Utah State University EXTENSION

FOOD STORAGE IN THE HOME

(Reducing Waste and Maintaining the Quality of Stored Food)

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Contents

WHO SHOULD HAVE A FOOD STORAGE PROGRAM?

We never know what emergency may befall us during which we may not be able to obtain food or drink. The emergency may be loss of job or inability to work due to accident or illness. This may result in a situation where financial resources to purchase food would not be available or may be decreased appreciably. Natural catastrophe such as flood, earthquake or storms may result in temporary inability to distribute food to supermarkets. Under these conditions even having money to purchase food does not mean it can be obtained.

Even in the United States each of the above conditions occurs occasionally. Because of the possibility of such emergencies the Civil Defense recommends storing food and drink adequate for your family's needs for a two-week period. Certain church organizations have recommended their members "Have on hand a year's supply of food, fuel, clothing and where possible money."

WHY HAVE A FOOD STORAGE PROGRAM?

A food storage program is essential to provide for ourselves and our family members in an emergency. The biggest motivator most adults have is to avoid hearing a hungry child cry. Even the most "macho" man is distraught if he cannot provide food or beverage to prevent a child from suffering.

WHAT TO STORE

Water

Since the human body is about 65 percent water we must consider it as an important nutrient. Rubner, a German physiologist, found that during starvation an animal can live if it loses nearly all the glycogen and fat, as well as half the body protein, but a loss of 20 percent of the water in the body results in death. One can live without food for over a month, but without water only a few days.

Sources of water for our bodies come from l) fluid foods in the diet, 2) solid foods in the diet, and 3) water produced in the body resulting from metabolism of energy nutrients. Water is lost from the body by way of the kidneys (urine), skin (perspiration), lungs (expired air), intestinal tract (feces), and eyes (tears). (See Table 1.)

A reasonable recommendation for water consumption per day would be a tablespoon for each 15 calories of food. A 2,200 calorie diet would require about 10 cups or 2 ½ quarts per day/person.

Water may be stored effectively by one of two methods: 1) individual containers of 1 - 2 gallon size; or 2) large immovable reservoirs of 50-100 gallon size. The advantage of small individual containers is the ease with which they can be transported. Large reservoirs, although immovable, may be connected to a potable water system so that circulation of fresh water is continuous.

TABLE 1. WATER BALANCE
(Average Individual)

Water Intake	
Liquid Food Solid Food Water produced in body	4.7 cups 2.1 – 3.8 cups 1.7 cups
TOTAL	8.5 – 10.2 cups
Water Output	
Vaporization (lungs & skin) Feces Urine	3.9 – 4.2 cups 0.3 – 0.4 cups 4.2 – 5.5 cups
TOTAL	8.4 – 10.1 cups

Water may be stored for long periods of time (5 years or more) if it does not react with the container or its components. Glass, polyethylene, polyester, or metallized polyester containers all work well. Insure that lids do not contain paper components. Adding an insert or barrier of any of the above plastics will work well. Water stored for long periods in proper containers may taste flat, but can be improved by shaking, causing some air to be incorporated with it.

Food Items

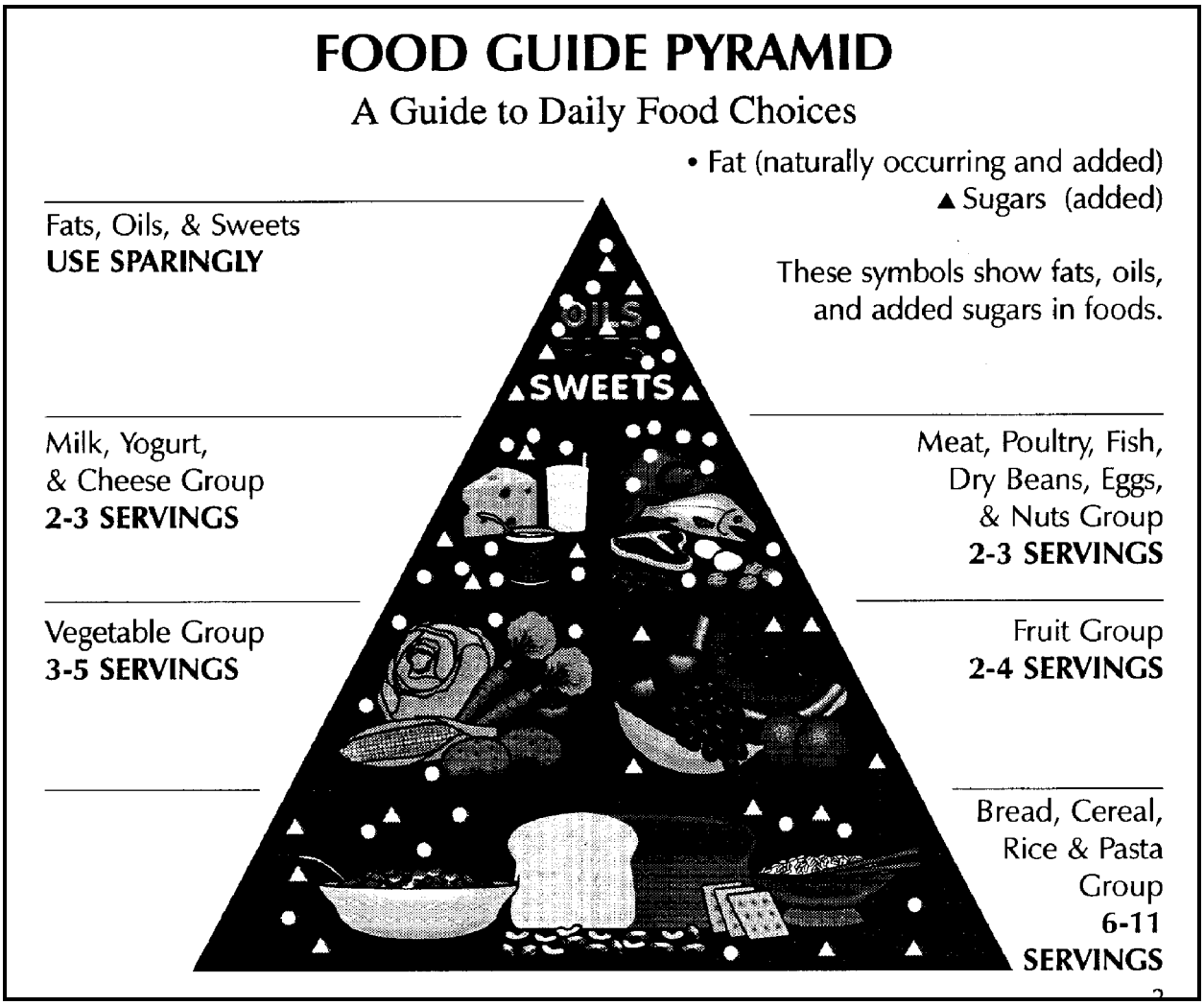
Enough people have eaten for a long enough period of time that some conclusions on "What to Eat?" can be drawn from experience. Some average amounts of the nutrients required for growth, maintenance and reproduction of the human system have been published (see Table 2). These nutrients are distributed among the food groups: l) milk/cheese, 2) meat/poultry/fish, 3) vegetables 4) fruit, 5) bread/cereal, and 6) fat/alcohol/sweets/other. Appropriate servings from each food group combined into a daily intake will provide an adequate nutrient supply.

There are three key principles to consider (i.e., variety, balance, and moderation) for diet selection. Enough data has been generated by our tax dollars so that any person can quickly determine a nutritionally sound diet to support and maintain good health. Such information is found in the Food Guide Pyramid.

TABLE 2. U.S. RDA's

Vitamin A	5,000 IU
Vitamin D	400 IU
Vitamin E	10 IU
Vitamin C	60 mg
Folic Acid	0.4 mg
Thiamin	1.5 mg
Riboflavin	1.7 mg
Niacin	20 mg
Vitamin B6	2.0 mg
Vitamin B12	6.0 mcg
Biotin	0.3 mg
Pantothenic Acid	10 mg
Calcium	1.0 g
Phosphorus	1.0 g
Iodine	150 mcg
Iron	18 mg
Magnesium	400 mg
Copper	2.5 mg
Zinc	15 mg
Protein	45 g

Every individual does not like the same foods. Each family member should have some input into planning what foods to store. A simple, sensible rule is to store the foods that you normally eat, if they provide an adequate diet. This rule will insure that, l) family members will eat the food that is stored, and 2) stored food will be consumed within the shelf-life period. If the family prefers corn flakes, milk, sugar, juice and bread for breakfast, then these are the items to store. It is difficult to imagine much enthusiasm at the breakfast table if this family were to sit down to whole wheat, powered milk, honey, and a vitamin pill. A diet of these foods would become monotonous in a few days. Additionally, a marked alternation in diet could cause some temporary digestive problems.



HOW TO USE THE DAILY FOOD GUIDE

What counts as one serving?

Breads, Cereals, Rice, and Pasta
- 1 slice of bread
- ½ cup of cooked rice or pasta
- ½ cup of cooked cereal
- 1 ounce of ready-to-eat cereal

Vegetables
- ½ cup of chopped raw or cooked vegetables
- 1 cup of leafy raw vegetables

Fruits
- 1 piece of fruit or melon wedge
- ¾ cup of juice
- ½ cup of canned fruit
- ¼ cup dried fruit

Milk, Yogurt, and Cheese
- 1 cup of milk or yogurt
- 1 ½ to 2 ounces of cheese

Meat, Poultry, Fish, Dry Beans, Eggs, and Nuts
- 2 ½ to 3 ounces of cooked lean meat, poultry, or fish
- Count ½ cup of cooked beans, or 1 egg, or 2 tablespoons of peanut butter as 1 ounce of lean mean (about ⅓ serving)

Fats, Oils, and Sweets
- LIMIT CALORIES FROM THESE especially if you need to lose weight

The amount you eat may be more than one serving. For example, a dinner portion of spaghetti would count as two or three servings of pasta.

A Closer Look at Fat and Added Sugars

The small tip of the Pyramid shows fats, oils, and sweets. These are foods such as salad dressings, cream, butter, margarine, sugars, soft drinks, candies, and sweet desserts. Alcoholic beverages are also part of this group. These foods provide calories but few vitamins and minerals. Most people should go easy of foods from this group

Some fat or sugar symbols are shown in the other food groups. That's to remind you that some foods in these groups can also be high in fat and added sugars, such as cheese or ice cream from the milk group, or french fries from the vegetable group. When choosing foods for a healthy diet, consider the fat and added sugars in your choice from all the foods groups, not just fats, oil, and sweets from the Pyramid tip.

How many servings do you need each day?

	Women & some older adults	Children, teen girls, active women, most men	Teen boys & active men
Calorie level*	about 1,600	about 2,200	about 2,800
Bread group	6	9	11
Vegetable group	3	4	5
Fruit group	2	3	4
Milk group	**2–3	**2–3	**2– 3
Meat group	2, for a total of 5 ounces	2, for a total of 6 ounces	3, for a total of 7 ounces

*These are the calorie levels if you choose lowfat, lean foods from the five major food groups and use foods from the fats, oils, and sweets group sparingly.

**Women who are pregnant or breastfeeding, teenagers, and young adults to age 24 need three servings.

Food comes in many forms. Fresh, frozen, dehydrated, canned, salted/cured, pickled, smoked, and pasteurized food can all play a role in a good storage system. All of these foods require some energy for their production, harvesting, preservation, storage, and preparation (cooking). In the absence of traditional energy sources some food forms may not be available or may not store for the normal shelf-life period. It is possible to convert some forms of food with short shelf-life into other forms with longer shelf-life. Fresh apples which spoil in 3-4 weeks at ambient temperatures (70°F) may be held 4-5 months at refrigerated temperatures (32°F). Frozen meat may be thawed, salted to a level of 12 percent salt, and then held at 60°F for several weeks. Before the meat is consumed salt must be leached from the tissues using fresh water so the resulting cooked product will be palatable. Frozen meat may be thawed and then canned without loss of quality. Vegetables and fruits which have been frozen are not acceptable when thawed and canned, but some kinds may be readily dehydrated after being frozen for short periods.

Only store foods that your family will eat.

STARTING YOUR FOOD STORAGE

Food storage is viewed as a part of emergency preparedness. It is also a part of the program of a gardener to preserve and store away some of the fruits of his or her labor. Whatever the reason a person has for storing food beyond immediate needs, planning must be done to avoid waste.

There are a number of approaches to building a food storage program. Only two will be outlined, which can be adapted to fit individual needs. A major reason for not having food storage is the expense. A simple way to avoid a large cash outlay is to merely purchase double the items on the grocery list with each shopping excursion. The extra items are then marked with the purchase date and put into storage to be rotated out and replaced on the next shopping trip.

Perishable items such as fluid milk or eggs are difficult to work into this system. Therefore substitutes such as nonfat dried milk may be purchased for storage. Keep in mind, however, that there is a limit to the length of time that even these semi-perishable or dehydrated items can be stored.

A disadvantage of the double purchase system is that it is not as easy to benefit from sales prices. One advantage is that items are only purchased that are routinely used in menu planning, thereby reducing waste and improving rotation.

Another approach to beginning a food storage program is to use a lump sum of money such as a tax refund or a bonus check to purchase a large amount of basics for your family. The pamphlet “Essentials of Food Storage” has suggested that basics should include wheat, sugar or honey, salt and nonfat dried milk. While it is true that these items do store well, it is important that the family will use what they store. This list could be modified to include grain products such as wheat and white flour, pasta products, rolled oats, rice, dried beans, split peas, lentils and other dehydrated fruits and vegetables. Cracked or whole wheat products do not store well

Your food storage is only as good - and as nutritious - as the original quality.

because the membranes are broken that keep the oil in the wheat germ away from the iron and other minerals in the endosperm and the bran layer. Rancidity occurs at a rapid rate. Rolled oats are heat treated which destroys the lipase enzyme and therefore will store quite well.

When establishing a food storage program do not forget:

1. Store only those items you will use. If you do not currently include a food in your diet it is not likely that you will use it.
2. Do not purchase more than you will rotate and use within a 2 to 3 year period of time to reduce waste.
3. Insure that the quality of the item you purchase is acceptable. Quality does not improve upon storage for most foods.

Planning before you begin a food storage program will help to avoid pitfalls.

HOW MUCH TO STORE

Many families or individuals desire to maintain a 12 month supply of food. Most food storage systems in Utah involve growing and preserving food at home from gardens and orchards. Generally, these sources provide a major portion of foods to the storage systems between June and October. Home meat supplies are most commonly obtained in the fall of the year when wild game seasons occur, and following pioneer traditions of slaughtering domestic animals during the cooler months to take advantage of natural refrigeration.

If you were to sample most Utah family food storage programs in November, about 45 percent would have adequate stores of food for one year. If the same families were resampled in May only 20 percent would still have a years supply on hand. Families which did not have a years supply in May had used food from storage and had no garden or orchard to replenish the supply during the winter months. For this reason, it is suggested that an 18 month supply be stored in order to maintain a 1 year supply of food. The extra 6 months supply of food would be available between December and June when most systems are at their lowest level.

Families that were resampled and still had a years supply in May did so because they never used food from their storage system. We have analyzed over 10,000 food storage systems in Utah and found that many people are under the illusion that food lasts forever. Their food storage systems are designed so that a years supply is purchased and stored until needed. Consequently they have some stored food that is 10, 20, and 25 years old. In view of what is known about shelf-life, these systems are quite wasteful and inefficient.

14 gallons of water per person (2 week supply)
1 pound of dry matter per person per day of dried foods

One pound of dry matter provides about 1600 calories of energy. Because energy is the most critical item in a food storage program (it will prevent the baby from being hungry) it should be considered first. Thus dried beans, flour, wheat, rice, sugar, dried fruits or vegetables, pastas or dried skim milk all provide about 1600 calories per pound. While 1600 calories will not adequately meet the energy needs of a hard-working large man it will quiet hunger pangs for individual members of a family. One pound of dry matter per person per day serves as a basis for a food storage program. Generally in Utah with our home gardens a

family will supplement the dried products with fresh fruits and vegetables in a storage pit or cellar as well as canned or frozen fruits and vegetables.

THE STORAGE AREA

The storage area should be located where the average temperature can be kept above 32°F and below 70°F. Remember that the cooler the storage area the longer the retention of quality and nutrients. Freezing of some items, such as canned products, should be avoided since the expansion of the food during freezing may rupture (metal) or break (glass) the container, or break the seal on lids on glass bottles, and allow the food to be contaminated. This could pose a serious safety risk when the food thaws.

The storage area should be dry (less than 15 percent humidity), and adequately ventilated to prevent condensation of moisture on packaging material. The area should be large enough so that shelves can accommodate all of the stored food and adequate space is available to keep the area clean and tidy. A 9 x 12 foot room with 10 foot ceilings will provide adequate space for a family of six to store an 18 month supply of food. Food should not be stored on the floor. It is a good idea to have the lowest shelf 2-3 feet off the floor in flood prone areas. Shelves should be designed so that a simple rotation system can effectively allow the oldest food to be used first and the newest food to be held within the shelf-life period.

When designing and building a food storage area, do it to minimize areas where insects and rodents can hide. As practical, seal all cracks and crevices. Eliminate any openings which insects or rodents may use to gain entrance to the storage area.

Electrical equipment such as freezers, furnaces and hot water heaters should not be housed in the storage area. These appliances produce heat, unnecessarily increasing storage temperatures. Insulation of the storage area from other areas of the house will effectively reduce the average yearly temperature of the food.

> *The cooler your storage, the longer the food will maintain quality.*

STORAGE LIFE

Quality and nutritive value of food deteriorates during storage, therefore foods should not be held for long periods beyond their established shelf-life. When food is stored too long, there is the risk of two things happening: 1) color, flavor, aroma, texture or appearance deteriorate to a level where people will not consume the food, and 2) nutrient deterioration may be severe enough to render the food an unreliable source of specific nutrients.

> *Properly processed canned, dried, and frozen (never thawed) foods do not become unsafe when stored longer than the recommended time, but palatability and nutrient quality are diminished.*

CAUSES OF DETERIORATION

Self Destruction

All living systems, whether plant or animal, were designed with a self-destruction mechanism. With death or harvest, this mechanism is activated. If allowed to proceed, naturally occurring enzymes in the food will cause discoloration, and undesirable flavor and textural changes such as when an apple rots. As animals and plants are slaughtered or harvested, they lose the protective devices provided by a living system. When wheat is ground, the kernel dies and becomes vulnerable to rancidity.

Microorganisms

Bacteria, yeasts and molds are the most common causes of spoilage of food and foodborne illness. Processing methods are designed to control microorganisms by either killing them (ex. canning) or preventing their growth (ex. drying or freezing). It is important to realize that a food which is safe due to inhibition of microorganisms loses that safety when conditions change. Dried beans that are cooked are no longer safe to store at room temperature. When meat is thawed, it still contains living organisms and therefore must be held under refrigeration and used within a fairly short time period.

Insects and Rodents

Rodents deposit waste products in stored grains. Insects grow in flour, hatching eggs, to produce larvae. Cleanliness and good packaging are important in the avoidance of both problems.

Contamination

Stored food can become unsafe to consume from contact with undesirable substances. Be aware of what nonfood material is in close proximity to the stored food. This includes packaging in nonfood-approved substances such as storing wheat in plastic garbage bags.

Chemical Changes

Flavor and color changes can occur during storage; especially when stored in packages which do not exclude air and light. Baking powder can lose its sizzle and baked products won’t rise.

WHAT AFFECTS STORAGE LIFE

Shelf-life is defined as the period of time between slaughter or harvest and consumption. Shelf-life may be relatively short (a few hours) or may be extended for a number of months. Scientists determine the shelf-life of a food by storing it under carefully controlled conditions for a given period of time. During this storage period measurements are made to monitor changes in two important parameters: l) the quality of the food (i.e., color,

flavor, texture, odor), and 2) the nutrients it contains (i.e., vitamins, protein, fat, water, minerals, and carbohydrate).

There are several important factors which influence shelf-life and are important to consider in a food storage program. Temperature, humidity, packaging material, irradiation by sunlight, the protection from insects and rodents, and formation of natural toxicants are just a few of the parameters which must be considered in establishing shelf-life recommendations. Since storage temperature is one of the most important factors, perhaps a general rule might be appropriate. The lower the temperature the longer the shelf-life. Persons storing foods in a garage at an average temperature of 90°F should expect a shelf-life less than half of what could be obtained at room temperature (60-70°F) which in turn is less than half the storage life in cold storage (40°F). We have adjusted many of the recommendations to a 70°F environment (see Tables 3, 4, 5, 6). This is about the average basement storage temperature for Utah. Persons storing food at 90°F should reduce the recommendation by one-half in most cases. These recommendations were not made to establish how long food may be stored, but to provide data for a sensible rotation system. For instance, canned condensed milk may be stored safely for 5 years, but the quality and nutrient content will never be improved over what it was between 1-12 months. The quality may be so poor no one will consume it.

Irradiation by sunlight can also induce physical and chemical changes in food. Insects and animals can consume food and spread disease. High humidity increases perishability of many foods. Selective packaging material which can exclude light, air, and moisture enhances the length of shelf-life.

PACKAGING MATERIALS

While many families have gone to great lengths to insure an adequate store of food in their homes, not much thought has been given to packaging the food.

Food should only be stored in food-grade containers. A food-grade container is one that will not transfer non-food chemicals into the food and contains no chemicals which would be hazardous to human health. Some good examples of containers not approved for food use are trash or garbage bags, paint or solvent cans, industrial plastics and fiber barrels that have been used for non-food purposes. The safety of any packaging material can be determined by contacting the manufacturer and asking if a particular container is approved for food use. Many manufacturers are beginning to indicate on the container label if it is approved for food use.

Consumers who have stored food in containers other than those approved for food use should dispose of the food immediately. Bury the food deep in the ground where animals do not have access to it. There is no stored food that is worth enough to risk chemical contamination by non-food chemicals and a potential hazard to human health.

Plastic films and containers of food-grade quality are made from polycarbonate, polyethylene and polyester. They differ in characteristics of density, strength and barrier properties. To increase moisture and oxygen barrier properties, films have been laminated. Laminated plastics may include a metallic layer which will greatly increase barrier properties. Military food packaged in metallized polyester, polyethylene wrap has a long shelf life (5+ years) if kept cool.

When safe packaging material has been identified, some suggestions as to size and durability are warranted. Containers for storage of dry foods such as wheat, beans, rice, oatmeal, and cornmeal should have a maximum of 20-30 pound capacity. These sizes may be moved easily by one adult person. More important is that these smaller amounts of food will

be used up in a relatively short period of time, thus reducing the chance for contamination or infestation by insects. Smaller containers provide a way of using the food, but not exposing large quantities to the environment during use periods.

Metal cans used in the canning industry are only designed to last a few years. Losses of canned foods usually occur due to breakdown of the can rather than extensive deterioration of the food under normal storage conditions. Sealed number 10 cans are popular for dehydrated foods mainly due to size, convenience and minimal exposure of the foods to the environment.

Glass jars, which are popular among home canners, are quite inert compared to metal cans, but are less durable to shock. Fiber boxes, which were the original containers for glass jars, make excellent storage containers for jars of fruit since they exclude light and effectively separate individual jars to prevent breakage.

Glass, metal and plastic containers, especially if they have tight-fitting lids and no open crevices or seams, are usually the containers of choice.

If food items, such as grain or cereals, are insect-free when placed in these containers, they will most likely stay insect-free after a long period of storage. Glass jars have the advantage that you can see what's in them.

Flexible plastic containers last longer and are more durable if placed inside a rigid container. Information on the suitability of flexible plastic containers for protecting food from insect infestations is limited. If the food is insect-free to begin with, and if the packages are properly sealed, they should prove satisfactory.

Chemicals

Non-food household chemicals should not be stored in the same area with food. Volatile chemical compounds can be transferred to the food and affect the flavor and odor. These chemicals should be stored in a separate area where children do not have access to them.

Date and rotate food in your storage.

Many consumers have requested information concerning the chemical treatment of food prior to storage to extend the shelf-life and prevent insect infestation. Before using any chemical treatment, check to make sure it is safe to use and determine what levels of the chemical are safe and effective.

KEEPING BAD THINGS OUT OF THE FOOD SUPPLY

Clean, cool, dry storage areas are preferred. Avoid storing food in open containers on shelves. Keep food storage areas free from spilled food and food particles. Good housekeeping helps prevent insect infestations. To prevent or at least minimize insect infestations in stored food products it would be ideal to store them somewhere between 35°F and 45°F. Realistically, if they can be stored below 65°F it will be helpful.

Insects and Animals

In the best interests of the family budget, food conservation, clean food and health, stored food items should be protected from contamination and damage from insect pests.

Small flour beetles, dermestids, weevils, larder beetles, several kinds of moths and other stored food pests readily infest, contaminate, destroy, and consume accessible food supplies. It is important to prevent or reduce these kinds of losses whenever possible.

Prevent Insect Infestations

To prevent insect infestations in bulk foods, keep all stored foods in tight, clean, metal, plastic, or glass insect-proof containers that have tight fitting lids and no open seams or crevices. Store food off the floor and away from damp areas.

Fumigation with Dry Ice Prior to Storage

To fumigate home stored wheat or similar products, spread about 2 ounces of crushed dry ice on 3 or 4 inches of grain in the bottom of the container, then add the remaining grain to the can until it is at the desired depth. If fumigating large quantities use 14 ounces for 100 pounds of grain or 1 pound of dry ice for each 30 gallons of stored grain. At approximately 75 cents a pound for dry ice the cost of fumigating is reasonable.

Since the fumes from vaporizing dry ice are heavier than air, they should readily replace the existing air in the container. Allow sufficient time for the dry ice to evaporate (vaporize) before placing the lid on all the way (approximately 30 minutes). The lid should not be made tight until the dry ice has pretty well vaporized and has replaced the regular air. Then it can be placed firmly on the container and sealed.

Should pressure cause bulging of the can after the lid has been put in place, remove the lid cautiously for a few minutes and then replace it. If using plastic bags in the can, don't seal the bags until the dry ice has vaporized. Carbon dioxide will stay in the container for some time, provided the container lid is tight. When practical, follow the above procedure in a dry atmosphere to reduce the condensation of moisture in the bottom of the can.

Dry ice tends to control most adult and larval insects present, but probably will not destroy all the eggs or pupae. If a tight fitting lid is placed firmly on the container after the dry ice has vaporized, it may keep enough carbon dioxide inside to destroy some of the eggs and pupae. After 2 to 3 weeks another fumigation with dry ice may be desirable to destroy adult insects which have matured from the surviving eggs and pupae.

If properly done, these two treatments should suffice. Yearly treatments are not indicated unless an infestation is recognized.

> ***Caution**: Dry ice should always be handled with care. It should not be accessible to young children or to adults who are not aware of its vaporizing properties.*

Chemical Control in Insect Infested Areas

If the infestation is extensive, dispose of the contaminated food. If the infestation is light, you may be able to salvage the product, but in most cases it will be to your advantage to dispose of any insect infested food you have in storage, including spices.

Remove all food packages and containers from the infested area. Clean the shelves, and as appropriate, remove the lower kitchen drawers and clean the areas behind and

underneath the drawers with an extension to the vacuum. Then spray the area with a household formulation of an approved insecticide such as pyrethrum or Malathion. If an aerosol formulation is used, the dosage should be no problem. If mixing a concentrated insecticide with water, follow label directions. Spray cracks and crevices under shelves and along mop boards. Do not spray the insecticide directly on food, food preparation surfaces, such as bread boards, or on any food equipment or utensils. If appropriate, once the spray dries, cover the shelves with clean shelf paper or foil before returning food packages to the shelves.

Kerosene-based sprays should not be used around flour since the flour may absorb the kerosene. If treating an area where flour is stored, remove the flour before treating and place it back on the shelves after the kerosene odor is gone. Do not spray oil-based insecticides on asphalt-tile floors.

Household formulations of Diazinon, Baygon (propoxur), Malathion, or Drione, may be used for crack and crevice treatment behind radiators, under sinks, and in ant runs to destroy ants, roaches, earwigs, silverfish and roaming flour-infesting insects. See label directions for information on insects controlled by these chemicals and the appropriate uses.

NOTE: Most insecticides are poisonous to man and animals. Follow instructions on the label. Do not store pesticides near foods or medicines. Keep all pesticides out of the reach of children, pets, and livestock.

Physical Methods of Controlling Insects in Food

Clean, cool, dry storage areas are preferred. Avoid storing food in open containers on shelves. Keep food storage areas free of spilled food and food particles. Good housekeeping helps prevent insect infestations.

Deep Freeze Control for Grain

Small quantities of grain, 1 to 10 pounds, can be put in medium to heavy food grade plastic bags and placed in a deep freeze for 2 to 3 days. This will usually destroy all stages of any insect pests which are present.

As a check spread the deep freeze treated grain on a cookie tray at room temperature until thawed. If live insects are present they will probably be seen crawling about. If they are present, repeat the process. If not, remove any insect fragments, put the grain in an approved container and store it in a cool, dry place.

Heat Treatment—Air

When packaged goods such as beans, cereals, whole grains, nut meats, and similar dried foods become infested they may be “sterilized” by heating in an open oven as follows.

Spread a shallow layer of wheat in a cookie tray or large pan. Pre-heat the oven to about 140° to 150°F. Put the tray in the preheated oven and leave it there for 30 minutes or more. The oven door should be left slightly open to avoid overheating. This treatment should destroy all stages of the insect if the layer of grain on the tray is not too thick (1/2 inch). Next, remove the tray and cool the wheat thoroughly before returning it to a clean, dry storage container. As necessary, use a fan to blow off any existing insect fragments. Where large quantities of dry food are to be treated, this method is not practical.

Heat is detrimental to the proteins in wheat and may reduce the ability of the bread to rise properly. Some reduced loaf volume and heavier texture may be apparent when using heat treated grains.

Dry Ice

Food may be fumigated with dry ice as previously described.

Bay Leaves, Chewing Gum, Chanting Words and Phrases

We receive numerous inquiries asking about exotic treatments to prevent insect infestations in stored grain. In unofficial experiments we have conducted, it was noted that some insects will continue to feed when enclosed in containers with tight fitting lids, even in the presence of these exotic suggestions. We have also concluded that chanting words and phrases fall upon deaf ears. Some consumers have reported on the effectiveness of many exotic treatments. Our investigations have shown these instances to only be effective when no insects were initially present in the food.

TABLE 3
VEGETABLES AND FRUITS

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Fresh potato	ventilated boxes or bags	35 - 40°F.	moderately moist pit or cellar	6 months
Fresh sweet potato	ventilated boxes or bags	55 - 60°F.	dry basement	6 months
Canned potato	original container	70°F.	dry basement	30 months
Canned sweet potato	original container	70°F.	dry basement	30 months
Frozen potato	original package	0°F.	freezer	8 months
Dehydrated potato	original container	70°F.	dry basement	30 months
Potato chips	original container	70°F.	basement	1 month
Fresh dark green vegetables	flexible package	38 - 40°F.	refrigerator	7 days
Onions fresh dry	net bag	32°F.	cool dry area	6 months
Carrots fresh	ventilated boxes or bags	32°F.	moist pit or cellar	6 months
Pumpkin fresh	ventilated box	55°F.	moderately dry basement	6 months
Squash (winter) fresh	ventilated box	55°F.	moderately dry basement	6 months
Tomatoes fresh ripe	flexible package	38 - 40°F.	refrigerator	2 weeks
Tomatoes green mature	flexible package	55 - 70°F.	moderately dry basement	4 - 6 weeks

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Cabbage fresh	ventilated box	32°F.	moderately moist pit or cellar	6 months
Other fresh vegetables	flexible package	38 - 40°F.	refrigerator	1 - 2 weeks
Beets fresh	ventilated box	32°F.	moist pit or cellar	6 months
Canned vegetables	original container	70°F.	dry basement	24 months
Frozen vegetables	original container	0°F.	freezer	12 months
Dehydrated vegetables	air & moisture-proof cont.	70°F.	dry basement	8 months
Fresh citrus fruits	ventilated container	32°F.	moderately moist cellar	8 weeks
Bananas fresh	ventilated container	60 - 70°F.	basement	1 week
Berries fresh	ventilated container	38 - 40°F.	refrigerator	1 - 2 weeks
Pears fresh	ventilated container	32°F.	moderately moist cellar	4 months
Apples fresh	separated in boxes	32°F.	moderately moist cellar	6 months
Canned fruits	original container	70°F.	dry basement	24 months
Frozen fruits	original container	0°F.	freezer	12 months
Dehydrated fruits	air and moisture-proof cont.	70°F.	dry basement	8 months
Canned fruit juices	original container	70°F.	dry basement	24 months
Frozen fruit juices	original container	0°F.	freezer	12 months
Dehydrated fruit juices	air & moisture-proof cont.	70°F.	dry basement	12 months
Canned vegetable juice	original container	70°F.	dry basement	12 months
Canned tomato condiments	original container	70°F.	dry basement	24 months
Jams and jellies	original container	70°F.	dry basement	18 months
Pickles	original container	70°F.	dry basement	12 months

TABLE 4
BREAD, CEREAL, RICE AND PASTA

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Flour (whole wheat graham)	10 - 12% moisture sealed cont.	70°F.	basement	2 weeks
Flour (white enriched)	10 - 12% moisture sealed cont.	70°F.	basement	1 year
Prepared flour mixes (pancake, muffin, cake)	original container	70°F.	basement	8 months
Hot breakfast cereals (wheat and oat)	original container	70°F.	basement	6 months
Cold breakfast cereals (corn, oat, wheat, rice)	original container	70°F.	basement	1 year
Rice, dried (brown, white enriched)	10 - 12% moisture sealed cont.	70°F.	basement	2 years
Cornmeal	original container	70°F.	basement	1 year
Pasta, dried	10 - 12% moisture sealed cont.	70°F.	basement	2 years
Popcorn, unpopped	original container (can)	70°F.	basement	3 years
Popcorn, unpopped	original container (bag)	70°F.	basement	3 months
Bread fresh purchased	original container	70°F.	basement	5 days
Bread frozen purchased	original container	0°F.	freezer	6 months
Bread made from whole wheat (ground fresh)	polyethylene bags	70°F.	basement	3 days
Bread made from white flour	polyethylene bags	70°F.	basement	5 days
Raw batters and doughs frozen	original container	0°F.	freezer	3 months
Pretzels, crackers, cereal snacks	original container	70°F.	basement	3 months
Other bakery products (fresh rolls, cakes and cookies purchased)	polyethylene bags or cartons	70°F.	kitchen	4 days
Other bakery products (frozen rolls, cakes and cookies)	polyethylene bags or cartons	0°F.	freezer	6 months
Raw whole wheat	10 - 12% moisture sealed cont.	70°F.	basement	25 years

TABLE 5
MEAT, POULTRY, FISH AND LEGUMES

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Beef fresh	original package	38 - 40°F.	refrigerator	4 days
Beef ground	original package	38 - 40°F.	refrigerator	1-2 days
Beef frozen	air and moisture-proof container	0°F.	freezer	10 months
Beef corned	original package	38 - 40°F.	refrigerator	2 weeks
Beef chipped	vacuum package	38 - 40°F.	refrigerator	28 - 42 days
Beef dried	restructured and dried in a can	70°F.	cool basement	18 months
Beef canned (in chunks with natural juices)	original package	70°F.	cool basement	30 months
Pork frozen	air and moisture-proof container	0°F.	freezer	4 - 6 months
Pork fresh	original package	38 - 40°F.	refrigerator	4 days
Pork cured	vacuum package	38 - 40°F.	refrigerator	4 weeks
Pork sausage	original package	38 - 40°F.	refrigerator	4 days
Veal fresh	original package	38 - 40°F.	refrigerator	4 days
Veal frozen	air and moisture-proof container	0°F.	freezer	8 months
Lamb fresh	original package	38 - 40°F.	refrigerator	4 days
Lamb frozen	air and moisture-proof container	0°F.	freezer	8 months
Variety meats fresh	original package	38 - 40°F.	refrigerator	2 days
Variety meats frozen	air and moisture-proof container	0°F.	freezer	4 months
Frankfurters	vacuum package	38 - 40°F.	refrigerator	3 weeks
Processed lunch meats	vacuum package	38 - 40°F.	refrigerator	4 weeks
Chicken and turkey fresh	original package	38 - 40°F.	refrigerator	5 days
Chicken and turkey frozen	air and moisture-proof container	0°F.	freezer	8 months
Fish frozen (varies with species)	original package	0°F.	freezer	3 - 9 months

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Fish smoked	vacuum package	38 - 40°F.	refrigerator	4 weeks
Fish canned	original package	70°F.	cool basement	18 months
Fish shellfish frozen	original package	0°F.	freezer	3 months
Eggs fresh	original package	38 - 40°F.	refrigerator	4 weeks
Eggs dried	original package	70°F.	cool basement	36 months
Egg substitutes	original package	0°F.	freezer	3 months
Nuts	original package	70°F.	cool/dry basement	12 months
Beans dry	rigid plastic or metal container	70°F.	cool/dry basement	12 months
Peas and lentils	rigid plastic or metal container	70°F.	cool/dry basement	12 months

TABLE 6
DAIRY PRODUCTS

Food Component	Storage Condition	Average Storage Temperature	Storage Area	Optimum Length of Storage
Fresh fluid milk whole	original container	38 - 40°F.	refrigerator	14 days
Fresh fluid milk 2%	original container	38 - 40°F.	refrigerator	14 days
Fresh fluid milk skim	original container	38 - 40°F.	refrigerator	14 days
Fresh fluid buttermilk	original container	38 - 40°F.	refrigerator	14 days
Fresh fluid milk chocolate	original container	38 - 40°F.	refrigerator	14 days
Canned evaporated milk	can inverted at 2 month intervals	60 - 70°F.	basement	12 months
Canned condensed milk	can inverted at 2 month intervals	60 - 70°F.	basement	12 months
Dry milk products	original container	60 - 70°F.	basement	24 months
Cream light	original container	38 - 40°F.	refrigerator	14 days
Cream heavy	original container	38 - 40°F.	refrigerator	14 days
Cream half and half	original container	38 - 40°F.	refrigerator	14 days
Cream substitutes	original container	60 - 70°F. or frozen	basement or freezer	24 months
Cream sour	original container	38 - 40°F.	refrigerator	14 days
Yogurt	original container	38 - 40°F.	refrigerator	14 days
Ice cream	air and moisture-proof container	0°F.	freezer	30 days
Ice milk	air and moisture-proof container	0°F.	freezer	30 days
Sherbet	air and moisture-proof container	0°F.	freezer	30 days
Natural American cheeses	vacuum package	38 - 40°F.	refrigerator	6 months
Processed American cheeses	vacuum package	38 - 40°F.	refrigerator	8 months
Swiss cheese	vacuum package	38 - 40°F.	refrigerator	6 months
Cottage cheese creamed	original container	38 - 40°F.	refrigerator	14 days
Cream cheese	original container	38 - 40°F.	refrigerator	21 days
Dry cheeses	original container	60 - 70°F.	basement	3 months
Cheese spreads, dips, etc.	original container	38 - 40°F.	refrigerator	21 days

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