

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.

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 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. storage that each separately do not have.

The most common plastic that raises suitability questions is High Density Poly Ethylene (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.

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.

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.

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:

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.

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.

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 standalone 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.