



Refrigeration and Food Safety

A refrigerator is one of the most important pieces of equipment in the kitchen for keeping foods safe. These electric units are so commonplace today, we forget a refrigerator was once little more than a box with a block of ice used to supply a rather undependable source of cold air. But we are instantly reminded of its importance to our daily lives when the power goes off or the unit fails, putting our food's safety in jeopardy.

History of Refrigeration

In prehistoric times, man found that his game would last longer if stored in the coolness of a cave or packed in snow. He realized the cold temperatures would keep game for times when food was not available. Later, ice was harvested in the winter to be used in the summer. As man became more industrialized and mechanized, ice was harvested from lakes and rivers or manufactured, stored, and transported to many countries. Even today, ice is still manufactured for this use.

The intermediate stage in the history of cooling foods was to add chemicals like sodium nitrate or potassium nitrate to water causing the temperature to fall. Cooling wine via this method was recorded in 1550, as were the words "to refrigerate." The evolution to mechanical refrigeration, a compressor with refrigerant, was a long, slow process and was introduced in the last quarter of the 19th century.

The science of refrigeration continues to evolve. In 1996, there was a change made in the type of refrigerant used to comply with the Regulatory Clean Air Act, Title 6. The old refrigerant known to most people as "freon," a tradename, was replaced with HFC 134a, a new refrigerant less injurious to the ozone and still just as effective in keeping food cold. As consumers, we should notice no difference.

Importance of Refrigeration

Refrigeration slows bacterial growth. Bacteria exist everywhere in nature. They are in the soil, air, water, and the foods we eat. When they have nutrients (food), moisture, and favorable temperatures, they grow rapidly, increasing in numbers to the point where some types of bacteria can cause illness. Bacteria grow most rapidly in the range of temperatures between 40 and 140 °F, the "Danger Zone," some doubling in number in as little as 20 minutes. A refrigerator set at 40 °F or below will protect most foods.

Types of Bacteria in Refrigerated Foods

There are two completely different families of bacteria: *pathogenic* bacteria, the kind that cause foodborne illness, and *spoilage* bacteria, the kind of bacteria that cause foods to deteriorate and develop unpleasant odors, tastes, and textures.

Pathogenic bacteria can grow rapidly in the "Danger Zone," the temperature range between 40 and 140 °F, but they do not generally affect the taste, smell, or appearance of a food. In other words, one cannot tell that a pathogen is present.

On the other hand, *spoilage* bacteria can grow at low temperatures, such as in the refrigerator. Eventually they cause food to develop off or bad tastes and smells. Most people would not choose to eat spoiled food, but if they did, they probably would not get sick. It comes down to an issue of quality versus safety:

- Food that has been left too long on the counter may be dangerous to eat, but could look fine.
- Food that has been stored too long in the refrigerator or freezer may be of lessened quality, but most likely would not make anyone sick. (However, some bacteria such as *Listeria monocytogenes* thrive at cold temperatures, and if present, **will** multiply in the refrigerator and could cause illness.)

Safe Refrigerator Temperature

For safety, it is important to verify the temperature of the refrigerator. Refrigerators should be set to maintain a temperature of 40 °F or below. An appliance thermometer can be kept in the refrigerator to monitor the temperature. This can be critical in the event of a power outage. When the power goes back on, if the refrigerator is still 40 °F, the food is safe. Foods held at temperatures above 40 °F for more than 2 hours should not be consumed. Appliance thermometers are specifically designed to provide accuracy at cold temperatures. Be sure refrigerator/freezer doors are closed tightly at all times. Don't open refrigerator/freezer doors more often than necessary and close them as soon as possible.

Safe Handling of Foods for Refrigerating

Hot food can be placed directly in the refrigerator or it can be rapidly chilled in an ice or cold water bath before refrigerating. Cover foods to retain moisture and prevent them from picking up odors from other foods.

A large pot of food like soup or stew should be divided into small portions and put in shallow containers before being refrigerated. A large cut of meat or whole poultry should be divided into smaller pieces and wrapped separately or placed in shallow containers before refrigerating.

Placement of Foods

The temperature in a refrigerator should be 40 °F or below throughout the cabinet, so any place within the cabinet is safe for storage of any food. Raw meat, poultry, and seafood should be in a sealed container or wrapped securely to prevent raw juices from contaminating other foods.

Some refrigerators have special features such as adjustable shelves, door bins, crispers, and meat/cheese drawers. These features are designed to make storage of foods more convenient and to provide an optimal storage environment for fruits, vegetables, meats, poultry, and cheese.

Shelves

Shelves should be adjustable to accommodate a variety of packages. Tempered glass shelves are attractive and easy to clean. Some refrigerators feature sealed glass shelves to contain spills and make cleanup easier. Some shelves pull out to provide better accessibility to items in the back.

Specialized Compartments

Sealed crisper drawers provide an optimal storage environment for fruits and vegetables. Vegetables require higher humidity conditions while fruits require lower humidity conditions. Some crispers are equipped with controls to allow the consumer to customize each drawer's humidity level.

An adjustable temperature meat drawer maximizes the storage time of meats and cheeses. Additional cool air is directed into the drawer to keep items very cold without freezing.

Safety of Foods Stored on the Door

Don't store perishable foods on the door. Eggs should be stored in the carton on a shelf. The temperature of the storage bins on the door fluctuate more than the temperature in the cabinet. Keep the door closed as much as possible.

Food Safety While Defrosting

Most refrigerators-freezers sold today don't require defrosting by the consumer. However, there are still units on the market and in homes that do allow frost to build up and require periodic defrosting.

When food is removed from the refrigerator for defrosting, it's important to keep refrigerated foods cold and frozen foods from thawing. To do this, place the food in a cooler with a cold source or pack it in a box and cover it with blankets for insulation.

Do not use any type of electrical heating device, ice pick, knife, or other sharp object to remove frost, as this could damage the inner lining.

Keeping the Refrigerator Clean

One very important step in keeping your food safe is keeping your refrigerator clean. Wipe up spills immediately — clean surfaces thoroughly with hot, soapy water; then rinse.

Once a week, make it a habit to throw out perishable foods that should no longer be eaten. A general rule of thumb for refrigerator storage for cooked leftovers is 4 days; raw poultry and ground meats, 1 to 2 days. Refer to the cold storage chart for storage of meat, poultry, and egg products in the home refrigerator.

To keep the refrigerator smelling fresh and help eliminate odors, place an opened box of baking soda on a shelf. Avoid using solvent cleaning agents, abrasives, and all cleansers that may impart taste to food or ice cubes, or cause damage to the interior finish of your refrigerator. Follow the manufacturer's instructions.

The exterior may be cleaned with a soft cloth and mild liquid dishwashing detergent as well as cleansers and polishes that are made for appliance use. The front grill should be kept free of dust and lint to permit free air flow to the condenser. Several times a year the condenser coil should be cleaned with a brush or vacuum cleaner to remove dirt, lint, or other accumulations. This will ensure efficiency and top performance.

Removing Odors

If food has spoiled in a refrigerator — such as during a power outage — and odors from the food remain, they can be difficult to remove. The following procedures may have to be repeated.

- Wipe inside of unit with equal parts vinegar and water. Vinegar provides acid which destroys mildew.
- Wash inside of unit with a solution of baking soda and water. Be sure to scrub the gaskets, shelves, sides, and door. Allow to air out several days.
- Stuff unit with rolled newspapers. Close the door and leave for several days. Remove paper and clean with vinegar and water.
- Sprinkle fresh coffee grounds or baking soda loosely in the bottom of the unit, or place them in an open container.
- Place a cotton swab soaked with vanilla inside freezer. Close door for 24 hours. Check for odors.
- Use a commercial product available at hardware and housewares stores. Follow the manufacturers' instructions.

Storage Times for Refrigerated Foods

NOTE: These short but safe time limits will help keep home-refrigerated food from spoiling or becoming dangerous to eat.

FOOD	REFRIGERATION TIME
Eggs	
Fresh, in shell	3-5 weeks
Raw yolks, whites	2-4 days
Hard-cooked	1 week
Liquid pasteurized eggs, egg substitutes	Unopened, 10 days Opened, 3 days
Cooked egg dishes	3-4 days
Mayonnaise, commercial	2 months
Deli and Vacuum-Packed Products	
Store-prepared (or homemade) egg, chicken, tuna, ham, and macaroni salads	3-5 days
Pre-stuffed pork, lamb chops, and chicken breasts	1 day
Store-cooked dinners and entrees	3-4 days
Commercial brand vacuum-packed dinners with/USDA seal, unopened	2 weeks
Raw Hamburger, Ground and Stew Meat	
Ground beef, turkey, veal, pork, lamb	1-2 days
Stew meats	1-2 days
Ham, Corned Beef	
Ham, canned, labeled "Keep Refrigerated"	Unopened, 6-9 months Opened, 3-5 days
Ham, fully cooked, whole	7 days
Ham, fully cooked, half	3-5 days
Ham, fully cooked, slices	3-4 days
Corned beef in pouch with pickling juices	5-7 days
Hot Dogs and Luncheon Meats	
Hot dogs	Unopened package, 2 weeks Opened package, 1 week
Luncheon meats	Unopened package, 2 weeks Opened package, 3-5 days

FOOD	REFRIGERATION TIME
Bacon and Sausage	
Bacon	7 days
Sausage, raw from meat or poultry	1-2 days
Smoked breakfast links, patties	7 days
Summer sausage labeled "Keep Refrigerated"	Unopened, 3 months Opened, 3 weeks
Hard sausage (such as Pepperoni)	2-3 weeks
Cooked Meat, Poultry and Fish Leftovers	
Pieces and cooked casseroles	3-4 days
Gravy and broth, patties and nuggets	1-2 days
Soups and Stews	3-4 days
Fresh Meat (Beef, Veal, Lamb and Pork)	
Steaks, chops, roasts	3-5 days
Variety meats (Tongue, kidneys, liver, heart, chitterlings)	1-2 days
Fresh Poultry	
Chicken or turkey, whole	1-2 days
Chicken or turkey, parts	1-2 days
Giblets	1-2 days
Fresh Fish and Shellfish	
	1-2 days

Food Safety Questions?

Call the USDA Meat & Poultry Hotline

If you have a question about meat, poultry or egg products, call the USDA Meat and Poultry Hotline toll free at **1-888-MPHotline** or **1-888-674-6854**, TTY: 1-800-256-7072.



from 10 a.m. to 4 p.m. EST (English or Spanish).

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