



Food Preservation by Freezing



Interior of a commercial freezer locker plant. At the left, trays for packages in the quick freezer. At the right, a patron removing packages from a typical locker.

*By Staff Members of the College of Agriculture
The Ohio State University*

Food Preservation by Freezing



Preservation by freezing makes it possible to have fresh foods—vegetables, fruits, meat, milk, eggs, and poultry—the year around. This method of food preservation has proven satisfactory and is growing in popularity. Farm families may now own and use freezing units in their own homes or they may patronize commercial locker plants. Some may take advantage of both. There are around 400 commercial plants in Ohio available to farmers, and thousands of farm families have their own units.

Quick freezing units have been developed to fit the needs of any size family. They may be purchased or made at home from plans available through the Extension Service. The home freezer is not likely to interfere with the development of the community plants, because many who have their own home units will want to take advantage of the services rendered by the locker plants, such as cutting and wrapping meats, blanching and packing vegetables, etc. In many cases the processing and freezing of meats may be done more satisfactorily at a locker plant than at home, particularly if butchering is done during warm weather.

Locker plants are licensed, and come under the regulations of the State Department of Agriculture. All licensed plants are susceptible to inspection without notice by an official of the Division of Foods and Dairies of the state of Ohio.

PREPARATION OF FOODS FOR FREEZING

No matter what fruit or vegetable is being frozen, no matter what process is being used, whether in the home unit or the central plant, it is essential that the product be harvested when it is at its best for eating. No freezing process will make a first-class product out of second-class material.

The so-called quick freeze (10 degrees below zero or lower), commonly used in central locker plants, is not needed for farm refrigeration, because farmers do not usually freeze large quantities of food at one time. Zero temperature is a satisfactory quick freeze for small quantities of food. Where there is a need for freezing more than can be handled in the home freezer, one may find it is desirable to take advantages of the facilities of the community plant.

THE USE OF THE FREEZER LOCKER

Many persons look to their freezer unit or locker as their food bank, and where they use the community locker service they make an effort to produce and freeze enough to have on deposit a year-round supply.

The following amounts and the months for harvesting are suggested as a guide for a family of four people—two adults and two children.

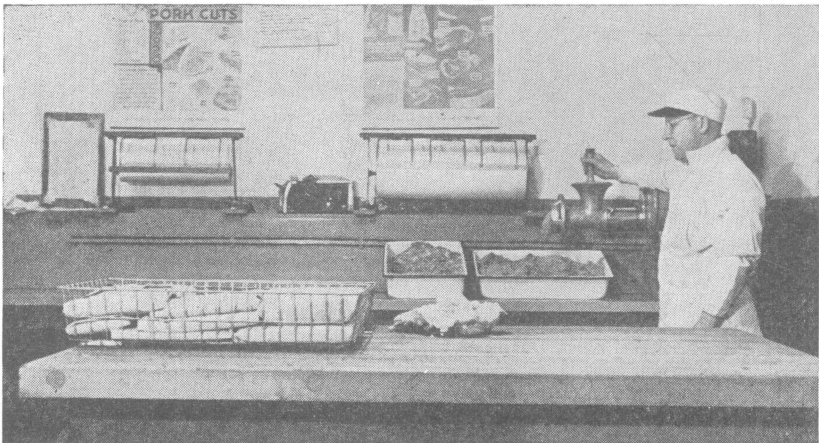
| <i>Vegetable or fruit</i> | <i>Month</i> | <i>Amount</i> |
|----------------------------------|----------------------|---------------|
| Asparagus..... | May | 10 pints |
| Peas..... | June | 20 " |
| Strawberries..... | June | 20 " |
| Beans (lima, green, or soy)..... | July-August | 20 " |
| Corn..... | August | 10 " |
| Greens..... | September or October | 10 " |

Assuming that fresh fruits and vegetables will be used in season, the above schedule calls for a total of 90 pints, about 65 pounds, or 65 percent of a locker with a capacity of 6 cubic feet, on or about October 1. At this time, the amount of meat will be reduced to about 70 pounds. This assumes a capacity of 200 pounds of meat or 140 pints (about 100 pounds) of vegetables and fruit per locker.

PROCEDURE FOR REMOVING PACKAGES

The contents of the locker or freezer unit should be arranged in order to remove the desired piece or package with a minimum of time in sorting. This is especially true of meats. When the supply is replenished, the original packages should be taken out and replaced on top of the new supply. Here is where dating the individual packages becomes useful.

For purposes of future meal planning, it is well to keep a running inventory of what goes into the locker and then check off each item as it is taken out. This will eliminate the embarrassment of going for a particular item and finding that all such packages have been consumed.



A locker plant processing room where cutting and packaging are done.

The Preparation of Meat for Freezer Storage

By

L. E. KUNKLE

Department of Animal Husbandry, The Ohio State University



MEAT SELECTION

Meats may be selected in accordance with grading standards and family requirements of palatability or the intended use. The variations among the kinds of meats—beef, pork, veal, and lamb—are taken for granted. The important features of carcass meat that predetermine eating qualities—conformation, quality, and finish—may be observed in the pair of beef ribs shown in Fig. 1 (A, B), which represent “choice” and “cutter,” or high and low grades, respectively.

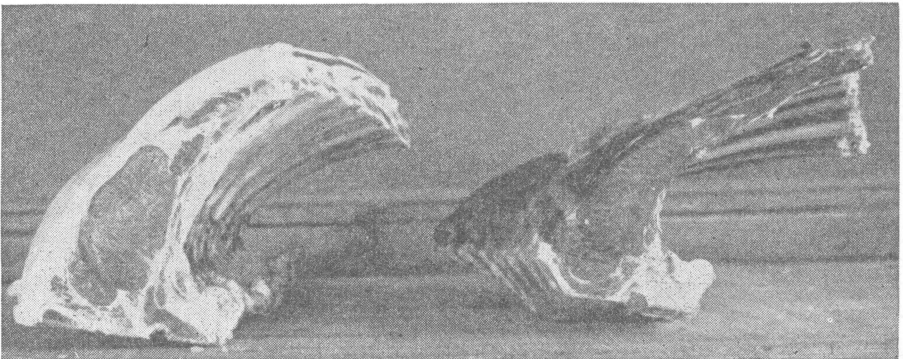


Fig. 1A.—Choice grade.

Fig. 1B.—Cutter grade.

The shape, or conformation, of the carcass or cut will be a direct indication of the amount of edible portion. Since the number and size of bones are comparable, it is obvious that a slice from Fig. 1A would provide more bites of roast beef than a similar serving from Fig. 1B.

The fat, a product of *finish*, that completely covers the lean serves as protection from surface drying and provides the very desirable characteristic juiciness when the cut is cooked. The amount and distribution of fat will vary as shown by the pair of ribs. Fig. 1A has as much fat as is required for choice grade beef. The marbling, “network of fat in the lean,” serves as an aid to the surface fat in assuring juiciness. White brittle fat is the result of long-time grain feeding of beef animals.

Tenderness is dependent upon the features of *quality*, which are texture and color of muscle and color of bone. The pair of beef ribs shown also represent a wide contrast in quality. Light bright colors of lean usually accompany fine texture and invariably are associated with soft red bone. Coarse texture and dark color of meat are usually associated with hard white bone. The condition of bones is a direct reflection of the age of the animal from which the carcass comes and should be observed, since there may be a wide range in the age of beef animals at the time of slaughter.

The three grading factors as discussed for beef may apply to pork, veal, and lamb when the allowances are made for variation in size, characteristic quantity of fat, and color of lean for the respective kinds.

If the animal chosen for the family's meat is not a choice or good grade, it may still be used. Make sure that the animal eats its feed well and is in apparent good health. Commercially dressed carcasses are inspected and bear the certification stamp which implies that the carcass is wholesome and desirable for human consumption.

INSPECTION OF MEAT

In farm communities where a veterinarian is available, it is advisable to call him for meat inspection service. A stamp of inspection will enable the owner to take the carcass or parts into any plant for chilling, cutting, and wrapping service. Where city meat inspection is enforced, the locker operator is required to chill uninspected meat in a separate compartment, and do the cutting and wrapping in another or separate processing room. Under such conditions the owner of the products is obligated to use such uninspected meat in his own home, since inspection regulations prohibit the sale of uninspected products within jurisdiction of the Local Board of Health.

SLAUGHTERING AND CHILLING

The Time for Slaughtering.—Slaughtering may be done any month of the year. The carcass should be rushed to the chill room of the locker plant within two hours of the completion of the task. The size of the family and its demands for beef, pork, veal, and lamb will govern the plan for choice of meat and the timing of procurement.

Chilling.—The dressed carcass may carry an internal temperature which is near 100 degrees F. at the time the slaughtering job is completed. The more quickly this temperature is reduced to 38 degrees F., the greater the chance for a fresh wholesome product that will lend itself to curing or freezer storage without danger of off-flavors or spoilage.

Exposure to adequate refrigeration immediately following slaughter is imperative for the good of the locker patron, as well as the service of the locker plant management.

Suggested Holding Time for Meat Carcasses.—Chilling usually requires 48 hours for the larger carcasses. The time that elapses between the com-

pletion of chilling and cutting the carcass will vary according to the kind and grade of meat.

In order that the plant management will be able to take care of the cutting on schedule, it may be well to plan with the manager in advance so that the time of slaughtering, chilling, and cutting the meat will follow as scheduled.

| Carcass | Time for Chilling (counted from slaughter) | Cutting Day |
|---------------------|--|-------------|
| Lean Beef | 2 days | 5th |
| Fat Beef | 2 days | 10th |
| Pork | 2 days | 3rd |
| Veal | 1 day | 3rd |
| Lamb | 1 day | 5th |

Fat beef, under sanitary conditions, may remain in the chill room at 38 degrees F. longer than any of the other kinds of meat without appreciable

shrinkage. Aging is the term applied when the entire carcass or the loins and ribs of beef are held for several days or even weeks. This period of time

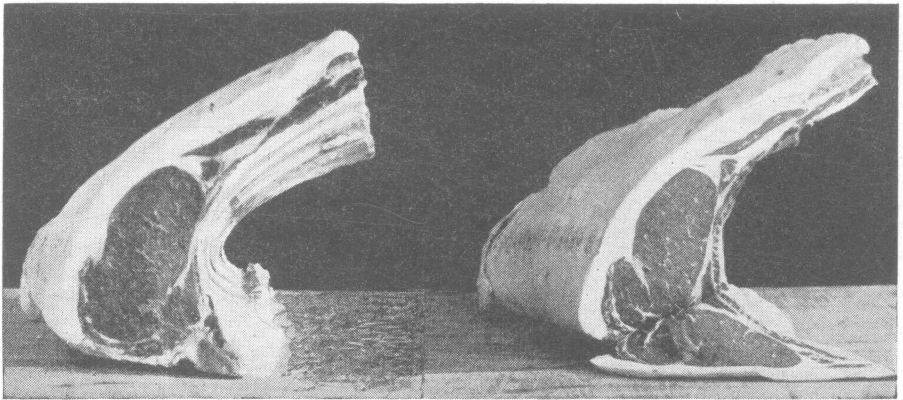


Fig. 2.—Losses due to drying will occur. The dried exposed surface should be trimmed as shown on right.

permits sufficient enzyme action to render the connective tissue in muscles less resistant to cookery and mastication. Excessive aging results in additional shrinkage and trimming loss, as shown in Figure 2.

Pork has an abundance of fat which should be salvaged by rendering into lard. It is desirable to prepare pork for the locker as soon after chilling as possible to avoid fat changes observed as peculiar odor and bitter flavor.

Veal is the leanest of the four kinds of meat and, because there is no protective covering of fat, it should be cut and wrapped for freezing as soon after chilling as is possible.

Lamb may carry a fat covering which is proportionate to similar grades of beef. Since it comes from an animal which is less than a year of age, any improvement in tenderness after a 5-day holding period would be offset by shrinkage.

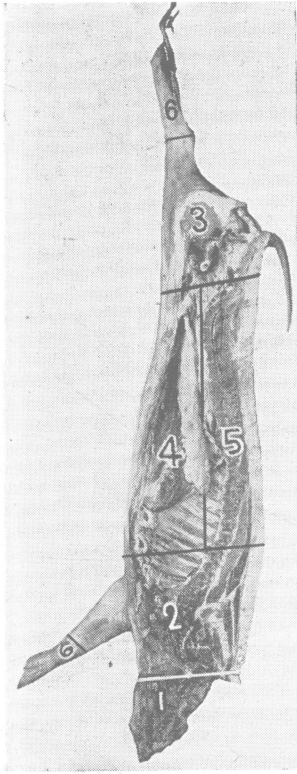


Fig. 3.—The dressed pork carcass with head removed, marked to show division of cuts: 1, jowl; 2, shoulder; 3, ham; 4, bacon; 5, loin; 6, feet.



Fig. 4.—Showing division of the beef carcass into wholesale cuts.

RECOMMENDATIONS ON CUTTING THE MEAT

The method of cutting and workmanship may determine the usefulness of locker service. The object of all meat cutting methods is to obtain a maximum number of meals from a given carcass weight. This implies care in separating the regions so as to group the muscles that are similar, and to remove the thin portions from the thick parts.

In the case of certain cuts, boning is recommended. This allows more efficient use of the locker space, as well as saving fuel and space during cooking. The boneless roast also lends itself to ease of serving as compared to the original bony cut. Desirable boning requires much skill; hence the patron should anticipate paying more for the processing service which requires careful trimming and boning certain wholesale cuts. It is imperative that care be taken in cutting carcasses that for one reason or another have developed some surface spoilage. A small area, such as the exposed surface of a pork shoulder that has spoiled, will serve to inoculate a batch of fresh

pork sausage and consequently spoil the flavor of all of the sausage. The odor is only subdued in freezing, and will become apparent when the product is thawed and even be obnoxious to taste.

Family requirements or personal preference may dictate the divisions for roasts, steaks, or chops, and boiling meat versus ground meat. These directions should be mutually understood before the cutting or processing is undertaken by the locker management.

CUTS OF MEAT, AND APPROXIMATE WEIGHT OF EACH

*Beef Carcass, 500 Pounds, from an 850-pound Live Animal**

ONE FOREQUARTER, 130 POUNDS:

| Cut | Weight, pounds | Individual Cuts |
|---------------|-------------------|---|
| Rib | 20 | 4 standing rib roasts average 5 lbs. each |
| Chuck | 17 | Arm roasts or steaks |
| " | 24 | Blade roasts or steaks |
| " | 12 | Beef cubes or ground beef |
| Plate | 10 | Short ribs |
| " | 4 | Boiling beef or ground beef |
| Brisket | 6 | Boiling beef (boneless) or ground beef |
| Shank | 11 | Cross cut soup shank <i>or</i> |
| " | 6 | Ground beef |

ONE HINDQUARTER, 120 POUNDS:

| | | |
|------------------|----|--------------------------------|
| Flank | 1 | Steak |
| " | 5 | Beef cubes or ground beef |
| Short Loin | 2 | Club |
| " | 9 | T-Bone |
| " | 5 | Porterhouse |
| Loin end | 20 | Sirloin |
| Rump | 7 | B and T rump roast |
| Round | 30 | Round steak |
| " | 4 | Heel pot roast |
| " | 11 | Cross cut soup shank <i>or</i> |
| " | 4 | Ground beef |

* The differences between original weight and the total of final cut weights may be attributed to shrinkage and the weights of bones and excess fat that may be eliminated before packing.

Lamb Carcass, 38 pounds, from an 80-pound Spring Lamb

BOTH SIDES:

| Cut | Weight, pounds | Individual Cuts |
|------------|----------------|--------------------------|
| Legs | 11 | 2 American style roasts |
| Back | 3½ | Loin chops |
| " | 3½ | Rib chops |
| Stew | 8 | 2 B and T lamb shoulders |
| " | 3 | Ground lamb |

Veal Carcass, 110 pounds, from a 200-pound Live Calf

BOTH SIDES:

| Cut | Weight, pounds | Individual Cuts |
|--|----------------|---|
| Leg | 9 | 2 rump roasts |
| " | 20 | Veal steak |
| Loin | 12 | Veal chops |
| Shoulder | 20 | Veal roasts (B and T) (4 or 5 lbs. per roast) |
| Breast | 7 | Pocketed breast |
| Shank and Flank. | 20 | Boneless stew <i>or</i> Ground veal |
| Liver, heart, Tongue and Sweetbreads | 5 | |

Pork Carcass, 160 pounds, from a 200 to 220-pound Live Hog

BOTH SIDES:

| Cut | Weight, pounds | Individual Cuts |
|-----------------|----------------|----------------------------|
| Ham | 10 | Butt roasts |
| " | 10 | Fresh ham steaks <i>or</i> |
| " | 30 | 2 cured hams |
| Loin | 24 | 6 pork roasts <i>or</i> |
| " | 19 | Pork chops |
| Shoulder | 15 | 2 picnic roasts |
| " | 13 | Boston butt <i>or</i> |
| " | 13 | Steaks |
| Belly | 22 | Cure for bacon |
| Spareribs | 3 | |
| Sausage | 8 | |
| Lard | 25 | |

PACKAGING AND WRAPPING REQUIREMENTS

Meat cuts for a single meal should be wrapped in one package. Roasts should be individually wrapped. Steaks, chops, ground meat, and specialties may be combined to make a size of package that is in accordance with particular family needs.

Quality of Wrapping Paper.—It is necessary that meat which is to be stored in zero temperatures be protected from excessive drying (dehydration). There are wrapping papers that are adapted to this use which also have other desirable characteristics. The efficiency of wrapping material may be appraised by the following factors:

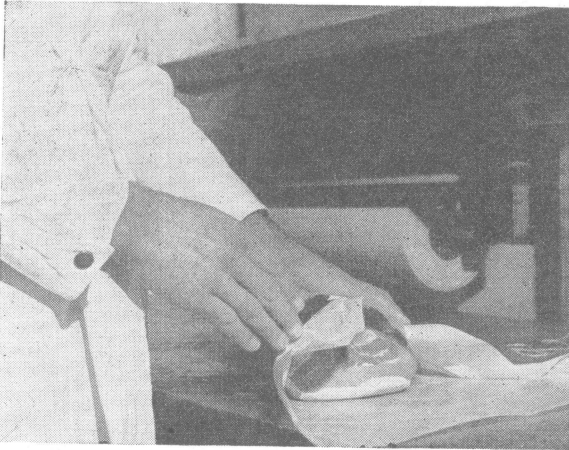


Fig. 5.—Single-wrap locker paper for meat storage at zero.

1. Prevention of dehydration and discoloration.
2. Strength to resist punctures and tears in handling.
3. Ability to resist the absorption of meat juices.
4. Freedom from odors and flavors
5. Ability to be separated from the frozen meat.
6. External surface susceptible to marking for package identification.

Some papers are used in combination—that is, two kinds, a waxed or specially treated surface next to the meat and the outside carries the identification of the cut of meat.

In addition to the popular paper and combination treated sheets used for food wrapping there is cellophane, pliofilm and aluminum foil available.

Application of the wrapper to meat must be done carefully. The diagonal placement on the sheet is the beginning of the common or butcher wrap method as shown in Fig. 5. Another is called the drug store wrap. This method uses a minimum of material and allows equally complete contact with the meat cut. The important part is selection of a good material and apply it with care.



Fig. 6.—Labeling the product, giving weight and date.

Labeling the Product.—Labeling should include the cutting and wrapping *date*, the *name* of the cut, and its weight.

FROM CHILL ROOM TO LOCKER STORAGE

Sharp Freezing.—Sharp freezing, which is sometimes referred to as quick freezing, implies the immediate exposure of meat packages to extremely low temperatures. Most locker plants maintain a small room or compartment with a temperature of -20° F. for this purpose. The freezing capacity of this room is important. Average size roasts should be reduced to zero temperature in an overnight exposure.

Locker Room Temperatures.—The completely frozen packages of meat are removed from the sharp freezer and transferred to the patron's locker, where the constant room temperature is held at 0° Fahrenheit. This temperature is accepted as the standard. Where a particular locker room is maintained at a higher temperature ($+10^{\circ}$ F.) there is good chance for satisfactory storage for a moderate length of time.

In the event that lower temperatures are available, the patron may be assured of adequate storage for a longer time.

Storage Time.—There is a wide variation in the length of time of freezer storage for meat products. Under low temperature and with optimum protection by the container or wrapping material, cuts of beef, lamb, and veal may be kept a year. Pork may be stored in similar conditions for a period of 3 to 6 months. All trimmings must be fresh and ground through a clean machine, then packaged with care to avoid sacrifice of the fresh flavor. Fresh ground pork may be seasoned for sausage to be used within a 3 months' period.



Fig. 7.—Freezer locker provides fresh fruit and vegetables for the farm home table the year around.

SPECIALTIES AND OTHER MEAT PRODUCTS

The use of certain meats known as specialties that are excellent sources of particular nutrients makes them popular for the locker. Liver, sweetbreads, heart, tongue, and similar items are preserved in more nearly their original fresh state by freezing than by any other method.

Occasionally, cured pork is prepared under many variable conditions, and there may be doubt about the preserving qualities of the cure. In this case, the cured items may be cut, wrapped, and frozen.

In some communities where game is plentiful or in the event that hunters acquire big game, it may be processed and stored in a locker.

It is recommended that the locker contents be used as rapidly as possible and that replenishment be planned in accordance with the quantity desired by the particular family. There is no economy in storing cuts that will outlive their original palatability and usefulness. These requirements apply similarly to home unit zero cabinets.

Preparing Poultry and Eggs for Freezer Storage

By

C. M. FERGUSON

Extension Poultry Husbandman, The Ohio State University



PREPARING POULTRY FOR LOCKER STORAGE

Only well finished poultry should be placed in freezer lockers. Fish oils should not be fed chickens for at least 2 weeks before killing, nor to turkeys for at least a month before slaughter. Otherwise, a fishy flavor may be present in the stored product.

Killing the Birds.—Use a pointed blade that tapers from a width of $\frac{1}{2}$ inch at the handle to a point. Hang the bird at a convenient height, and press the back of the blade lightly against the bones in the neck as the blade passes through the neck, severing the jugular vein (see Fig. 8).

This method insures rapid, thorough bleeding.

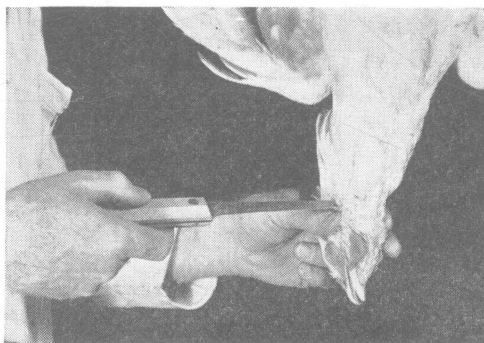


Fig. 8.

Scalding.—Slack scalding at 128° to 130° F. for 20 to 50 seconds, depending on the age of the bird, leaves the skin in good condition. Scalding at higher temperatures, 140° to 150° F., makes picking faster, but tends to leave the skin blotchy and less attractive.

Chilling.—Immediately after scalding, picking, and singeing, the birds are chilled in ice water, or in a chill room.

Preparation for Freezing (see Ohio Agricultural Extension Bulletin 263 for details):

BROILERS weighing up to 2 pounds alive may be split down the back, the back and keel removed, and the bird split in halves ready for the skillet (see Fig. 9).



Fig. 9.

FRYERS weighing from 2 to 3 pounds alive, may be further divided by cutting just back of the last rib, making four generous servings. Large fryers may be further cut up.

ROASTERS, young, soft-fleshed birds weighing 3½ pounds and over alive, are trussed ready for the oven. The crop is removed by splitting the skin on the back of the neck. The neck is removed and the skin is folded under the wing tips.

FOWLS, hens 1 year old or older, are cut up for fricassee. The thighs are separated from the legs, the back cut in two pieces, and the breast in two or three pieces, as desired.

Packaging.—Birds must be packaged in moisture and vapor proof wrappers, frozen in water or glazed to prevent drying out (freezer burn).

Cut up chicken can be packed in water-tight chicken boxes, covered with water, and frozen in a solid block of ice. This makes a convenient package easily prepared and effectively prevents drying out.

Moisture and vapor proof wrapping materials, which can be heat sealed, or wax-treated locker wrapping paper are satisfactory if the wrapping is carefully done to exclude the air. Use the drug store wrap.

Glazing is done by immersing the frozen bird in water at freezing temperature for 3 to 5 minutes. This deposits a layer of ice on the bird which will protect it from 3 to 6 months. The birds may then be wrapped in butcher paper to protect the glaze from chipping in the locker.

LOCKER STORAGE OF EGGS

Consumers may well consider breaking and freezing eggs during the spring season, to lower the year-round cost of this important food. While in commercial practice egg whites and yolks may be frozen separately as well as frozen mixed, it is likely that freezing the mixed whites and yolks is most desirable for the home consumer. If the whites and yolks are thoroughly mixed by stirring, it prevents undesirable coagulation of the yolk during storage. If separated whites and yolks are desired, the yolks should be thoroughly mixed before freezing.

Adding 1 tablespoon of corn syrup or of sugar, or 1 teaspoon of salt to each cup of liquid eggs gives added protection.

Mixed Eggs Packed in Cartons.—The mixed egg whites and yolks should be packaged in air-tight tins or wax paper containers that hold just enough eggs for a meal of scrambled eggs or the amount used in a single batch of cake, salad dressing, etc.

When removed from storage, the eggs should be thawed by placing the container in a pan of running water and all of the frozen eggs should be used promptly after they are thawed. One cup of mixed egg yolks and whites equals the volume of five whole eggs.

On the following pages (15 to 22) the preparation of vegetables and fruit for freezing storage is discussed. Suggestions on the cooking of frozen foods are given on pages 22 to 24.

Freezing Preservation of Vegetables and Fruits

By

H. D. BROWN

Department of Horticulture, The Ohio State University



PREPARATION FOR FREEZING THE PRODUCT

Blanching Vegetables.—Vegetables should be subjected to steam or boiling water for 1 to 7 minutes (blanched) in order to kill enzymes, which would produce undesirable odors and flavors and shorten the effective storage period. Blanching tends to intensify the color, and is one of the effective

means of cleaning the product, and of killing spoilage organisms. It softens the vegetable and makes it easier to pack.

An adequate supply of heat is essential to maintain the desired temperature when the vegetables are placed in the boiling water or steam. For vegetables, steam is being used more generally for blanching. This is especially true of greens and other vegetables prized for their mineral and vitamin B (complex) content. Minerals and the vitamins B and C are largely water soluble and partly lost, if water is used as a blanching agent. Retorts and even more elaborate equipment are used for blanching in commercial freezing plants.

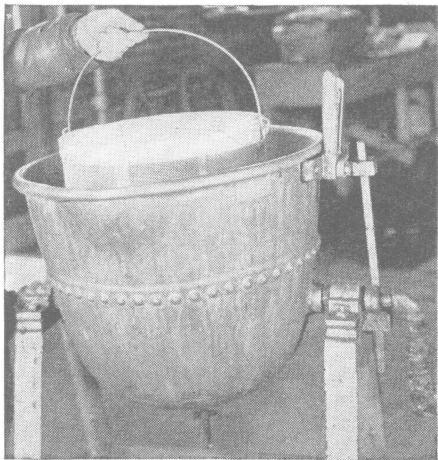


Fig. 10.—With a steam jacketed kettle and galvanized wire basket, a freezer locker plant blanches vegetables for customers.

commercial freezing plants. For home use, any loosely covered container with a false bottom can be used. In handling vegetables, a preliminary cooling following blanching is easily accomplished by dipping the blanched product first in clear, cool, running water, and then into a smaller quantity of ice water. Hard water, when used as a blanching and cooling agent, causes beans, peas, and asparagus to toughen in storage.

Exclusion of Air.—The exclusion of air is an important factor in the preservation of vegetables and fruits. (See paragraph under apples.) A $\frac{1}{2}$ to 1 percent salt solution (brine) is effective in excluding air from vegetables, and vegetables covered with brine are generally better colored, and better flavored, than those not so covered. However, excellent products are secured without the use of brine, so, it is commonly omitted because of the extra cost in freezing and the difficulty with leakage.

Sugar.—Sugar is effective for the exclusion of air from fruits. The sirup is more effective than the dry sugar. A 30 or 35 percent solution is generally used. The 30 percent solution is made by adding 30 pounds (68 cups) of

sugar to 70 pounds (35 quarts) of water, and a 35 percent solution is made by adding 35 pounds (79 cups) of sugar to 65 pounds (32½ quarts) of water. Higher concentrations can be used but a portion of the liquid remains unfrozen at zero temperature.

If the sugar is used dry, it should be distributed as uniformly as possible over the product in the proportion of 1 part of the finely granulated sugar to from 3 to 5 parts of fruit. *Sugar substitutes* can be used if the flavors are not objectionable. Corn sirup is most commonly used. It freezes at lower temperatures than sugar sirups. Mixtures of water and honey (half and half) are also used, if the taste of the honey is desired.

Containers.—There are many types of containers suitable for storage. Tin cans are probably best, if vacuum sealers can be used. This lessens slightly the oxidation process. The square cornered asparagus can is coming into use in the west for commercial packs. Oxygen can, however, be effectively excluded by covering the vegetables with brine, and fruit with sirup or sugar.

Square cornered paper cartons, lined with coated parchment, heat sealed plastics, cellophane, pliofilm, shellene, or other moisture-proof paper, are used most frequently. The square cartons and boxes occupy less space in storage. Friction or slip-on covers are satisfactory. Cans should be lined with fruit enamel for fruits, especially red fruits. Small duplex bags with moisture-proofed inside and substantial outside material and aluminum foil are coming into use.

If glass containers are used, one-tenth of the volume of the container should be left to allow for expansion. This is especially important for a liquid, such as cider. Glass containers are not used extensively in freezer lockers on account of breakage. A glass jar with flaring sides to facilitate the removal of frozen products is now on the market.

VEGETABLE VARIETIES AND PREPARATION

Asparagus.—Mary Washington is a relatively satisfactory variety. Asparagus deteriorates rapidly at high temperatures and low humidity and should be harvested, prepared, and frozen as quickly as possible. Use only high quality spears, clean, blanch in steam or boiling water for 2 to 3 minutes, chill quickly in fresh soft water, then in ice water, and pack and seal in airtight containers. Spears cut in short lengths (2 inch) pack more easily and are in greatest demand. If the spears are covered with a 2 percent brine the quality is retained longer. A storage temperature of 20 degrees below zero Fahrenheit is recommended. Ten pounds of fresh asparagus should yield 5 to 7 pounds of frozen product, if the spears are cut at the surface of the ground and are 8 to 10 inches long. The snapping method is excellent for determining the portion suitable for freezing.

Snap Beans.—Rival, Tenderpod, any of the Refugee types, and Giant Stringless Green Pod are excellent varieties for freezing. Burpee Stringless Green Pod, Pencil Pod Black Wax, Sure Crop Wax, Bountiful, and Round Pod Kidney Wax are satisfactory varieties. Full Measure and Black Valentine are not satisfactory.

The tender, crisp beans should be snapped, washed, snapped to desirable sizes, and blanched for 2 to 4 minutes, depending on their size. Cool and pack as indicated for asparagus.

Lima Beans and Soybeans.—Baby Fordhook, Concentrated Fordhook, Fordhook 242, and King of the Garden (pole) are very good varieties for freezing. Fordhook is good and Henderson is only fair for freezing. They should be harvested while young and tender, shelled, blanched for 2 to 3 minutes, cooled and packed. Edible soybeans are treated much the same as lima beans.

Viners can be used for shelling the small and large limas on a commercial scale. Clothes wringers, with iron cylinders substituted for the rubber cylinders, are useful on a small scale for shelling the larger limas. Edible soybeans should be treated with steam before placing the pods in the shelling machines. Lima beans in the pods can also be blanched to facilitate shelling.

Sweet Corn.—The varieties Bantam Evergreen, Top Cross Bantam, Golden Cross Bantam, Golden Hybrid, Marcross, Lee, Whipples Early Yellow, Golden Sunshine, Narrow Grain Evergreen, Charlevoix-Ferry Gold, and Ohio Gold are excellent for freezing. Satisfactory varieties include Early Evergreen, Country Gentleman, Kingscrot, Spancross, and Ioana.

Corn may be frozen on or off the cob. In tests conducted at the Ohio State University, it was found that the corn retained its flavor much better when cut from the cob, especially in the milk stage, however, corn in the cream stage can be frozen successfully on the cob.

Corn on the cob should be blanched 6 to 8 minutes. Corn cut from the cob needs to be blanched for only 3 to 4 minutes. Blanch before cutting from the cob. If the corn is to be cut from the cob, it should be harvested in the milk stage and frozen as quickly as possible, as it loses its quality quickly upon exposure to high temperatures. Corn cutting machines used for preparing whole grain corn are necessary for the economical cutting of corn from the cob. For small scale operations, the corn may be cut with a convenient knife but the cob is not scraped. A small, hand operated corn cutting machine is available for small scale operations.

Cantaloupes.—Cut fresh in form of balls from firm fruits, picked full slip (with none of the stem attached to the fruit) from healthy vines. Pack in moisture-proofed packages and dry freeze. Do not blanch. Watermelons can be frozen in the same manner.

Eggplant.—Slice unpeeled eggplant as for frying, drop into cold water containing 3 teaspoons of lemon juice per quart. Blanch for 4½ minutes; cool and dip in lemon juice and water solution for 3 minutes, drain, pack, and freeze.

Carrots, Beets, Parsnips, and Turnips.—Clean, peel, dice, and blanch for 2 to 3 minutes in steam; cool and pack without brine. Blanching with water removes much of the sugar content of the products. Nantes, Chantenay, and Tendersweet carrots; Edmond's Blood, Detroit Dark Red, and Ohio Canner beets; Hollow Crown parsnips; and Purple Top Glibe turnips are recommended.

Mushrooms.—Select buttons of white or tan cultivated varieties. Clean with care, and avoid bruising. Blanch from 2 to 4 minutes, depending on size; cool rapidly and dry pack.

Rhubarb and Rhubarb Juices.—Use varieties with dark red stems free from fibers. McDonald is an excellent variety. Enzymes are not active in the stalks, but are very active in leaves, hence the leaves must be removed. The stems (petioles) need not be blanched. Pack in 40 to 50 percent sugar solution or use sugar 1 pound to 4 or 5 pounds of rhubarb. Extracted juice should be sweetened to suit individual taste and packed in suitable containers. A 10-second blanch will diffuse the color and still preserve the shape of the petioles.

Broccoli.—Italian Green Sprouting is used extensively. Trim into small pieces, wash, examine carefully and remove dirt and insects, blanch 3 to 5 minutes in steam, cool, and package.

Succotash.—Frozen succotash is a very desirable product. Combine corn and lima beans at the measured proportions of 2 to 1 or 1 to 1. A mixture of Golden Bantam corn and Fordhook lima beans is attractive and of excellent quality. Both vegetables should be prepared as already indicated, blanched, cooled, mixed, and placed in the containers and then frozen. It is likely that the varieties best suited for freezing will all make good succotash.

Peas.—Thomas Laxton is an excellent variety. Alderman, Improved Gradus, Dark Podded Telephone, Dark Podded Thomas Laxton, Laxton's Superb, and Onward are suitable varieties. Alaska, Wisconsin Early Sweet, Dwarf Telephone, and Champion of England are unsuitable for freezing. The peas should be picked when tender, succulent, and sweet, then shelled, washed, blanched for 1 to 2 minutes, depending on size, cooled, and packed with or without a 2 percent brine. For large scale operations, a regular viner is used for shelling the peas. For semi-commercial freezing, the peas can be shelled from the pods by a small pea huller. Shelling peas by hand is tedious and costly. Ten pounds of peas in pods yield about 4 pounds frozen peas.

Squash and Pumpkin.—Select well matured Golden Delicious or Hubbard squash. Wash carefully. Cut into small pieces and blanch until soft (10 pounds pressure 5 to 10 minutes). Scoop from rind or run through cyclone or colander, package, and freeze. All ingredients for pie except milk may be added before freezing. Some even make the pies and freeze.

Spinach.—Succulent spinach (Savoy types rather than smooth leaved types) entirely free from seed stalks can be frozen very satisfactorily. King of Denmark, Long Standing Bloomsdale, Old Dominion, and Giant Noble are recommended. It should be well washed to remove sand and grit, blanched for 2 to 3 minutes, cooled, drained, and packed without brine or added liquid. *Swiss chard and similar greens are treated the same as spinach.* If the spinach leaves are cut off about 2 inches above the crown the leaves will fall apart, washing will be facilitated and the undesirable stem will be eliminated. This trimming causes a loss of approximately 30 per cent.

Cauliflower.—Use any white solid head (curd) and proceed as for broccoli.

VARIETIES OF FRUITS AND THEIR PREPARATION

Blackberries.—Eldorado is a satisfactory variety. Pick fully mature berries which have little or no astringency. Frequent picking is needed to harvest fully ripe berries. Immature berries, even if black, turn reddish brown when frozen and are not attractive. Fully ripe berries have plump drupelets with a velvety skin rather than shiny black.

Handle and pack without delay. For dessert use, wash, sort, and pack with 30 to 50 percent sirup. If preparing for culinary use, such as pies or jam making, pack with 4 parts berries to 1 part sugar. Paraffined containers, fruit enamel lined tin cans, or any reasonably airtight containers are satisfactory.

Black Raspberries.—Logan, Cumberland, and Bristol are satisfactory varieties.

Frozen black raspberries are not very desirable for dessert purposes, because of the excessive amount of seeds. Where well grown and harvested when fully ripe, frozen black raspberries are useful for pies, preserves, or juice making. Handle promptly after picking. Wash, sort, and drain well. Pack in 30 to 50 percent sirup or use 3 to 4 parts of fruit to 1 part of sugar by weight. Use containers as suggested for blackberries.

Red Raspberries.—Latham, Milton, and Taylor are acceptable varieties. Firm, ripe red fruit preserved by freezing makes an excellent product for dessert or for culinary use. Handle promptly after picking. If berries are dirty, wash and drain thoroughly, but unnecessary handling should be avoided. For dessert pack, use 30 to 50 percent sirup. For culinary purposes, sugar pack as recommended for black raspberries. Use containers as suggested for blackberries. Do not shake down or pack tightly as this causes collapse of the berries.

Purple Raspberries.—The Sodus and Marion varieties make a very acceptable frozen product.

Strawberries.—Dorset, Robinson, Premier, Catskill, Blackmore, Midland, and Sparkle are satisfactory for freezing.

Strawberries are the most popular berries for freezing. For best quality, harvest when full red color indicates that proper maturity has been attained. Prepare berries as soon after picking as possible to prevent loss of flavor and damage from mold and deterioration. Hull, sort, and wash thoroughly, handle carefully. Berries may be frozen either whole or cut into slices about an eighth of an inch in thickness.

For dessert use, pack in 40 percent sirup. For sugar pack, use 3 to 4 weights of berries to 1 weight of sugar, adding as evenly as possible until container is filled. The sugar pack is satisfactory for sliced berries. Use containers as suggested for blackberries.

Sour Cherries.—Montmorency is a very satisfactory variety for freezing. Harvest when full uniform maturity has been reached with bright red color, fairly firm texture, and sprightly acid flavor. Over-ripe cherries become too dark, and immature cherries are too pale in color and lack eating quality.

Stem, sort, wash, and chill in cold water to firm the cherries for pitting. For pies or preserves, a sugar pack is desirable with 3 to 4 parts of pitted fruit by weight to 1 part of sugar, well distributed throughout the mass of cherries. Usually, enough juice is present to dissolve the sugar and produce adequate sirup to prevent fruit from discoloring. A 40 to 50 percent sugar sirup may be added to cover the surface of the cherries in the container and prevent darkening. A sirup pack with 50 to 60 percent sugar solution is excellent for dessert but rather juicy for pies. The juice may be used for jelly making.

Paraffined containers can be used for sugar packs and enameled tin cans for cherries packed in sirup. Cherry pitting machines are essential for economical preparation of large quantities of fruit.

Sweet Cherries.—Firm dark fleshed varieties such as Schmidt and Windsor are preferred for freezing. Lightly colored varieties such as Napoleon (Royal Ann) and Emperor Francis are satisfactory but may show some browning. The softer fleshed heart type cherries such as Black Tartarian are less satisfactory for freezing.

Pick when fully tree ripened and prepare as suggested for sour cherries except that they may or may not be pitted according to choice. For dessert use, a pack in 40 per cent sirup is preferable.

Grapes.—A number of varieties are satisfactory for freezing, of which Concord is very suitable. Pick when fully ripened, stem, wash, sort carefully, pack in a 40 per cent sirup in enamel lined tin cans. Seal tightly and freeze.

Peaches.—A number of freestone varieties are suitable for freezing. Among yellow freestone varieties, J. H. Hale, Elberta, Shippers Late Red, South Haven, Halehaven, and Golden Jubilee, are satisfactory. White fleshed varieties such as Belle of Georgia and Champion are apt to darken objectionably unless sliced into cold sirup containing ascorbic acid. Clingstone varieties are not yet recommended for frozen packs.

Select firm, tree ripened fruits. Over-ripe peaches become too mushy and are not attractive for dessert use. Immature fruits will still be immature after freezing and storage. Immerse peaches in boiling water or subject to steam for 1 to 3 minutes, just sufficient to loosen the skins. Drop in cold water, peel and halve, pit, and slice each half in five or six longitudinal pieces into a 40 to 50 percent sirup. Cut peaches darken readily and a number of treatments may be given the freshly sliced pieces to prevent discoloration. One method is to slice into a $\frac{1}{2}$ to $\frac{7}{10}$ percent citric acid solution (juice of one small lemon per gallon of sirup), then drain and pack within a few minutes into the sirup.

Another method is to place the peaches in a sirup containing 3 level teaspoons of crystalline ascorbic acid to a gallon of sirup. Sirup is cooled to room temperature or lower before adding the ascorbic acid, to prevent its oxidation. A combination of ascorbic acid and citric acid in quantities indicated above is the best treatment for the prevention of discoloration. Peaches can also be treated with sodium meta-bi-sulphide, as described for apples. Pack in airtight containers, such as sealed cellophane lined cardboard or lacquered tin cans.

The sugar pack and the freezing of whole peaches are not recommended. Thaw in unopened container; use promptly and completely after thawing. Directions for freezing peaches are also applicable for apricots.

Apples.—Though apples keep well in cool storages, it is often desired to freeze some apples in ready-to-use form, chiefly for pies and culinary uses. A number of varieties are satisfactory, including Jonathan, Stayman Wine-sap, Baldwin, Stark, Rhode Island Greening, Northern Spy, Rome Beauty, Golden Delicious, and Grimes Golden.

Select firm, ripe apples at a stage of maturity and flavor suitable for table use. Peel, core, and slice longitudinally into eighths or twelfths. Slicing into a 2 percent brine solution will prevent darkening during preparation but not after fruit has thawed. Drain thoroughly and pack immediately. A still better method is to scald the slices in steam at a temperature of 205 degrees to 210 degrees F. for 2 minutes to inactivate the oxidation enzymes; then cool rapidly, drain well, and pack in tight containers. If packed in tins, use lacquered cans. Slices scalded in steam remain permanently fresh in color. Freezing of whole apples is not recommended.

One of the best ways to prepare apples for freezing at home or commercially is to peel, then cut the apples into approximately 12 equal portions and treat with a sodium meta-bi-sulfide solution for at least 1 minute and not to exceed 5 minutes. The correct concentration can be obtained by adding 1 to 2 teaspoonfuls (.6 oz.) of sodium meta-bi-sulfide to a gallon of water or 5.7 ounces to 10 gallons (2,000 to 3,000 parts per million or 0.2 to 0.3 percent).

The thinly sliced apples can be conveniently dipped in the solution in wicker baskets. Allow the apples to stand about 2 hours after the treatment before they are placed in the freezer. This allows sufficient time for the solution to completely penetrate the tissues. Pack in cellophane lined containers, as the solution will attack tin. Some people object to the taste of sulfur. Its use for commercial packs is not legal in Pennsylvania. Calcium chloride added at the rate of 1 level teaspoonful per gallon (1 percent) will firm the tissue. The use of calcium chloride has been legalized for tomatoes but not for apples. A small metal suction pump, properly attached to a water faucet, can be used to draw the air out of apple slices, submerged in a sirup, ascorbic acid, calcium chloride solution, in an airtight container. It requires about 10 minutes to evacuate the air and a similar interval should be allowed while the slices are still submerged in order to allow the solution to replace the air. Apples so treated are far superior in flavor and keep longer than those treated in any other manner now available. Similar procedures can be used for other fruits. Retorts and special equipment are used commercially. Some processes are patented.

Apple Cider.—Frozen apple cider is an excellent product. In tests conducted at Columbus, Ohio, filtered and unfiltered cider has been kept for 6 months at zero degree F. with no appreciable loss in flavor. The cider was placed in 1 gallon paraffined cylindrical paper cartons with a 2-inch space left at the top to provide for expansion.

Plums.—Firm fleshed varieties with high sugar content are preferred for freezing. Select fully tree ripened fruit, but harvest before any browning of the flesh develops around the seed. Wash, halve, and pit the fruit. Peel or not as desired and pack in 50 per cent sirup. Completely airtight containers are not necessary. Stanley, Italian Prune, Imperial Epineuse, and Danison are recommended varieties.

Use After Freezing.—All fruits and vegetables should be used as quickly as possible after thawing. Unfrozen products deteriorate rapidly.



Frozen Food Cookery

Revised by

ALMA L. GARVIN

Extension Nutritionist, The Ohio State University

Enjoyment and economical use of frozen foods depends not only on correct handling before freezing and during storage, but on correct preparation after freezing.

Frozen foods are perishable when thawed and do not keep as well as the fresh foods. However, they may be kept frozen satisfactorily for several days in the freezing compartment in a mechanical refrigerator. When frozen fruits and vegetables are thawed, they tend to become flabby and lose flavor.

FROZEN VEGETABLES

All vegetables, excepting corn on the cob, should be cooked while still in the frozen state. Only a small amount of water should be used and should be brought to a rapid boil before vegetables are added. It is advisable to break up the frozen block of vegetables before putting into the boiling water. If not, the vegetables on the outside of block will be overcooked, and those on the inside undercooked. Care should be taken not to overcook frozen vegetables. Freezing softens the fiber, and it takes only about one-half as long to cook them as for the fresh product. Use liquid in which the vegetable was cooked either with the vegetable or in soup or gravy.

It is difficult to give the exact time for cooking vegetables, because it depends on so many factors, but some average figures are:

| | |
|------------------------------------|-------------------------------------|
| Asparagus (spears) 5 to 8 minutes | Beans, Green . . . 10 to 15 minutes |
| Asparagus (pieces) 3 to 4 minutes | Beans, Lima . . . 15 to 20 minutes |
| Broccoli 4 to 10 minutes | Peas 5 to 8 minutes |
| Corn 3 to 5 minutes | Spinach 4 to 6 minutes |

The length of time frozen vegetables may be kept before cooking depends on the conditions under which they are kept. Following are approximate times vegetables will stand before thawing.

| | |
|-----------------------------------|---|
| Room temperature . . 4 to 6 hours | Mechanical refrigeration . 12 to 36 hours |
| Ice box 12 to 24 hours | Ice cube compartment . . . 3 to 7 days |

Locker patrons might be interested in these figures when planning to take out vegetables for a week's supply.

FROZEN FRUITS

Fruits that have been properly prepared for freezing need no further preparation. Fruits are best served when there is still a small amount of ice left in the tissues. Therefore, they should not be allowed to stand long after thawing, as they will become discolored and mushy.

Fruit may be thawed in any one of the following ways:

| | |
|--------------------------------|----------------|
| Room temperature | 2 to 4 hours |
| Ice box | 8 to 10 hours |
| Mechanical refrigeration | 12 to 18 hours |
| Ice cube compartment | 2 to 3 days |

Fruits should be thawed in the unopened container. If the fruits have been packed in leak-proof containers, it is advisable to invert the container while thawing. This gives the fruit a more uniform color and flavor. Fruits darken and lose their flavor soon after they are removed from container. So, they should be used immediately. If frozen fruits are to be used in cooking, such as pies, they may be used without thawing.

FROZEN MEATS

Use the best method of preparation for the kind and cut of meat. A low temperature is best for all methods of cooking meats. Frozen meats may be put on to cook without previous thawing, but usually, roasts are partially thawed before cooking is begun. If the meat is not thawed, allow extra time for cooking. In general, allow 10 to 15 minutes longer per pound for steaks, and 15 to 20 minutes longer per pound for roasts.

The use of a meat thermometer is the only exact means of knowing when a roast is done. To insert a thermometer in frozen meat, make a hole with a stout ice pick. Chill thermometer before inserting it into the hole to prevent its breaking.

When the thermometer indicates the degree of doneness desired for the particular kind of meat, the roast should be removed from the oven. Overcooking should be avoided.

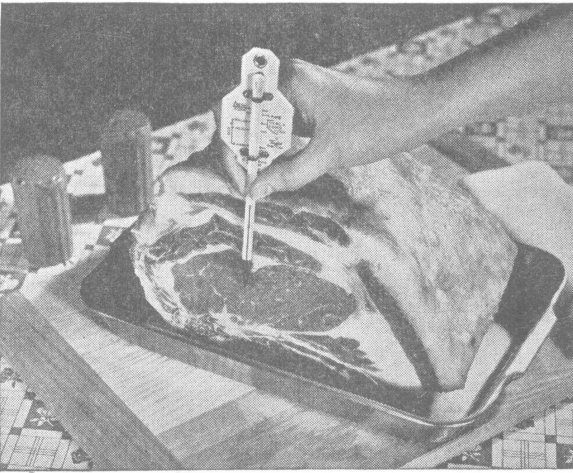


Fig. 11.—Measure distance to center of the largest muscle in order to know how far to insert the thermometer into the roast.

COOKING FROZEN POULTRY

Upon removal from storage, the birds should be kept frozen until just before cooking. Cut up poultry can be thawed by placing in running water. Roasters and turkeys must be sufficiently thawed to permit stuffing. Complete thawing is not necessary before the birds go into the oven. Poultry then may be cooked in the same manner as freshly killed birds. Broilers may be started to broil or fry while partially frozen.

Low temperatures and high humidities preserve the fresh surface appearance of poultry.

Poultry is prepared according to methods given for meat. That is, if roasted, use a low temperature, add no liquid, and do not cover. If it is to be stewed, keep it just below the boiling point and cover the utensil.

FOOD VALUE OF FROZEN FOODS

Frozen foods retain their food value the same as fresh foods.

Vitamin A is practically all retained in fruits and vegetables during processing and freezing.

Vitamins B, C, and G are water soluble and tend to suffer some loss during the blanching and cooling of vegetables before freezing and in the leakage or drip after defrosting.

Vitamin C of cooked frozen or fresh foods is about the same. Vitamin C of fruits is well retained since fruits are not blanched, but vegetables lose variable amounts.

Thus we see if we follow best methods of thawing and serving fruits and in cooking vegetables we will prevent a great deal of the loss of food nutrients.