

Food Storage

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Proper food storage helps maintain food quality by retaining flavor, color, texture and nutrients, while reducing the chance of contracting a foodborne illness.

Foods can be classified into three groups. The first group, perishable foods, includes meat, poultry, fish, milk, eggs and many raw fruits and vegetables. All cooked foods are considered perishable foods. To store these foods for any length of time, perishable foods need to be held at refrigerator or freezer temperatures. If refrigerated, perishable foods should be used within several days.

Semi-perishable foods, if properly stored and handled, may remain unspoiled for six months to about one year. Flour, grain products, dried fruits and dry mixes are considered semi-perishable.

Staple, or non-perishable, foods such as sugar, dried beans, spices and canned goods do not spoil unless they are handled carelessly. These foods will lose quality, however, if stored over a long time, even if stored under ideal conditions.

There is no exact method to determine how long a food will maintain quality and be safe to eat, because many conditions affect quality. The storage life of foods is affected by:

- the freshness of the food when it reached the grocery store.
- the length of time and the temperature at which it was held before purchase.
- the temperature of your food storage areas.
- the humidity level in your food storage areas.
- the type of storage container or packaging the food is stored in.
- the characteristics of the food item.

How Food Spoils

Food spoilage and deterioration is no accident. It is a naturally occurring process. To understand how to maintain the quality of food and prevent spoilage, we need to know what can cause spoilage.

Microorganisms

Many types of microorganisms can cause food problems. The microorganisms that can cause foodborne illness are called pathogenic microorganisms. These microorganisms grow best at room temperatures (60-90°F), but most do not grow well at refrigerator or freezer temperatures. Pathogenic microorganisms may grow in foods without any noticeable change in odor, appearance or taste. Spoilage microorganisms, including some kinds of bacteria, yeasts and molds, can grow well at temperatures as low as 40°F. When spoilage microorganisms are present, the food usually looks and/or smells awful.

Enzymes

Enzymes, substances naturally present in food, are responsible for the ripening process in fruits and vegetables. Enzymes are responsible for texture, color and flavor changes. For example, as a banana turns from green to yellow to brown, not only does the color change, but there is also a change in the fruit's texture. Unblanched frozen corn-on-the-cob may taste like the cob over time. This is the result of enzyme action.

Air

Oxidation, a chemical process that produces undesirable changes in color, flavor and nutrient content, results when air reacts with food components. When fats in foods become rancid, oxidation is responsible. Discoloration of light-colored fruits can be reduced by using an

antioxidant, such as ascorbic acid or citric acid, before freezing. Vapor-proof packaging that keeps air out helps reduce oxidation problems.

Light

Light exposure could result in color and vitamin loss. Light also may be responsible for the oxidation of fats.

Insects, Rodents, Parasites and Other Creatures

These creatures require food to survive and damage food, making it more vulnerable to further deterioration.

Physical Abuse

Bruises and cracks on raw produce leave areas where microorganisms easily may grow. Improperly packaged foods, dented cans and broken packages provide places for microorganisms, air, light and creatures to enter. Gentle handling of food items will help maintain food quality and safety longer.

Temperature

Temperature affects storage time, and food deteriorates faster at higher temperatures. Recommended temperatures for storage areas are:

Cupboard/Pantry	50-70°F
Refrigerator	34-40°F
Freezer	0°F or below

Microorganisms, both spoilage and pathogenic, grow rapidly at room temperature. To slow microbial growth, the enzymatic and oxidation processes, store foods at lower temperatures.

Time

Microorganisms need time to grow and multiply. Other reactions, such as oxidation and enzyme action, also require time to develop. Purchase reasonable quantities, especially of perishable foods, to help avoid long term storage.

Cupboard/Pantry Storage

Cupboard or pantries should be kept clean, dry, dark and cool. The best temperature range for dry and canned items is 50-70°F. Temperatures over 100°F may cause canned food to deteriorate and lose quality.

To prevent foods from spoiling, use a rotation system — FIRST IN, FIRST OUT. By using this method, older canned and dried food items will be used before newly purchased items. Writing the date of purchase on

food items will help maintain the rotation system.

Check canned items frequently for signs of spoilage. Do not use food from cracked, bulging or leaking cans, or those that spurt liquid when opened. Never taste these foods to determine their safety, but discard the cans immediately.

Refrigerated Storage

Refrigerator temperatures do not destroy pathogenic or spoilage microorganisms. The lower temperature does, however, slow the growth of microorganisms already in the food. Perishable food will deteriorate, even at refrigerator temperatures, due to spoilage microorganisms, enzymes and oxidation. Time and temperature are important factors in food quality.

Use food quickly, and don't expect food to remain high-quality for the maximum length of time. Opened and partially used items usually deteriorate more quickly than unopened packages.

Maintain your refrigerator between 34°F and 40°F. Refrigerator thermometers are available to help monitor the temperature inside the appliance.

Foil, plastic wraps or bags or airtight containers are the best choices for storing most foods in the refrigerator. Open dishes may result in refrigerator odors, dried-out foods, loss of nutrients and mold growth.

Food placement in the refrigerator affects air circulation and efficiency. Don't stack foods tightly or cover refrigerator shelves with foil or any material that prevents air circulation from quickly and evenly cooling the food.

Some foods, including milk, meats and leftovers, should be kept colder than others. The coldest part of the refrigerator is usually the area nearest the freezer compartment, but a refrigerator thermometer will provide an accurate check for each appliance.

Freezer Storage

Keep your freezer at zero degrees or below to maintain the quality of frozen foods. Most foods will maintain good quality longer if the freezer temperature is -10 to -20°F. At temperatures between 0 and 32°F, food deteriorates more rapidly. Fluctuating temperatures, such as those in self-defrosting freezers, also may damage food quality. Do not plan to store frozen foods for the maximum suggested time if your freezing unit cannot maintain zero degree temperatures. Even foods stored properly will lose color, texture, flavor and nutritional quality but will not cause foodborne illness.

Freezer temperatures, however, do not destroy pathogenic or spoilage microorganisms, which will begin growing under warmer temperature conditions. When frozen foods are thawed at room temperature, the surface of the food warms enough for microorganisms to grow and multiply.

If your freezer does not have a built-in thermometer, check the temperature frequently. One easy way to estimate the freezer's temperature is to check the consistency of ice cream stored inside the compartment. If the ice cream is not brick-hard, the temperature of your freezer is too warm. A warning light or other device may be installed to warn you if the freezer is not operating correctly. A plug protector may be used to keep the electrical plug in the outlet.

Time is an important factor in maintaining high-quality frozen foods. Frozen foods will not last forever. The chart at the end of this publication lists the maximum length of storage times to help you maintain quality food products. One option is to label frozen food items, maintain a rotation system and use the items with the oldest dates first.

Many products, including foil, plastic wrap or bags, freezer paper and airtight containers are designed for frozen food storage. If food removed from the freezer is found to have white, dried-out patches, freezer burn has occurred. Freezer burn means improper packaging allowed air to dry out the food surface. While freezer-burned food will not cause illness, it may be tough or tasteless when consumed. Lastly, allow proper air circulation in the freezer.

Solving Odor Problems in Your Refrigerator or Freezer

If food has been allowed to spoil in a refrigerator or freezer, the strong odors associated with food spoilage may be extremely difficult to remove.

The first step is to clean the appliance with a gentle household cleaning solution and water. Use a bleach solution (one tablespoon chlorine bleach per gallon of water) to rinse inside surfaces. While the unit is

unplugged, leave the door open for a day or two to air it out. If the odor remains, try one of the following methods:

- Place trays of activated charcoal, clean kitty litter or baking soda on the shelves of the refrigerator or freezer. Run the appliance empty for two or three days. Activated charcoal can be purchased from stores that sell aquarium and terrarium supplies.
- Place freshly ground coffee on cookie sheets in the refrigerator or freezer and close the door. Again, run the appliance empty for two or three days. A slight coffee odor may remain, but will disappear after washing and rinsing.
- Pack each refrigerator or freezer shelf with crumpled newspaper. Set a cup of water on the top shelf or sprinkle the newspaper with water. Allow the refrigerator or freezer to run for approximately five or six days. This method is time consuming, but effectively removes strong odors.
- Several commercial products are available for removal of refrigerator and freezer odors. These products may be purchased at hardware, grocery, discount and variety stores.

Spray disinfectant around hinges and locks and into any openings. If the unit has been off several days, it is possible the odor has gone into the insulation. If the odor has penetrated the insulation, much work is needed to get it out. An air compressor might be needed to blow air into this section of the unit. If the above methods do not satisfactorily take care of odor problems, it may be that drippings from meat or fish leaked into the insulation. This problem would require service by a refrigerator technician, who may have to remove the liner and replace the insulation.

Food Storage Chart

The following chart provides maximum storage times for foods stored under optimum conditions. These times may be used as a guideline for food storage safety.

Storage Periods for Retaining Food Quality

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Milk/Milk Products			
Milk		1 week	1 month
Butter		2 weeks	12 months
Canned or dry milk (unopened)			6 months
Cottage cheese		1 week	3 months
Cream		1-2 weeks	
Ice cream			2-3 weeks
Margarine		1 month	12 months
Natural cheese		1 month	4-6 months
Processed cheese		1 month	4-6 months
Sour cream, buttermilk, cream cheese		2 weeks	Not recommended
Yogurt		1 month	
Meat			
Fresh roasts, steaks, chops		3-4 days	2-3 months
Fresh livers, hearts, kidneys, other variety meats		1-2 days	3-4 months
Fresh ground meat, stew meat		1-2 days	3-4 months
Cured pork and lunch meat		1 week	Not recommended
Cooked meat, gravies made with meat stock		2-3 days	2-3 months
Canned meat		1 year	
Meat pies, stews, casseroles, meat salads		2-3 days	3 months
Hotdogs		2 weeks (unopened) 1 week (opened)	1-2 months
Bacon		7 days	1 month
Sausage, raw from pork, beef, turkey		1-2 days	1-2 months
Hard sausage-pepperoni, jerky sticks		2-3 weeks	1-2 months
Poultry/Eggs			
Fresh poultry		2 days	6-8 months
Cooked poultry		2-3 days	6 months
Poultry stuffing		1 day	

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Poultry pies, stews, creamed dishes, gravies		1 day	6 months
Poultry salads		1 day	
Eggs		2-4 weeks	1 year
Raw yolk, whites		2-4 days	1 year
Hardcooked eggs		1 week	Not recommended
Liquid pasteurized eggs or egg substitutes		10 days (unopened) 3 days (opened)	1 year (unopened)
Egg-containing products: custards, custard sauces, puddings, custard-filled pastries or cakes		1-2 days	Not recommended
Puddings, canned		1-2 days (opened)	
Fish/Seafood			
Fresh fish		1-2 days	3-6 months
Cooked fish		3-4 days	1 month
Fish salad		1 day	
Smoked fish		10 days	4-5 weeks
Canned fish	1 year		Not recommended
Dried or pickled fish		3-4 weeks	
Clams, oyster (shucked) and scallops		7-9 days	
Crab		7 days	2 months
Shrimp		3-5 days	6-12 months
Lobster (shelled or unshelled)		3-7 days	6-12 months
Wild Game			
Venison		3-5 days	3-4 months
Rabbit, squirrel		1-2 days	12 months
Wild duck, pheasant, goose(whole)		1-2 days	6 months
Fruits			
Apples	Until ripe	1 month	
Citrus fruits		2-6 weeks	
Grapes		1-3 weeks	

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Melons, most varieties		1 week	
Peaches, nectarines		2-3 weeks	
Pears (mature but not fully ripe)		1-3 months	
Pineapple, ripe		1 week	
Other fresh fruit	Until ripe	3-5 days	9-12 months
Canned fruit	1 year	2-4 days (opened)	
Dried fruit	6 months	2-4 days (cooked)	
Fruit juice concentrates			1 year
Canned fruit juices	1 year	3-4 days (opened)	

Vegetables

Asparagus		2-3 days	
Broccoli, brussels sprouts, green peas, green onions, lima beans, rhubarb, greens, summer squash, mushrooms		3-5 days	
Cabbage, cauliflower, celery, cucumbers, snap beans, lettuce, peppers, tomatoes		1 week	
Carrots, beets, parsnips, radishes, turnips		2 weeks	
Corn		1 day	
White potatoes, sweet potatoes, winter squash, rutabagas, dry onions	1 week (several months at 50-60°F)		
Canned or dried vegetables	1 year	1-4 days (opened/cooked)	

Cereal Products

Flour, white	1 year		
Flour, whole or wheat		6-8 months	1 year
Rice, white	2 years		
Rice, brown	6 months		
Ready-to-eat cereals	1 year		
Uncooked cereals	1 year		
Pasta	1 year		
Corn meal		1 year	

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Bakery Goods			
Breads, baked with no preservatives		2-3 weeks	2-3 months
Breads, quick, baked			2 months
Cake, angel			6-12 months
Cake, baked, frosted			1 month
Caked, baked, unfrosted			2-4 months
Cakes, batter			1 month
Cakes, fruit			6-12 months
Cinnamon rolls, partially baked			2 months
Cookies, baked, homemade		2-3 weeks	6-12 months
Cookies, dough		1-2 days	3 months
Cookies, packaged		2 months	12-18 months
Crackers		2 months	
Doughnuts, unfrosted			2-4 months
Muffins, baked			6-12 months
Pies, fruit		2-3 days (baked) 1-2 days (unbaked)	6-8 months (baked) 2-4 months (unbaked)
Pies, pumpkin or chiffon		2-3 days	1-2 months
Rolls and bread, unbaked		2-3 weeks	1 month
Waffles			1 month
Mixes/Packaged Foods			
Biscuit, brownie, muffin mix	9 months		
Cake mixes	6-9 months		
Casserole mix	9-12 months		
Cookies, homemade	2-3 weeks		
Cookies, packaged	2 months		
Crackers	3 months		
Croutons and bread crumbs	6 months	6 months	1 year
Frosting, canned	3 months		
Frosting, mix	8 months		
Hot roll mix	18 months		
Pancake mix	6-9 months		

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Piecrust, mix	6-9 months		
Potatoes, instant	6-12 months		
Rice mixes	6 months		
Sauce and gravy mixes	6-12 months		
Soup mixes	12 months		
Toaster pastries	2-3 months		

Other Foods

Baking powder	18 months		
Baking soda	2 years		
Chocolate syrup	2 years (unopened)	6 months (opened)	
Cocoa mixes	8 months		
Coffee, lighteners (dry)	9 months (unopened) 6 months (opened)		
Cornstarch	18 months		
Gelatin	18 months		
Pectin	1 year		
Salad dressings, bottled	12 months (unopened)	1-3 months (opened)	Not recommended
Sugar, brown	18 months		
Sugar, confectioners'	18 months		
Sugar, granulated	2 years		
Vinegar	2 years (unopened) 1 year (opened)		
Cheese, parmesan, grated	10 months (unopened) 2 months (opened)		
Coconut, shredded	12 months (unopened) 6 months (opened)		
Imitation bacon bits, etc.	4 months		
Peas, beans, dried	12 months		
Popcorn	2 years		
Whipped topping, dry	12 months		
Yeast, dry	Expiration date on package		
Honey, jams, syrups, molasses	1 year		
Nuts, unshelled	6 months		
Nuts, shelled		6 months	

<i>Food</i>	<i>Room Temperature</i>	<i>Refrigerator</i>	<i>Freezer at 0°F</i>
Peanut butter	6 months (unopened)	2 months (opened)	
Chocolate	1 year		
Coffee	1 year (unopened) 2-4 weeks (opened)		
Coffee, instant	6 months (unopened) 2 months (opened)		
Pudding mixes	1 year		
Shortening, solid	8 months		
Vegetable oils	1-3 months		
Tea, bags or loose	1 year		
Tea, instant	1 year		
Soft drinks	3 months		
Bouillon products	1 year		
Mayonnaise		10-12 weeks	Not recommended

Spices, Herbs, Condiments, Extracts

Catsup, chili sauce	12 months (unopened) 1 month (opened)		
Mustard, prepared yellow (refrigerate for longer storage)	2 years (unopened) 6-8 months (opened)		
Spices, whole	1-2 years		
Spices, ground	6 months		
Herbs	6 months		
Herb/spice blends	2 years (unopened) 12 months (opened)		
Other extracts	12 months		

Sources

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For More Information

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Acknowledgment

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