



**Food Safety and Inspection Service
United States Department of Agriculture
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Consumer Education and Information

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Safe Storage of Meat and Poultry: The Science Behind It

From the farm to the store, meat and poultry products must be chilled -- and kept chilled, packaged and handled properly so it will be safe for consumers to buy. Several government agencies have the responsibility to assure the food's safety. In the home, food caretakers must do their part to store, handle and cook meat and poultry right so it's safe to eat. Here are some of the scientific principles behind the safe storage of meat and poultry.

Why is Chilling Meat and Poultry Important?

Raw meat and poultry products should be maintained at 40° F or below to greatly reduce the growth rate of any pathogenic bacteria that may be present on their surfaces. Chilling is required of all raw product unless it moves directly from the slaughter line to heat processing or cooking (made into hot dogs or luncheon meats, for example), which destroys pathogens.

How is Meat and Poultry Chilled and Maintained at the Plant?

Meat and poultry products are chilled immediately after slaughter to acceptable internal temperatures which insure the prompt removal of the animal heat and preserve the wholesomeness of the products. Generally, red meat carcasses (which are above 90° F at the time of slaughter) are chilled in a blast cooler with rapidly moving chilled air, and, in some instances, a cold water shower.

Poultry is required to be chilled to 40° F or less within specified time frames, depending upon the size of the carcass. Whole birds and parts of major size are chilled in ice or ice and water media. Poultry parts are chilled in ice, air or water spray with continuous drainage. Giblets must be chilled to 40° or below within two hours of slaughtering the birds.

How Does Packaging Prolong Storage Times?

Packaging is a physical barrier to cross contamination. Microorganisms exist everywhere in nature. They are in the soil, air, and water. The simple act of covering food keeps microorganisms from contacting the food. Covered perishable foods can be stored longer and at better quality than uncovered foods. Modified atmosphere packaging (MAP) and vacuum packaging help prolong storage (see following question). Refer to the charts on pages 5 and 6 for recommended storage times.

What Effect Does

Oxygen in the air hastens both the chemical breakdown and microbial spoilage

Vacuum Packaging and MAP Have on Meat Storage?

of many foods. To help preserve foods longer, scientists have developed ways to help overcome the effects of oxygen. Vacuum packaging, for example, removes air from packages and produces a vacuum inside. MAP (modified atmosphere packaging) helps to preserve foods by replacing some or all of the oxygen in the air inside the package with other gases such as carbon dioxide or nitrogen. (examples: lunch meat in a blister package; raw beef brisket or filets in vacuum packaging; fresh turkeys).

At What Temperature Can Raw Poultry Be Maintained?

USDA's new rules for labeling raw poultry products as to their storage temperature will become effective in December 1997. The term "*fresh*" may **ONLY** be placed on raw poultry that has never been below 26° F. Poultry held at 0° or below must be labeled "*frozen*" or "*previously frozen*." No specific labeling is required on poultry between 0 and 26° F.

This poultry label rule addresses a truth-in-labeling issue, not food safety, because most pathogenic bacteria do not grow or grow very slowly at normal refrigerator temperatures. The Agency concluded that the term "*fresh*" should not be used on the labeling of raw poultry products that have been chilled to the point they are hard to the touch.

How are Meat Products Kept Safe During Transportation?

To prevent rapid growth of pathogenic bacteria, perishable meat and poultry products should be kept cold (40° or below) or frozen (0° or below) during transport from the plant to a refrigerated warehouse or retail store. Microorganisms capable of causing foodborne illness either don't grow or grow very slowly at refrigerated temperatures of 40°F. Freezing keeps food safe by slowing the movement of molecules, causing any microbes present to enter a dormant stage. There's also no risk of dripping juices to contaminate nearby products and storage areas.

How is the Temperature Inside Trucks Monitored?

Trucks should have temperature devices which constantly record temperatures on a running graph for the duration of a trip. A visual temperature device is located outside the trucks so the drivers can monitor how cold it is inside. Trucks can be specially sealed to prevent being opened during transit.

How are Meat Products Kept Safe During Loading and Unloading?

One of the extremely important places in handling perishable meat and poultry products safely is the receiving dock. Employees should verify the products are at a safe temperature upon arrival. According to the Food and Drug Administration *Food Code* (which covers retail establishments, not federal) the temperature must be at 5° C (41° F) when received. Employees should also check the conditions of the packaging materials and the sight and smell of the products..

In the Store, How Should Meat Products Be Safely Handled?

To protect perishable food from contamination after receipt at the store, food employees must wash their hands before handling it. Raw foods must be kept separate from cooked ready-to-eat foods during storage, preparation, holding and display. Some local jurisdictions may require food handlers to wear gloves.

Frozen foods must be maintained frozen. When "thawed for your convenience," frozen food must be kept under refrigeration that maintains

the food at 5° C (41° F) or below, or completely submerged under running water following strict guidelines outlined in the *Food Code*.

How is Meat Kept Safe in Display Cases?

Meat and poultry products on display must be protected from contamination by the use of packaging; counter, service line, or salad bar food guards; display cases or other effective means, according to the *Food Code*. Unpackaged, raw animal food, such as beef, lamb, pork, poultry and fish, may not be offered for consumer self-service.

Ready-to-eat meat and poultry at consumer self-service operations must be provided with suitable utensils or effective food dispensing methods that protect the food from contamination. After being served or sold and in the possession of a consumer, food that is unused or returned by the consumer may not be re-offered as food for human consumption.

Should Meat and Poultry Be Stacked Above the Cooling Level of the Display Case?

In order for meat and poultry to be stored at the required safe temperatures, fresh and frozen products should not be stacked above the cooling level of refrigerator and freezer display cases. The foods should be arranged to maintain the recommended temperature of 5° C (41° F) in the *Food Code* unless the state prescribes a different temperature (for example, many states allow shell eggs to be stored at 45° F).

Is Food Product Dating Required by Federal Law?

Except for infant formula and some baby food (see below), product dating is not required by Federal regulations. However, if a calendar date is used, it must express both the month and day of the month (and the year, in the case of shelf-stable and frozen products). If a calendar date is shown, immediately adjacent to the date must be a phrase explaining the meaning of that date such as "sell by" or "use before."

There is no uniform or universally accepted system used for food dating in the United States. Although dating of some foods is required by more than 20 states, there are areas of the country where much of the food supply has some type of open date and other areas where almost no food is dated.

What Types of Food Are Dated?

"Open" dating, or *dates you can read*, are found primarily on perishable foods such as meat, poultry, eggs and dairy products. "Closed" or "*coded*" dating might appear on shelf-stable products such as cans and boxes of food.

Types of Dates

There are several types of dates:

- A "**Sell-By**" date tells the store how long to display the product for sale. You should buy the product before the date expires.
- A "**Best if Used By (or Before)**" date is recommended for best flavor or quality. It is not a purchase or safety date.
- A "**Use-By**" date is the last date recommended for the use of the product while at peak quality. The date has been determined by the manufacturer of the product.
- "**Closed or coded dates**" are packing numbers for use by the manufacturer.

Safety After Date Expires

Except for "use-by" dates, product dates don't always refer to home storage and use after purchase. But even if the date expires during home storage, a product should be safe, wholesome and of good quality -- if handled properly and kept at 40° F or below. See the accompanying refrigerator charts for storage times of dated products.

Foods can develop an off odor, flavor or appearance due to spoilage bacteria. If a food has developed such characteristics, you should not use it for quality reasons.

If foods are mishandled, however, foodborne bacteria can grow and cause foodborne illness -- before or after the date on the package. For example, if a package of hot dogs is taken to a picnic and left out several hours, the hot dogs wouldn't be safe to use, even if the date hasn't expired.

Other examples of potential mishandling are products that have been: defrosted at room temperature more than two hours; cross contaminated; or handled by people who don't use proper sanitary practices. Make sure to follow the handling and preparation instructions on the label to ensure top quality and safety.

How Can Some Products Have Lengthy Storage Dates?

Product dating is not required by Federal regulations. But a plant may use shelf-life studies to determine a sell-by or use-by date for its products. If the plant has dated a "keep-refrigerated" product, it promises the consumer it will be safe to use until at least that time, assuming the consumer is storing the product at 40° F or below.

Some packaging procedures which can lengthen safe storage of perishable foods are vacuum packaging and MAP. If a fresh meat and poultry product does not have a date affixed at the plant: refrigerate raw poultry and ground meat up to 2 days; beef, veal, pork and lamb, 3 to 5 days. Cook or freeze within those times. Hot dogs and luncheon meats can be refrigerated unopened up to 2 weeks but no longer than 1 week after a "sell-by" date. After opening, use or freeze hot dogs within 7 days; luncheon meats, 3 to 5 days.

Canning is another process which can lengthen the storage of meat and poultry products. Commercially processed cans, jars and flexible types of retort packages must exhibit a packing code to enable tracking of the product in interstate commerce. These codes aren't meant for the consumer to interpret as "use-by" dates. "Best if used by" dates on these products are quality dates. Canned meat and poultry will keep at best quality 2 to 5 years if the can remains in good condition and has been stored in a cool, clean, dry place.

What Ensures the Safe Storage Dates of Processed Products with Lengthy Dates?

Processed meat and poultry products are either cooked, heat treated, smoked or dried. These processes in themselves extend shelf life beyond that of a raw product. In addition, packaging processes such as canning, vacuum-sealing, MAP, retort packaging, and sealing in blister packaging further

extend the shelf life of these products. If the plant has dated the product, it promises the consumer it will be safe to use until at least that time, assuming the consumer is storing the product at 40° F or below.

Storage Times

Since product dates aren't a guide for safe use of a product, the consumer should follow these tips to store the food and use it at top quality.

- Purchase the product before the date expires.
- If perishable, take the food home immediately after purchase and refrigerate it promptly. Freeze it if you can't use it within times recommended on chart.
- **Once a perishable product is frozen, it doesn't matter if the date expires because foods kept frozen continuously are safe indefinitely.**
- Rotate frozen foods; use the oldest first for best flavor and quality.
- Follow handling recommendations on products.

REFRIGERATOR HOME STORAGE (at 40° F or below) OF FRESH OR UNCOOKED PRODUCTS

If product has a "Use-By Date," follow that date.

If product has a "Sell-By Date" or no date, cook or freeze the product by the times on the following chart.

PRODUCT	STORAGE TIMES AFTER PURCHASE
Poultry	1 or 2 days
Beef, Veal, Pork and Lamb	3 to 5 days
Ground meat and ground poultry	1 or 2 days
Fresh Variety Meats (Liver, Tongue, Brain, Kidneys, Heart, Chitterlings)	1 or 2 days
Cured Ham, cook-before-eating	5 to 7 days
Sausage from pork, beef or turkey, uncooked	1 or 2 days
Eggs	3 to 5 weeks

REFRIGERATOR HOME STORAGE (40° F or below) OF PROCESSED PRODUCTS SEALED AT PLANT

If product has a "Use-By Date," follow that date.

If product has a "Sell-By Date" or no date, cook or freeze the product by the times on the following chart.

PROCESSED PRODUCT	UNOPENED, AFTER PURCHASE	AFTER OPENING
Cooked Poultry	3 to 4 days	3 to 4 days
Smoked Turkey, whole frozen (after defrosting)	3 to 4 days	3 to 4 days

Cooked Sausage	3 to 4 days	3 to 4 days
Sausage, Hard/Dry, shelf stable	6 weeks/pantry	3 weeks
Corned Beef, uncooked, in pouch with pickling juices	5 to 7 days	3 to 4 days
Vacuum-packed Dinners, Commercial brand with USDA seal	2 weeks	3 to 4 days
Bacon	2 weeks	7 days
Hotdogs	2 weeks (but no longer than 1 week after a "sell-by" date)	7 days
Lunch Meats	2 weeks (but no longer than 1 week after a "sell-by" date)	3 to 5 days
Ham, fully cooked	7 days	slices 3 days whole 7 days
Ham, canned, labeled "keep refrigerated"	9 months	3 to 4 days
Ham, canned, shelf stable	2 years/pantry	3 to 5 days
Canned Meat and Poultry, shelf stable	2 to 5 years/pantry	3 to 4 days

For additional food safety information about meat, poultry or eggs, call the toll-free USDA Meat and Poultry Hotline at 1 (800) 535-4555. It is staffed by home economists, dietitians and food technologists from 10 a.m. to 4 p.m. Eastern time year round. An extensive selection of food safety recordings can be heard 24 hours a day using a touch-tone phone.

The media may call Bessie Berry, Manager, USDA Meat and Poultry Hotline, at (202) 720-5604.

Information is also available on the Internet from the USDA Food Safety and Inspection Service Home Page at <http://www.fsis.usda.gov/>.

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For Further Information Contact:

FSIS Food Safety Education Staff

Meat and Poultry Hotline:

- 1-800-535-4555 (Toll-free Nationwide)
- (202) 720-3333 (Washington, DC area)
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