly distributed, ensuring that the food dries at a more even rate. These dehydrators are also larger, allowing you to dehydrate more food at one time.

It is also possible to dehydrate using the power of the sun. Commercially available solar dehydrators consist of a net cage, with shelves to put the food on. While this does technically allow the sun access to the food being dehydrated, it is normal evaporation, more than the power of the sun which is dehydrating the food.

Homemade solar dehydrators are more effective. These consist of a glass-fronted case, which is pointed at the sun. Shelves inside the dehydrator hold the food. Some are simple boxes, similar to a solar oven, while others are more complex, providing an area to heat incoming air, which then passes via normal convection through the box with the food shelves in it. Both types are effective, although the one with separate warming chambers for the air and the food are more effective, allowing you to dehydrate more food at one time.

In order to dehydrate fruits and vegetables, most need to be cut first. While there is no actual set limit on thickness for foods to be dehydrated, the thicker they are, the longer it takes to dehydrate them. If they are thick enough, then it is virtually impossible to get the center of the food to dehydrate. For this reason, ¼” is a reasonable limit. It is also necessary to clean the fruit or vegetable, removing skins and seeds, if necessary.

The following temperatures are ideal for dehydrating various foods:

Food	Temperature
Herbs	95°F/35°C
Vegetables	125°F/52°C
Fruits	135°F/57°C
Meats/Poultry/Fish	155°F/68°C

The higher the moisture content in the food, the longer it will take to dehydrate it. So, fruits generally take longer to dehydrate than meats do, and meats take longer than vegetables do. You can tell when they are sufficiently dehydrated by feel. Properly dehydrated meats and vegetables will be hard, while properly dehydrated fruits will still be a little bit springy.

Some fruits have a high acid content, which helps to preserve them as well. But these fruits can also be too bitter to eat, once dehydrated. To compensate for this, the pieces of fruit are rolled in granulated sugar, before dehydrating. This is why commercially prepared dried pineapple always seems to have sugar on the outside. This sugar is there for taste, although it also helps as part of the preservation process.

Dried fruits and meats can be eaten as is; but dried vegetables are not. They are normally used only in soups. The process of cooking the soup allows the vegetables an opportunity

to rehydrate. While they rarely ever reach the exact same pre-hydration level, once cooked they taste pretty much the same.

Dried fruits and vegetables are extremely useful in a survival situation, due to their long shelf-life. They are also lighter in weight and less bulky than fresh or canned fruits and vegetables, making them ideal for carrying in a backpack or bug out bag.

Dried Meat or Jerky

It is widely known that the American Indians dried meat as a normal means of preserving it which is the root of jerky, a popular snack food. But they were not the only ones to do this. It turns out that many ancient cultures followed a similar practice, especially throughout Latin America.

Meat, poultry and fish can all be made into jerky effectively. Fish is slightly more difficult, because the flesh of fish doesn't have the structural integrity of red meat or poultry. So it has a bit of a tendency to fall apart, while drying. But that doesn't affect its taste or ability to be used effectively once dehydrated.

It is best to use extremely lean meat for making jerky. Tender cuts are not necessary, but gristle and fat should be trimmed off. If small amounts remain, it doesn't spoil the jerky, although the fat may turn rancid over time. The meat should be cut into pieces that are no more than ¼" thick, although they can be any size that you like.

When cutting meat for making jerky, it is best to cut across the grain, rather than with the grain. This provides a jerky which is easier to eat, as it will separate easily between the grain. To do this, you will need to buy roasts. Jerk which is made from meat that is cut with the grain is harder to bite and chew. However, it is exactly the same in other regards.

While dehydrating meats does protect them from bacteria, it does not protect them from mold. So it is necessary to marinate the meat in a brine (salt solution) before dehydrating it. Typically, additional flavorings are added into the marinade, either in the form of

ground spices or sauces. There are a wide variety of recipes available to satisfy the palate of just about anyone. When marinating the meat, it is important to ensure that all surfaces of each piece of meat are coated with the marinade.

A meat rub, containing salt, can also be used in place of the marinade. Once again, all surfaces of all pieces of the meat need to have the rub applied for maximum protection of the meat. Allow the meat to sit in the marinade or rub overnight before dehydrating it.

Today, meats are dehydrated in an electric dehydrator, but the American Indians made their jerky by drying it in the sun. Rather than using a dehydrator, they laid strips of meat over a framework of thin poles, allowing it to dry in the sun. This could take more than one day, meaning that the meat would have to be removed at night and then put back on the framework in the morning.

Homemade jerky which is well-marinated with a high salt content will keep, even without refrigeration, for an extended period of time. I can't really tell you how long, because I always end up eating it before it reaches the point of going bad. But I have had homemade jerky keep for several months, without refrigeration. Commercially made jerky, which also includes chemical preservatives, will keep for much longer.

Salt Fish

One of the many things the northern parts of Europe are known for is their maritime tradition, especially fishing. While the Vikings are probably history's best known mariners of this area of the world, the fishing fleets of the region far outnumbered Viking warships. However, salt fish is not limited to just these countries, as it has spread to many other parts of the world; even countries in hot climates.

With the harsh winter seasons that they experienced that far north, it was necessary to have a way of preserving the fish they caught, so that they could eat them through the

long winter months. Thus, the idea of salt fish was born. Similar to jerky, salt fish is a dried fish, which is prepared in salt, before drying.

It is possible to make salt fish with whole fish, fillets, butterflied or cut into steaks. Generally speaking, the larger breeds of fish are filleted or made into steaks, while smaller breeds are salted whole (but cleaned) or butterflied. The skin on the fish slows the process, so it is actually faster to make salt fish from fillets. However, without the skin and bones to hold the flesh in place, fillets of some species are more likely to fall apart.

Making salt fish is a two-step process, beginning with salting and ending with drying. To salt the fish, the fish are first cleaned and prepared. A waterproof crock or bin is used, along with a lot of salt. Larger-grained salt is better, such as rock salt or the salt used in ice-cream makers.

A liberal layer of salt is first placed in the bottom of the container, covering it completely. This is then covered with a layer of fish, without overlapping any part of one fish over another. If the skin is on the fish, it is laid skin side down. This is then covered with another layer of salt, and then more fish. Alternate layers of salt and fish are added until the container is filled, topping it all off with a final layer of salt.

The salt will draw the water out of the fish, creating a brine. Opinions vary as to how long the fish should be left in the brine, but traditionally it was left as long as 21 days. The fish are then removed from the brine and rinsed in fresh water. While not required, some people press the fish to help remove excess brine.

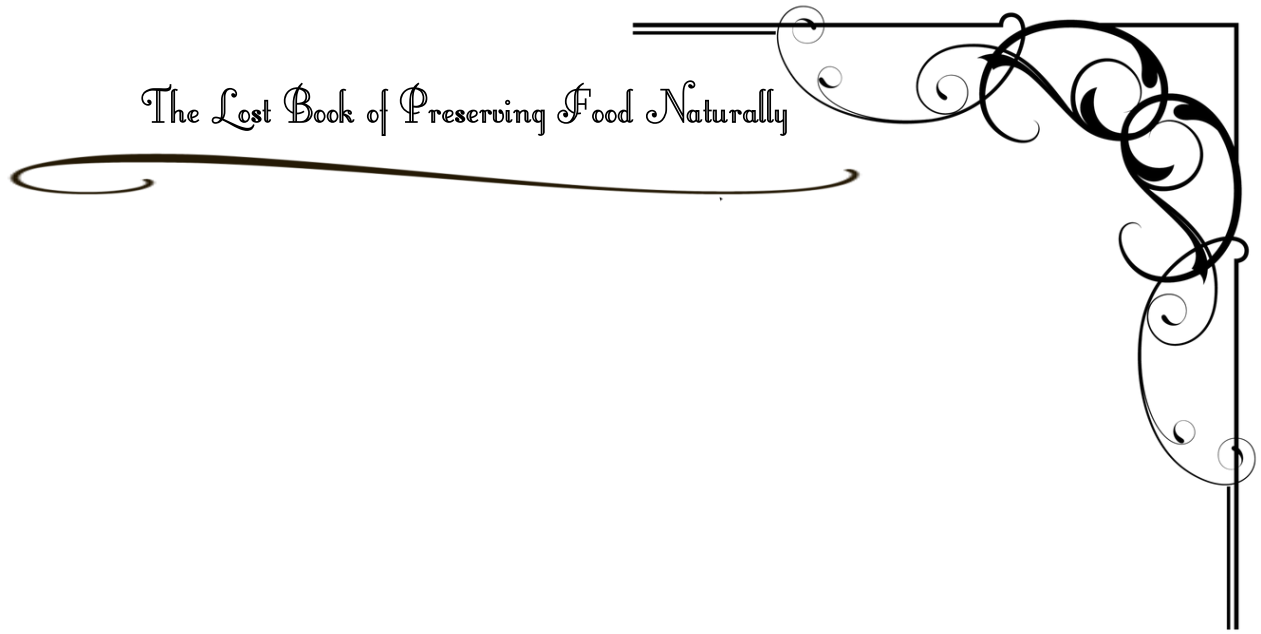
With the fish fully salted, it is either laid in flat baskets or hung from wood racks, much as the American Indians hung jerky off of wood racks to dry. The fish is then left in the sun to dry. A combination of sunlight and a warm breeze are needed for drying the fish. Ideally, this is done in warm weather, rather than hot weather. If the weather is too hot and the sun too strong, it could cook the fish, rather than drying it. On the other hand, if it is not warm enough, bacteria could grow in the fish, before it is dry.



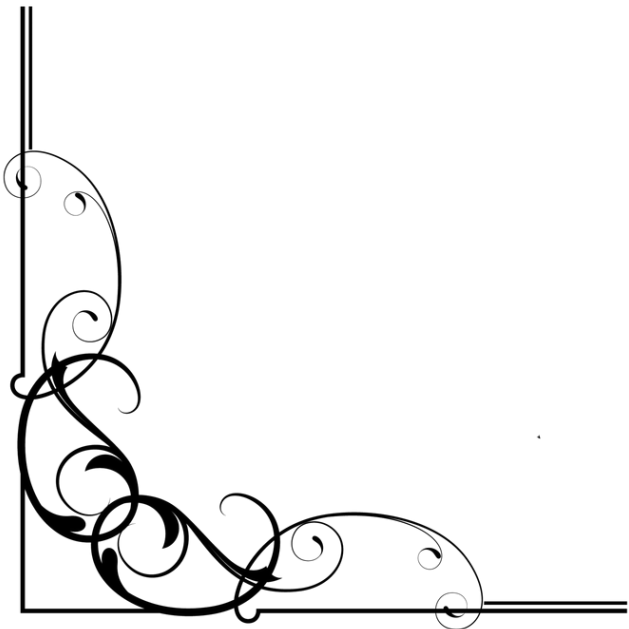
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Salt fish is not usually eaten raw, like jerky. Rather, it is cooked in a variety of different, traditional recipes.



Chapter 2: Preserving by Canning



It's hard to say whether canning or drying is a more common method of preserving food. If you go into any grocery store in the country, you'll find a canned food aisle. But you won't find a corresponding dry food aisle. Even so, there is a lot of dried food in that grocery store; we just don't normally think of it in those terms. Oatmeal, rice and other grains are all dried; even popcorn is. By extension, we could say that breakfast cereal, cookies and potato chips are also dried foods, although they are cooked, dried foods.

Canning is an almost perfect method of food preservation, at least for wet foods. It not only provides protection from bacteria, but from insects and rodents as well. Drying, as we discussed in the last chapter, doesn't automatically provide protection from insects and rodents; you have to provide some sort of packaging which does that. But the can or jar used in canning does that as well.

What makes canning so effective is that it creates a hermetically sealed environment, where no live enemies of our food exist. While it is still possible for the food to be damaged by heat or for the seal to be compromised and the food damaged, as long as the container stays intact, there is little risk to the food stored inside.

As part of the canning process, all food that is canned is pasteurized. This process requires raising the food's temperature to a minimum of 158°F (70°C) and holding it there for a minimum of 20 minutes to ensure that the food is heated all the way to its core. This temperature is hot enough to kill any bacterial that is in the food, sterilizing it. So, there is no way that the food can spoil (decompose) as long as the seal on the can or jar is not breached.

It may seem a little confusing, but most home canning is done in jars, rather than cans. That's because the word "canning" which refers to a specific process of preserving food existed and was in use before the invention of the can. The can was named as it is, because it was invented for use in canning.

But for home canning, you're probably going to want to use jars, rather than cans. The main reason for this is cost. The cans themselves are cheaper than jars, assuming that you don't reuse the jars. But canning in cans requires having the right equipment to seal the cans. While there are manually-operated consumer versions of this equipment on the market, even those are fairly expensive. When you factor in the fact that you can reuse jars over and over again, only having to replace the seals, they are a much more cost-effective investment over the long-term.

Before going on, let me clear up a misconception. If you buy canned foods in the grocery store, it will have an expiration date on it. Actually, this is nothing more than a guarantee date. The cannery that produced that food is guaranteeing that it will be safe for consumption, up until that date. After that, they don't guarantee it.

But that doesn't mean that the food goes bad after that point; in most cases it doesn't. There are still cans of food floating around, which were canned decades ago... and they are still good. As long as the can hasn't rusted or the seal broken, the food is still protected.

Recently, some canned food that was 100 years old was opened, in order to see how the food had fared being canned for so long. While the texture and color of the food had changed, it was still edible. The only thing that might be at doubt for canned food this old, is whether any of the nutrients in the food would oxidize, making the food less nutritious.

There is an exception to canned food lasting virtually forever though. That is for non-pickled foods that are canned in plastic jars, rather than glass ones. There is something different that is done in this process, which makes it so that the food does not last as long. There aren't many foods that fall into this category, but there are some; specifically applesauce and fruit juices. Applesauce in particular will begin to oxidize after about six months. So, while it is still safe to eat, it will not look the same.

The Canning Process

The freshest and best quality food should always be used for canning. If you use food that is nearing the end of its “fresh” shelf-life, it will affect the quality of the canned food you produce. While it will still be edible, the flavor and consistency of the food will be affected.

Any wet food can be canned; so vegetables, fruits and meats all qualify. It needs to be wet foods, because the excess space in the can or jar will be filled with water. This is to prevent oxidation of the food. Perhaps you’ve seen home-canned fruit, where some of the pieces were poking above the water and were discolored. This is the oxidation I’m referring to.

The food needs to be cleaned, cut and prepared before canning. In some cases, especially with meat, this would include cooking the meat, before canning. Fruits and vegetables are usually blanched, rather than being cooked. In other cases, foods will be mixed together or have spices added to them, before canning. There are thousands of canning recipes available online, which provide you with an abundant variety of ideas of what you can do.

Many of these recipes are old, having been passed down for generations. The US Department of Agriculture (USDA) undertook a major project long ago to determine minimum canning times and temperatures, as well as the need for adding salt or sugar to canned items. This data, which is available on the USDA website, is the basis used for all of these recipes. Food canned according to these guidelines cannot go bad, while in the can.

The canning jars themselves, with their lids, as well as the pot they are heated in must be sterilized before canning. This is done by filling the jars with water and putting them in a water bath in the pot. Then the temperature of the water is raised to at least 158°F (70°C) to kill any bacteria.

The prepared food is put in the sterilized jars and the remainder of the space in the jars is filled with water. A small amount of room, called “headspace,” must be left in the tops of the jars, to allow the food and water to expand. This varies depending on the type of food you are canning.

Food	Headspace
Jams, Jellies, Spreads and Butters	¼”
Pickles, Tomatoes and Fruit	½”
Non-pickled Vegetables	1”
Meats/Poultry/Fish	1” – 1 ½”

With the jars filled, the lids are placed on the jar and the rings loosely attached. These rings are there just to hold the lids in place through the canning process. They need to be loose enough to allow air to escape the jars during heating.

Heating time and temperature is a critical part of the canning process. Recipes you use for canning must provide this information. If you are unsure of the information provided in the recipe, check with the USDA website at: http://nchfp.uga.edu/publications/publications_usda.html for accurate information about times and temperatures.

Once the jars have been in the water bath at the right temperature and for the right amount of time, the pot can be removed from the heat and the jars removed from the pot. Allow them to cool on a cooling rack, before doing anything with them. Once cool, verify that the jars sealed properly by testing to see if the center of the lid is concave. If it moves downwards when you push on it, it is convex and did not seal. The jar will have to be heated again in the water bath to seal it.

Pressure Canning

Pressure canning involves using a special pressure cooker, unsurprisingly known as a “pressure canner” to increase the atmospheric pressure and therefore the boiling point of water. This allows canning at a higher temperature, which is necessary for some types of foods, especially meats. This higher temperature is necessary to ensure that all bacteria are killed.

Most references will tell you that you need to use pressure canning for all non-acidic foods. However, I have seen a wide range of recipes for canning non-acidic fruits and vegetables, which did not require a pressure canner. My wife and I canned a considerable amount of home-made applesauce and apple butter, before we ever had a pressure canner.

Nevertheless, I am not suggesting that you can without a pressure canner, unless you have specific information that it is safe to can the type of food you are canning without one. We have since acquired a pressure canner and use it for most of our canning.

Dry Canning

In the last few years, some people have been experimenting with pressure canning as a means of preserving dry foods. Rather than canning in a pot, the jars and their contents are heated in the oven, set to a low temperature (most home ovens only go down to 200 degrees).

Theoretically, dry canning should work as well for these foods, which are mostly grains and pasta, as normal canning does for wet foods. You can't use it for dry fruit, only for foods that are truly dry, like the aforementioned grains. Bacteria can't survive in this food, as there is not enough moisture in it; so there is very little moisture content to be concerned about. However, there is the possibility of insects, insect larva or insect eggs.

So heating is still necessary, not so much to kill the bacteria, but to kill insect larva and eggs.

One of the advantages being claimed for dry canning is that you can prepare pre-mixed dry meals, such as soups, with all the ingredients mixed tighter, except water. This would mean grain or pasta, dried vegetables, bouillon and even dried meat and spices. They can then be preserved, providing you with ready meals when the time comes. These become great survival rations.

To dry can in the oven, preheat the oven to 200°F (70°C) with a cookie sheet inside. You will probably need to remove the top rack. While it is heating, fill the jars with the food you are going to dry can and place the lids on the jars. Once the oven is heated, open it and place the jars on the cookie sheet. Leave the jars in the hot oven for 12 hours.

Like with normal canning, you're going to want to check the integrity of the seal, once the jars have had a chance to cool. Jars that did not seal properly can be reheated.

It should be noted that while this method seems like it would work well, it has not been used as long as normal canning has, so there is no proof that dry canning will work over the long-term. If you choose to use dry canning, you are doing so at your own risk. For this reason, it would be wise to use other methods for some of your food as well, so that all your eggs aren't in one basket.

Pickling

Although pickling and canning are actually quite different, they are normally categorized together, simply because most pickled foods are also canned. While canning is not essential for preserving these foods, it does provide an effective storage method for them, protecting them from insects.

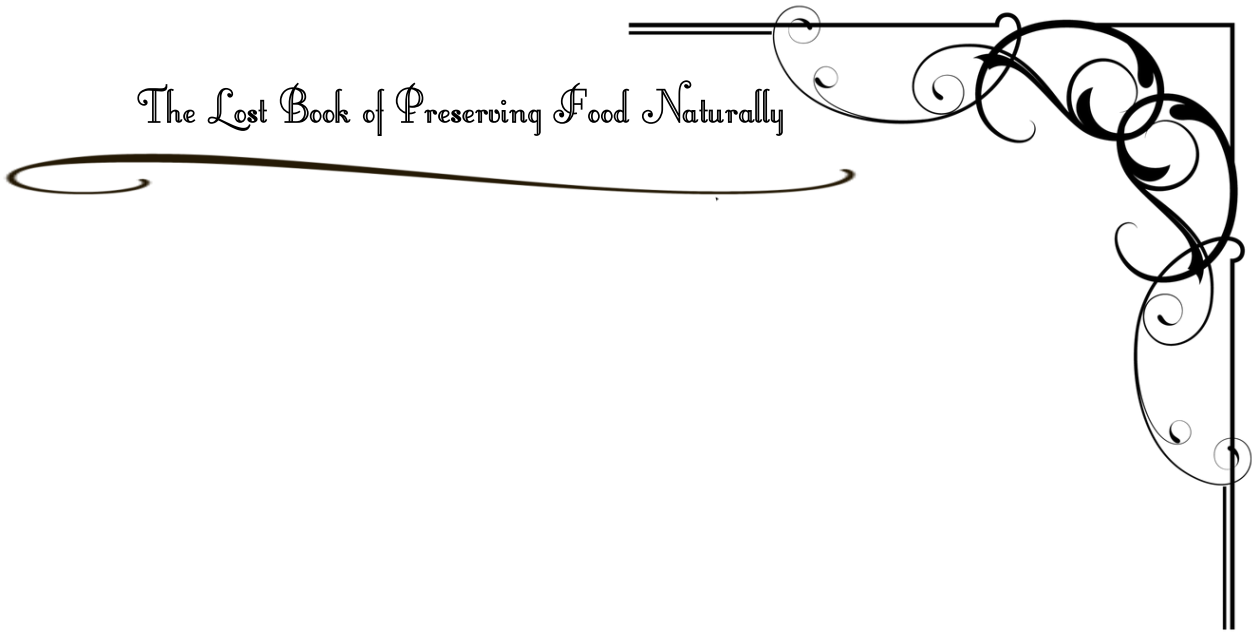
What makes pickling unique is that it depends on changing the pH of the foods, in order to create an environment which is inhospitable to bacteria. Vinegar is normally used for

this, although some recipes call for a salt brine, rather than using vinegar. In either case, the pickling process makes ensures that bacteria cannot survive in the food. The process of pickling also modifies the foods that are being pickled, affecting their flavor and even their texture.

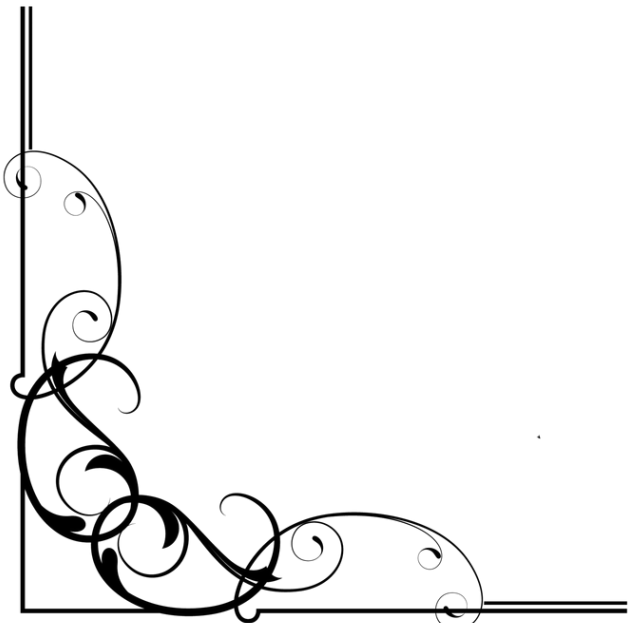
We are all familiar with “pickles” which can be placed on hamburgers or eaten plain. But there are many other condiments which are pickled as well, even though we don’t realize it. Ketchup, mustard, most meat sauces and salad dressing are all pickled products. There are even meat products which are pickled, such as corned beef, which was originally known as “pickled beef” and pickled herring.

Pickling is a time-consuming process; not for the person doing the pickling, but for the food. Foods which are being pickled must be left in the pickling solution for a considerable amount of time; sometimes for days. In many cases, the pickled foods are canned in the pickling solution, allowing the process to continue.

Should you decide you want to attempt pickling, it is essential that you follow a recipe. Since it is the pickling process that preserves the food and not the canning process, it would be dangerous to reduce or eliminate an essential ingredient, such as vinegar or salt.



Chapter 3: Packaging Dry Foods for Long- Term Storage



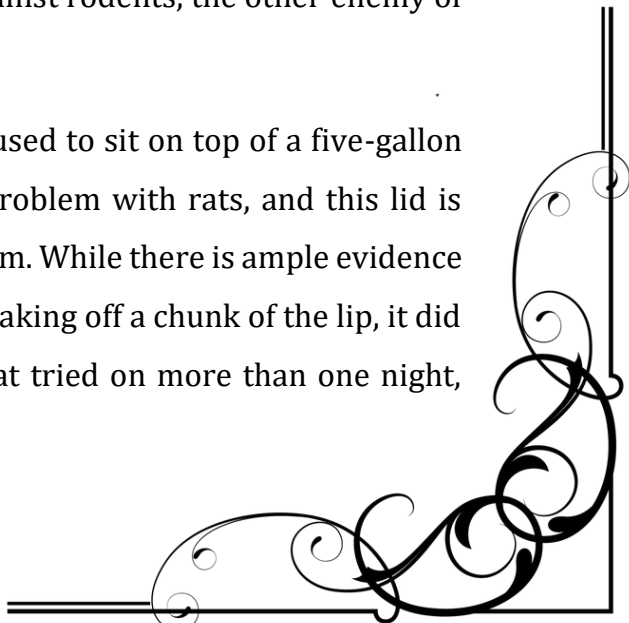
While canning is excellent for long-term storage of wet food products, the jury is still out as to whether or not dry canning of foods is effective. However, there is an effective way of packing dry foods for long-term storage; one which has been proved to be effective for as long as 20 years.

This method is actually intended for use with bulk food products, but it can easily be adapted for storing smaller quantities of food, by simply changing the size of the bags that are used. That would allow several bags to be put together in the same container, rather than using one large bag to seal the food.

What makes this method so effective is the use of oxygen absorbers. As we've already discussed, bacteria need a wet environment to survive; so they don't tend to spoil dry food products. What does spoil those foods is insects; which can mean the adult insects, insect larva or the eggs of insects which hatch after the food is sealed away. By eliminating the oxygen in the environment, insects can't survive, ensuring that they don't eat the food.

In addition to this, the sealed food packages are stored in five-gallon plastic buckets, which are impervious to insects. So there is no risk of insects eating their way into the packages. Those buckets also make good protection against rodents, the other enemy of our dry food products.

I have a five-gallon bucket lid in my workshop, which used to sit on top of a five-gallon bucket I stored dog food in. We occasionally have a problem with rats, and this lid is testimony of how well those buckets protect against them. While there is ample evidence of at least one rat gnawing on the lid, to the point of breaking off a chunk of the lip, it did not get into the bucket. By the way, I know that the rat tried on more than one night, because of how the gnawed area grew.



In order to package foods in this manner, you will need:

- Food-grade five-gallon buckets (the food grade ones are white)
- Six-gallon aluminized Mylar bags
- Food to be stored
- 1,000 cc Oxygen absorbers
- Vacuum cleaner with hose
- Hair straightener
- Permanent marker
- Rubber mallet

Oxygen absorbers and aluminized Mylar bags can be purchased from a number of online sources; most of which carry both of these items. While these sources will tell you that you need different size oxygen absorbers for different types of dry foods, I have found that using the 1,000 cc ones (basically the largest size you can get) ensures that you always have enough. A little overkill doesn't hurt.

These oxygen absorbers are highly sensitive and act quickly. So they need to be used rapidly. I would recommend having at least one assistant with you when you package food this way, giving them responsibility for the oxygen absorbers, opening the package, putting them in the buckets and then resealing the package quickly.

Food-grade five-gallon buckets are available from the larger home-improvement warehouses. You can also get used ones for free from your local bakery or some restaurants. But you'll have to clean these used ones out, before you can use them.

To store the food:

1. Open the bags and place them in the buckets
2. Fill the buckets with dry food, one type of food per bag, to about 1" from the top of the bucket

3. Using the marker, label the outside of the bucket with the contents
4. Seal all but 2 ½" of the top edge of the bag with the hair straightener. You will notice that you have a lot of excess bag; that's all right. You can cut off your seal and use that excess to reseal the bag, if you ever need to take out some of the contents
5. Working quickly, place an oxygen absorber in the bag, through the opening. Stick the end of the vacuum cleaner hose in the hole and suck out the air, being careful not to suck out any of the contents. Remove the hose and seal the bag the rest of the way
6. Fold the flap of the bag down onto the food and put the lid on the bucket
7. Use the rubber mallet to ensure that the bucket lid seats fully

You can store the filled buckets anywhere, even in a hole in the ground. This makes them ideal for use in setting up a food cache. Avoid placing them anywhere where there will be a lot of heat, as the heat could affect the food, even inside the bucket.

If you are trying to store smaller quantities of several types of food, you can buy one-gallon aluminized Mylar bags and do the same thing. You will need smaller oxygen absorbers (300cc for one gallon) to go with them. These packages can then be layered into the bucket, pushing them down to avoid any wasted space. Be sure to mark the contents of all the packages on the outside of the bucket.

Smoking & Curing Meats

Of all the categories of food, meats are the hardest to preserve. This is due to the higher bacteria content found in meats, compared to that which is found in produce. While drying meat is effective, the very act of drying it changes the meat to such a point, that it can't be eaten in the same manner that just cooking it would allow. Even rehydrating the meat merely makes it usable in soups. While nutritious, it may not be satisfying.

Meats can be canned quite effectively, but just like with anything else that is canned, the process of preserving the meat changes its texture and flavor. Many people find canned meats unappetizing to the point of avoiding it. While canned meats are still useful for emergencies, they are not highly favored.

Long before canning was invented (in 1810), meats, fish and poultry were smoked. As best as anyone can tell, this process actually began in prehistoric times. Early man apparently thought that the smoke from cooking over a fire helped preserve the meat, as smoke drove away flies. However, they were unaware of the actual mechanism of how smoking preserves meat.

Nevertheless, smoking has been part of food preservation for centuries. I've been to some of the living history museums here in the United States and seen how they customarily smoked meats. Some homes even had kitchen fireplaces large enough to walk into, with hooks embedded in the masonry, above head height, to hang hams and quarters of meat on for smoking.

There are actually several different aspects to how smoking preserves meat. First of all, salt is used in the smoking process, soaking the meat in a brine before putting it over the fire. In and of itself, this creates an inhospitable environment to the bacteria. Smoking also partially dries the meat, which of course, dries the bacteria as well, killing those that aren't killed by the heat of cooking the meat. Finally, the process of smoking produces a

thick skin of collagen (a protein) on the meat, called a “pellicle,” which is impermeable to bacteria.

The weakness of smoking, as a means of food preservation, is that once you cut through the outer skin of the meat, you expose meat to the air, which can be infected by bacteria. This is why those colonial homes had such large chimneys. Once the smoked meat was cut, it was hung in the chimney once again, allowing the fresh surface to smoke and protecting the meat. But if you don’t have this, once you start eating the meat, you either have to use it all fairly quickly or have a way to preserve it until it is used.

To be specific, the smoking I’m referring to is called “hot smoking,” which differs from cold smoking and smoke roasting:

- **Cold smoking** – A low temperature smoking process (68 – 86°F) used to impart smoke flavoring into food products. Cold smoking doesn’t dry out meat, like hot smoking does. But it doesn’t have any ability to preserve the meat.
- **Hot smoking** – A two-stage process, which starts with cold smoking, then moves on to a higher temperature (200 – 225°F) to fully cook the meat and kill microorganisms. It is during this high temperature phase that the pellicle is formed.
- **Smoke roasting** – Barbecuing meat in a “smoker.” This is a method of cooking, more than smoking; but if the lid of the grille is closed, it does infuse some of the smoke flavor into the meat. It is not intended for preserving meat, but to prepare it for eating.

Any smoking method tends to dry out the meat, especially hot smoking. That’s mostly due to the long time that the meat is exposed to the heat. But hot smoking makes up for this very well, because of the length of time. Because the meat is cooked slowly over a

low temperature, it tends to tenderize it quite well. This makes smoking an excellent process for some of the lesser cuts of meat, which tend to be tougher.

Smoking the Meat

Actual smoking requires either a smoker or a smoke house. Basically, they are the same, except for size. In either case, the meat isn't cooked by the heat of the fire, but rather by the heat of the air and smoke rising off that fire. In many smokers, the meat is not directly over the fire, but rather the smoke rising from the fire is directed to the area where the meat is located.

For a smoker to work, it needs a few things:

- **Heat** – This is usually a wood fire, as it is the smoke from the wood which imparts the flavor to the meat. Different types of hardwoods provide for different smoke flavors. Some industrial smokers use gas, but in that case wood chips are burnt to produce the smoke.
- **Water** – A pan of water is placed over the fire, so that the heat from the fire causes it to turn into steam, providing a moist environment. This helps to reduce the drying of the meat. While smoking, the water supply must be replenished regularly.
- **Thermometer** – It is important to monitor the temperature inside the smoker. Different meats need different temperatures.
- **Air Draft Control** – The temperature inside the smoker is controlled by controlling the amount of air which is drawn into the smoker at the fire and expelled at the top. There are generally two shuttered vents, which can be adjusted to control this air flow.

Before the meats are smoked, they are soaked in a brine (salt solution) overnight, allowing the salt to soak into the outer layer of the meat. The only exception to this is cured meats, which already have a high salt content.

As I already mentioned, smoking is a slow-cooking process. To hot smoke meats normally takes all day. The temperature has to be monitored throughout this time, adjusting the vents and adding fuel as necessary to maintain the temperature inside the smoker. Rather than cooking for a particular amount of time, it is typical to cook the meat until it reaches a specific internal temperature. The correct temperatures can be found on the USDA website at www.foodsafety.gov.

Curing Meats

All hot smoked meats are cured to some extent, by the process of soaking it in brine, before cooking. This is known as “wet curing.” You can also “dry cure” meats by using a meat rub, rather than brine. Rubs consist of a combination of salt, herbs and spices, intended to impart a particular flavor into the meat, while curing it.

But cured meats can refer to something else entirely; most of what we know as deli meats are actually cured meats. This tradition goes back to the Middle Ages in Europe, where it was used for both preserving meats and making less choice cuts of meat usable.

Curing meats consists of cutting up meat and fat and mixing it with salt and spices. The salt used is not ordinary table salt, but rather “curing salt.” This differs from normal table salt in that it has nitrates and nitrites mixed in. It is these nitrates and nitrites which break down the tough meat, turning it into a delicacy.

There has been some controversy over the use of nitrates and nitrites in food products. This stems from the danger of consuming too much of these substances. However, if you use curing salt, rather than adding your own nitrates and nitrites, it will have the right amount and your family will not be at risk.

The chopped and seasoned meats are normally put in a sausage casing and allowed to sit. Cold curing is done in the refrigerator, using the cold environment to protect the meat while it is curing. But much cured meat is smoked; which is usually done within a few



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days of making it. Smoked and cured meats are a delicacy in many parts of Europe, as well as here in the United States.

Chapter 4:

Cold as a Preservative

When most people think of preserving food in our modern industrialized society, they think of using cold. Actually, they don't even think of it in those terms, they just think they need to keep the food from spoiling. But isn't that the same thing? So off to the refrigerator they go.

Both refrigeration and freezing are means of preserving food; but they (especially refrigeration) are actually some of the poorest methods of food preservation going. Compared to the other methods we've discussed, refrigeration can only keep food from spoiling for a short period of time. Freezing extends this time, but does so at the cost of constant energy input. It is also risky, in the sense that it will stop working if electrical power is lost.

Unlike other methods of food preservation, refrigeration doesn't kill bacteria or turn the food into an inhospitable environment for it to survive. Rather, it acts on the bacteria itself by slowing its metabolism. Although bacteria can't be "cold blooded" because it doesn't have any blood, the same concept applies. The internal temperature of the bacteria is the same as its environment. So the lower the temperature, the slower the metabolism; the slower the metabolism, the less the bacteria eats.

Freezing lowers the temperature of the bacteria to the point where its metabolism comes to a complete standstill. But it doesn't kill the bacteria either. Once the food's temperature rises above freezing, the bacteria become active again and start consuming the food.

Freezing has another risk as well, especially in modern "frost free" freezers. In order to keep the freezer from developing frost, the moisture is sucked out of it regularly, something like that which is done in freeze-drying food. If food is not properly wrapped

to protect it, the moisture will be drawn out of it, causing freezer burn and rendering at least part of the food unusable.

Nevertheless, refrigeration, or the use of cold to slow the metabolism of bacteria, is the only way of keeping fresh food fresh, while still preserving it. You are just limited as to the amount of time you can keep this food fresh, as it will eventually spoil. But it will take much longer for the food to spoil, than if it were left at room temperature.

The modern electric refrigerator is a fairly new invention, having hit the market only about a century ago. Even so, the use of cold for food storage is not new. In the Middle Ages, people who had the capability used to keep milk, cheese and other perishables in caves or wells to keep them cool. This idea later developed into the root cellar, which also uses cool temperatures to reduce spoilage of food. In cold climates, freezing (especially of meat) was accomplished during the wintertime by building a food locker that was exposed to the outside temperature, while protecting it from wild animals.

While modern refrigeration is extremely convenient and widely used, it requires electricity. This places a limitation on refrigeration, in that it can't be used if the power goes out. In a post-disaster situation, where power is often lost, people tend to lose the contents of their refrigerators and freezers. If such a situation were caused by a true TEOTWAWKI event, such as the loss of the electric grid, the resultant loss of food would be devastating.

Refrigeration without Electricity

There are ways of keeping food cool, without the use of electricity. These predominantly cool by evaporation. The process of evaporation is a natural cooling process, that's why people perspire. As the sweat or water changes from liquid to gas (water vapor) it has to absorb a lot of heat. In the case of perspiration, it absorbs that heat from the person's body. In the case of an evaporative cooler, it absorbs that heat from what is in the cooler.

These sorts of coolers work more efficiently in areas where there is low humidity. The lower the humidity and the greater the ambient heat, the more water will evaporate, cooling the food. Even so, they will still provide some help in higher humidity areas.

The Zeer Pot is an ancient evaporative cooler, still in use in some parts of Africa to keep food fresh. It consists of two unglazed but fired ceramic pots, nested one inside the other. The space between the two pots is filled with sand and the food is put inside the inner pot. It is essential that the pots be made of unglazed ceramic, or it will not work.

To use the Zeer Pot, water is poured into the sand between the pots, saturating it. This water then wicks into the ceramic, saturating it as well. The water will start evaporating from the surface of the outer pot, cooling it and the contents.

For the Zeer Pot to continue working, water needs to be added to replenish what evaporates. Its efficiency can be increased slightly by placing a wet cloth over the top, so that the contents are not exposed to the hot ambient air. Used in this manner, Zeer Pots have kept vegetables fresh for four times as long as they would remain fresh if left sitting on the table.

This concept is effective enough that a company in India is manufacturing small home refrigerators in the same manner. The rectangular refrigerator is a double-walled ceramic box. The space between the walls is filled with water, rather than sand and food is placed inside the box, with a closable door to protect it. The unit not only keeps the food cool, but works as a water cooler too, as there is a spigot to get cold water out of it.

In an emergency, you can make a temporary evaporative refrigerator by hanging heavy fabric over a free-standing metal or plastic shelving unit. Be sure to totally enclose the shelves, leaving no gaps in the fabric. For a door, overlap two layers of fabric. Wet the fabric and leave sitting in an area with good airflow. Replenish the water as needed.

Like the Zeer Pot, the water on the outside of the fabric will begin to evaporate immediately, drawing heat out of the shelving unit and its contents. It will be necessary to wet the fabric several times per day to keep the system working.

Root Cellars

I mentioned earlier that ancient people kept food cool by keeping it underground. That works because it is always cooler underground than it is on the surface, unless there is volcanic action, which can include hot springs. Since heat rises and cold drops, air underground will always remain cooler than that on the surface. Typically, a root cellar will stay at 55°F or below, regardless of the ambient temperature. If it is built below the frost line, it will never drop below freezing.

If you happen to have a cave on your property, all you have to do is create some means of securing food in it and you'll have a root cellar. If you don't, you could dig your own. Basically, that's what a primitive root cellar is, a man-made cave for storing food in. If you wanted a better one, you could cover the walls with cement block, brick or pressure-treated timbers.

There is a company in Europe which is manufacturing modern fiberglass root cellars and selling them as natural refrigerators. The root cellar is a six foot diameter ball, with shelves built in and has an attached and enclosed staircase leading down into it. The company claims that the installed unit will keep food at 55°F.

If your home has a basement, you can build an enclosed room and turn it into a root cellar. In order to naturally cool the room, add a vent near the ceiling, for warm air to escape. Then add a vent pipe from outside, close to the ground, which comes out close to the floor in the root cellar. This arrangement will allow cool air at night to work its way into the root cellar, while keeping the warmer air from the daytime from coming in.

A simpler root cellar can be made by burying a used, non-working refrigerator in the ground, laying on its back, with the door at ground level. The same thing can be done with any sort of container, but the advantage of a used refrigerator is that it is insect and rodent proof. The insulation in the door will help keep the contents cool too.

Root cellars derive their name from being used for storing root vegetables, such as carrots, potatoes and onions. While not really refrigeration, as we know it today, the cooler temperature that a root cellar provides will keep these vegetables usable for months.

The Ice House

Before electric refrigerators, people used iceboxes. These were insulated wood cabinets, with doors and shelves for storing food. One compartment was left open from food and used to put a 25 or 50 pound block of ice. Ice men delivered ice on a regular schedule, so that people could keep their food cool.

The ice used for these iceboxes wasn't manufactured as it is today, but rather harvested from nature. The same men who delivered the ice during the warmer months, spent the winter months cutting blocks of ice from rivers and lakes, which was stored in an insulated warehouse, referred to as the "ice house. Additional insulation, usually in the form of sawdust or straw, was piled on the ice to slow its melting.

Even without the insulation, the massive amount of ice itself helped to keep it from melting. With several tons of ice packed together, even if the outer layer of ice was subject to melting, the rest of it would stay solid.

If you've ever seen the movie "Frozen" you've seen this process. The opening scene shows ice men on the lake, cutting blocks of ice and loading it on a wagon, for storage in the ice house. This was not made up for the movie, but rather a very real part of life for well over 100 years. Ice houses and their associated iceboxes were in use from the middle of the 19th century, until the 1930s, when they were replaced by electric refrigerators.

While collecting ice for keeping food cool is backbreaking work, it is effective. In the event of a TEOTWAWKI event, where we no longer had electricity to keep our food cold, I imagine an ice house and icebox would be the way to go. Producing enough electricity to run your refrigerator off of solar panels would require a lot of solar panels.

Although most ice houses looked no different than any other wood warehouse, the best ice houses were underground. The lower temperature underground helped keep the ice from melting prematurely, extending the amount of time that ice could last.

In Conclusion

While few Americans today pay much attention to preserving their own food, this was commonplace for much of human history. We only have to go back a couple of generations, to find our own ancestors canning, drying, smoking and otherwise preserving food. The ability to do these things was considered an essential part of keeping a home.

Should a major disaster happen, such as the destruction of the electrical grid, the ability to preserve our own food would be essential to survival. Those who did not have this ability would most likely die, once available food sources were exhausted. The only people who would stand a chance at surviving are those who would have the ability to grow, harvest and preserve their own food.

All of the methods we've discussed in this work are things that we can do today, in our own homes. The materials and tools are readily available, for those who care to look. Coupling these methods, with the ability to grow your own food, would make anyone much more self-sufficient.

But even without the danger created by a major disaster, the ability to preserve your own food provides you and your family with better, fresher, tastier and more nutritious food than you can buy commercially. While commercial food packaging has come a long way in the last 50 years, the necessities of harvesting early, so as to ensure that food is ripe and not over-ripe when packaged, means that it is never at its peak flavor. Home preserved foods can be.