

MEAT

Meat is considered to be the most important protein food of all. As it is fast becoming a luxury item, some knowledge of the various cuts of meat and methods of cooking and storing them is essential if one is to get good value for money. The term meat covers *carcase meat* -beef, mutton, lamb, pork and bacon; *poultry* - chicken, turkey, duck and goose; and game animals and birds.

Nutritive Value

Protein. Meat is rich in high-biological-value protein. The main protein is myosin, but albumin and globulin are also present and the connective tissue contains the proteins collagen and elastin,

Fat. All meat, even the leanest cuts, contains some fat. The amount of fat present in meat depends partly on the animal (chicken, for instance, contains relatively little fat) and partly on the type of cut (streaky bacon will have a higher percentage of fat than gammon).

Carbohydrate. There are no carbohydrates in carcase meat. There is some glycogen in liver but this changes to lactic acid after slaughter.

Vitamins. Meat is a good source of B group vitamins thiamine, riboflavin and niacin; liver, kidney and pork are particularly good sources. Liver is rich in vitamin A and suet contains some vitamin D. Vitamin C is lacking in all meat although there are traces in fresh liver.

Mineral elements. Meat contains iron; liver and kidney are a good source of this. There are small amounts of sulphur in most meats and offal is rich in phosphorus. Calcium is lacking in all meat except tripe, which is a good source owing to the use of lime in its preparation.

Water. Most meat is about 70 per cent water, although the proportion in fatty cuts is less.

Extractives. These are natural flavorings present in the tissue of meat, which dissolve into the cooking liquid or fat and give meat its characteristic succulent flavor. They stimulate the flow of digestive juices and are said to increase the metabolic rate.

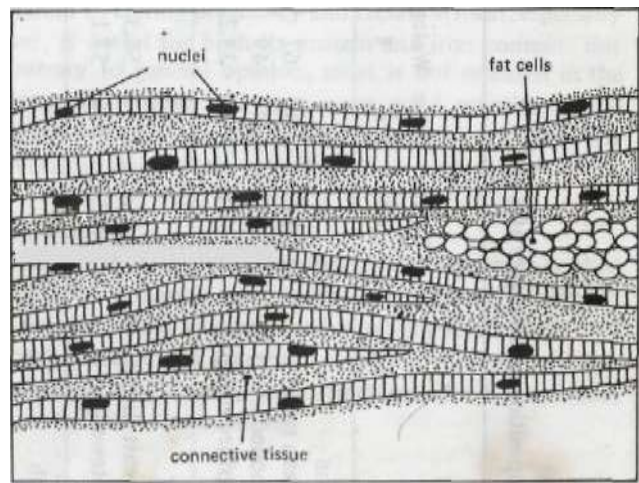
Structure

Lean meat or muscle tissue is composed of bundles of very tiny fibers or cells which contain protein, mineral salts and extractives dissolved in water. Each fiber is surrounded by a wall of

elastin, a tough connective tissue which is also found in arteries and tendons. The bundles of fibers are held together with collagen, another form of connective tissue which also encases the muscle and anchors it to the bone.

Connective tissue. This is a fibrous protein which is insoluble in cold water. Collagen changes to **gelatin** when subjected to moist heat, and this dissolves in water making the meat tender. Elastin contracts with heat, squeezing out some meat juices and causing the meat to shrink.

Fat. Fat cells are distributed between the fibers; there are more of them in some meats than others, e.g. pork contains many more than chicken. Good quality beef contains visible amounts of fat among the muscle fibers, and this fat is called marbling. Fat is also present on the outer surface of the animal as adipose tissue. As the animal ages there is a build-up of fat. This is why it is uneconomical to buy meat from an old animal.



Tender Versus Tough Meat

1. *Age.* Meat from an old animal is generally tough because there is a greater amount of connective tissue and there are larger muscle fibers and more gristle. Meat from a young animal has short, fine fibers which have less connective tissue holding them together and little gristle.
2. *Activity.* When muscle is very active, the fibers become longer and thicker and connective tissue builds up to hold these large fibers together. When a muscle is rarely used, the fibers stay short and little connective tissue is present. This explains why in the same animal neck or leg beef is always tough whereas fillet is very tender.
3. *Hanging.* Correct hanging can do much to improve the tenderness of meat. After slaughter the protein myosin sets in rigor mortis, making the meat very tough. Gradually muscle glycogen is converted into lactic acid (glycolysis) which softens the meat, assisted by proteolytic (protein-splitting) enzymes present in the meat. Before slaughter it is essential that animals are rested and they should not struggle during slaughter as this will use up the stores of glycogen present, making the meat tough and reducing its keeping qualities.

Tenderizing

This can be done

- a. *Before slaughter* by injecting tenderizing enzymes into the live animal.
- b. *Mechanically.* Processed meat and meat for caterers is sometimes tenderized with a machine which pierces the meat with thin knives or needles. These break the fibers but release juices, nutrients and flavor. Smaller quantities of meat can be tenderized if they are pounded with a heavy object such as a steak hammer or rolling pin before cooking.
- c. *Chemically,* by sprinkling tenderizing chemicals over the meat or steeping the meat in a solution of them.
Most of the chemicals contain proteolytic enzymes, e.g. papain (an extract from the paw-paw tree), which help to soften the fibers and are available commercially.
- d. *In cooking,* by using moist, slow methods such as stewing.

Dietetic Value

Meat is especially important in the diet of children, adolescents and adults for the animal protein it contains. Its excellent nutritive value makes it suitable for all diets, for it provides every nutrient except carbohydrate and vitamin C. During pregnancy and lactation meat, especially liver, is useful for both its protein and iron content. But contrary to general opinion, meat is not essential in the diet; fish, cheese and eggs make good substitutes and vegetarians can live products at all.

Digestibility

Meat can be digested raw, but it is usually eaten cooked so that pathogenic organisms are destroyed and the appearance and flavor are improved. Cooking develops flavors which increase the secretion of digestive juices, and also makes the tough connective tissue digestible. Stewed meat is particularly easy to digest.

Meat Production

Animals are born and bred on farms, many of which specialize in rearing one type of animal. The animals are sold at auctions or livestock marts which take place regularly around the country. There is no longer a centralized 'cattle market'. Those sold for slaughter are transported carefully to the abattoir or meat plant. Care is taken to keep stress to a minimum as, apart from humane considerations, animals lose weight and the quality of the carcass deteriorates if they are frightened.

Slaughter The carcass is graded, split in two and quickly chilled to approximately 5°C to retard the growth of bacteria. It is sold in halves or, in case of beef, quarters, to the retailer, who hangs it for the required time.

Hanging. Times vary according to the weather and the temperature of the storage area.

Beef	7—10 days
Mutton/lamb	2—7 days
Pork'	2—3 days
Poultry	1 day
Ducks	1 1/2—1 days
Turkeys	4 days
Game	until 'high' ¹ — usually several days.

Processing

1. *Vacuum packing.* Much of the meat sold in goes to meat plants where it is vacuum packed in bone less cuts for the wholesale or export market. These keep about three weeks stored at 0°C.
2. *Freezing.* Some is boned, trimmed, packed and blast frozen at minus 30°C. Ready-prepared meals such as hamburgers, curries and meat slices in gravy are also frozen and packed in boxes for retail sale. Meat freezes well if quickly frozen and few nutrients are lost, although there is some loss of B vitamins and juices during thawing.
3. *Canning.* Corned beef, ham, tongue and stewed meat are available canned. Some B vitamins are lost through heat processing and

the texture often becomes over-soft and stringy.

4. *Drying.* Once the only method of preserving meat, it is rarely used now except when meat is accelerated freeze dried (see p. 139). Meat is chopped and used in AFD soups and ready-prepared ‘packet’ meals. Once reconstituted it must be used up quickly.

5. *Curing.* Before refrigeration came into use, meat was heavily salted in order to preserve it. It is now possible to use milder cures which are less salty and have a better flavor. Bacon is the cured flesh of a specially bred pig.

Sides of the carcass are injected with a solution of preserving salts such as sodium nitrate and potassium nitrate (saltpetres), and subsequently soaked in a solution of brine for about four days. They are then hung in a chilled room to mature for about six days. If smoked bacon is required the meat is subjected to smoke fumes for two to three days. Smoked meats include bacon, ham and sausages such as salami.

Ham. The best hind legs from bacon sides are used to make ham. They are cut off before curing and the rest of the side is cured separately. Ham cures vary.

Corned beef. This is fresh beef which has been soaked in brine in much the same way as bacon. The saltpetre used gives its flesh a bright pink color when cooked. Usual cuts are brisket, tail end or silverside.

Spiced beef. Brisket or silverside is steeped in a dry marinade of salt, saltpetre, brown sugar, spices and herbs, which are rubbed into the joint each day for ten days. *Note:* Smoking and salting preserve the meat by slowing down enzyme action and preventing the multiplication of bacteria. This is why cured meats keep longer than fresh meat.

Sausages. The food value of sausages varies. They can contain 4—14 per cent protein and 20—30 per cent fat. Sausages may be made from the lean and fat of beef or pork. After these have been minced, cereals and seasonings are added and the sausage meat is filled into synthetic casings. Continental sausages include frankfurters, Blutwurst, salami and French garlic sausage.

Meat Hygiene

Meat of all types is particularly susceptible to bacterial contamination. Care should be taken at every stage of handling to eliminate the risk of food poisoning.

During production

1. The animal should be tested for disease before slaughter.
2. After slaughter the carcass should be checked for infection from parasites and pathogenic bacteria.
3. Strict hygiene must be observed at all stages of production as one infected animal could contaminate several carcasses. All machinery, knives and surfaces should be disinfected regularly and workers should keep their

hands clean and wear protective clothing.

4. Raw and cooked meat must never be prepared together because of the risk of salmonella poisoning.
5. Temperatures should be low enough to prevent multiplication of bacteria.

At the butcher

1. The shop should be clean and hygienic.
2. Assistants should not handle both meat and money. This is all the more dangerous if the meat is already cooked, as there will be no further process to destroy bacteria.
3. Raw and cooked meat should not be sold, handled or prepared together.

At home

1. Remove wrapping. Keep fresh meat covered, but not airtight, in a cool place, e.g. directly under the ice box in a refrigerator. Bacon should be stored in an airtight

container.

2. The length of time meat should be stored depends on how fresh it was when purchased and the storage facilities available. Most fresh meat should be eaten within two days, but mince and offal should be eaten on the day of purchase.
3. Meat should be removed from the refrigerator at least half an hour before cooking to bring it to room temperature. Cooked meat should also be at room temperature before it is eaten.
4. Cook meat thoroughly, especially pork and mince meats. Bacteria may reach the surfaces of meat during handling, but normal cooking will destroy them. When meat is minced or chopped, however, the bacteria are spread all through it. This means it must be cooked long enough for the heat to penetrate to the very centre of the dish and destroy all bacteria.
5. Avoid keeping meat dishes warm; germs thrive in a warm environment. Avoid cooling boiled meat in its own liquor. Cool leftovers quickly, keep in refrigerator and use as soon as possible.

Frozen Meat

1. Thaw large joints before cooking.
2. Thaw all poultry completely, chickens for 12-24 hours; turkeys for 24-48 hours. If a partly frozen bird is cooked for the normal time, the inside (often a source of

salmonella bacteria) will not reach a sufficiently high temperature for the bacteria to be destroyed. Eating a badly contaminated chicken could be *fatal*.

3. Never refreeze frozen meat or poultry which has thawed out unless it has been cooked in the meantime.
4. Frozen meat should be used quickly 'after thawing as any bacteria present before freezing will start to multiply again.

Choice of Meat

The butcher cuts and joints the carcass. Unpopular cuts are sold cheaply and money lost on these joints will be made up by selling popular cuts at a higher price. As preferences vary from one area to another, prices for the same cut may vary too.

Buying Meat

1. Buy meat from a butcher who sells fresh but well-hung meat.
2. The shop should be kept in a hygienic condition with refrigerated storage.
3. Know the cuts of meat and choose one suitable to the proposed method of cooking. Do not forget that the cheaper cuts are just as nutritious as expensive cuts and the flavor is equally good.
4. Choose meat with a small proportion of bone, fat and gristle.
5. The meat should not have an unpleasant smell, should be moist and should have a good characteristic color.

Do not be persuaded to buy unsuitable meat. Many butchers cut up too much meat for display and some of it becomes dark and dried up. Insist on freshly cut meat if necessary and ask to see both sides of a joint.

6. Ask for bones and suet to make stock and dripping. Most butchers make no charge for these if the customer is also buying meat.

Effects of Heat on Meat

1. Protein coagulates; it toughens if cooked too quickly.
2. Elastin contracts and water evaporates, causing meat to shrink and juices to escape.
3. Collagen changes to soluble gelatin upon moist cooking.
4. Hemoglobin turns brown, giving a cooked appearance.
5. Fat decomposes and melts away.
6. Bacteria and parasites are destroyed at high temperatures and decomposition is delayed.
7. Meat becomes tender and digestible.
8. Extractives are released producing appetizing odours and flavors and some B vitamins and minerals pass into meat juice.

OFFALS.

This term includes all the edible internal organs of an animal. Structure and nutritive value vary but most organs are a good source of protein, iron and B vitamins. Offal is not hung and should be eaten fresh, preferably on the day of purchase. It is generally cheaper than carcass meat and there is little waste. The flesh should be firm with no unpleasant smell. Wash well in tepid water and cut away vessels and tough parts. Dry in kitchen paper.

Liver. Rich in protein, iron, vitamin A with some vitamin C and a little fat. Lambs' liver is the tenderest. Pigs' and calves' liver have a stronger flavor. Ox liver is the most nourishing and cheapest, but tends to be strong-flavored and coarse-textured.

Kidney. Contains protein, iron, vitamins A and B. It should be very fresh, firm and plump. Lambs' or sheep's kidney should be surrounded by suet. Remove white core and membrane before washing and cooking. Ox kidney is strong-flavored and much larger than sheep's kidney.

Heart. A strong muscular organ with little fat. It is inclined to be tough unless cooked very carefully. Rich in protein and B vitamins. Trim well, cut central division, wash, and soak for 2-4 hours.

Tongue. Contains protein and fat in equal amounts. Rich in calcium and vitamin B. May be

fresh or salted.

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Sweetbreads. Usually the pancreas and thymus gland of animals. They are whitish, easily digested and therefore very useful in the diet of invalids and convalescents. They are sold in pairs and must be very fresh. Ox sweetbreads are cheapest but not as tender as those from calves and lambs. Soak in cold water before use, blanch, and then remove fat.

Brains. Contain very little protein and considerable amounts of fat. Freshness is essential. Calves' and lambs' are most suitable for cooking and are usually deep-fried.

Tripe. The lining of the stomach of an ox, cleaned and partially cooked by the butcher. It is rich in the protein collagen, which changes to gelatin during cooking, and calcium from the salts used in its preparation. Varieties include honeycomb, blanket and monk's head. It is easy to digest but needs thorough cooking in a well flavored sauce.

Oxtail. Very bony. Good flavor. Used for soups and stews.

Feet. Calves' feet used for invalid jelly; pigs' feet boiled.

GELATINE

Gelatin is a protein food obtained from the collagen of animals. It is transparent, tasteless and odorless and, as it sets liquid it is used to make jelly, ice cream and other sweets. Powdered gelatin is manufactured from the bone, skin and hooves of animals. The collagen is converted to gelatin by simmering it in water: this is an example of hydrolysis. After purifying, the gelatin is concentrated and dried in granular form.

Gelatin forms a gel at low temperatures and dissolves at higher temperatures, but it must never be boiled as this reduces its setting properties.

Types

Powdered. Available in 15 g envelopes. *Leaf gelatin.* Sold in sheets. It is not easily available now, nor is it as convenient as powdered gelatin.

Isinglass. Obtained from the sturgeon and is expensive. It is sometimes used in wine-making.

Agar agar. Obtained from seaweed and not true gelatin. It is useful in vegetarian cooking and is used in laboratories for the culture of micro-organisms.

Aspic jelly. A form of gelatin made from meat stock and used in savory dishes.

Nutritive Value

Although a protein, gelatin is of little nutritive value because it lacks many essential amino

acids, particularly tryptophan. As it is used in very small quantities, it forms an insignificant percentage of total protein intake; nevertheless, if used in conjunction with cereals or high protein foods, it forms a useful supplement to the diet. Gelatin is useful in invalid and convalescent diets as it is very easily digested.

Rules for Using Gelatin

1. Use in correct proportion; 15 g to 500ml of liquid is the usual combination, but more gelatin may be necessary in hot weather or when a quick set is required. Too much gives an unpleasant flavor and too stiff a consistency, while too little fails to set.
2. Soak gelatin in a little-of the cold measured liquid for 10 minutes before use, then dissolve it by placing the bowl in a saucepan of hot water and stirring.
3. Use at once. Pour gradually, in a thin stream, into the prepared ingredients stirring all the time. If it is added too quickly, the gelatin will set in lumps.
4. When it is cold and starting to thicken, pour into a wet mould. To speed up setting, place the mould on ice cubes or in cold water.
5. Allow to set in a cold place overnight or in a refrigerator for 1—2 hours. Prolonged refrigeration will make the food dry and leathery.

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