FAQs

1. What is pasteurization?

Pasteurization refers to moderate heating in the temperature range of 58 – 75 ºC whereby most of the microorganisms present are killed or inactivated. This is also the cooking temperature range of most processed meats. Pasteurization significantly extends the shelf life of meat although such products also need to be stored under refrigeration.

2. What is sterilization?

Sterilization refers to severe heating at a temperature above 100 ºC whereby all microorganisms are killed or their microbial cells are damaged beyond repair. This heat treatment renders the meat products commercially sterile because some bacterial spores may still service. However, exposure of meat to such high temperature imparts sulphydryl flavor and noticeable changes in texture and color.

3. What is commercial sterilization?

In commercial canning practice total sterility is not achieved. Some bacteria can form spores, which need very severe heating to kill. Such severe heating reduces the eating quality of meat. Complete sterility cannot be achieved without damaging product quality. Hence a relatively mild process is developed termed as “Commercially sterile”. Commercial sterility is a practice in canning industry wherein heating is just sufficient to destroy or inactivate all pathogenic, toxigenic and spoilage organisms. This kind of product may contain a few numbers of heat resistant spores, but normally they will not multiply. Commercially sterile meat products have a shelf life of two years or more.

4. Define aseptic canning.

In aseptic canning, foods are pre - sterilized at a very high temperature (150 – 175 ºC) for a few seconds and then sealed in to cans under aseptic conditions. The flavor, color and retention of vitamins are superior with this high temperature - short time process to the conventional canning.

5. Define cold point in can.

Cold point is the location in the can where heating is slowest. The position of the cold point is determined by the type of food material, its heat transfer mechanisms, and to certain extent by the agitation of can in the retort. When convection heating is the main mechanism involved, the cold point is on the vertical axis, close to the bottom end of the can. In conduction heating, the cold point is located in the geometrical center of the container. For viscous meat material, with cans rotating during heating cycle, the cold point is close to the geometric center. In static heating of liquid or semisolid products, such as meat pieces in brine, where the leading heat transfer mechanism is convection, the cold point is one – third from the can bottom end.

6. Describe heat transfer mechanisms in canning of meats.

Heat transfer in cans takes place due to the differences in temperature between two objects. Conduction and convection are the two heat transfer mechanisms.
Conduction: Transfer of heat takes place through the particles and distributes the heat throughout, i.e., direct transfer of heat from particle to particle and no other medium is involved. When large meat piece is heated, the heat is transferred from surface to the center.
Convection: Transfer of heat through fluid media is by mass movement of particles in the medium such as water.

7. What are the effects of heating on nutrients?

Heating generally increases pH and reduces enzyme activity. All enzymes are destroyed at 79 ºC in a few minutes. Heating causes denaturation of proteins and loss of water. Nutritionally cooking improves the digestibility of meat but it changes amino acid composition. Some vitamins and minerals are also lost during heating. Warmed over flavor results when cooked meat is refrigerated and reheated. These changes alter the sensory attributes such as flavor, color and texture quality of meat and meat products.

8. What is protein denaturation?

Denaturation is a process in which proteins or nucleic acids lose the quaternary, tertiary and / or secondary structure, which is present in their native state, by application of some external stress or compounds. The compounds are strong acid or base, a concentrated inorganic salt, an organic solvent (e.g., alcohol or chloroform). Radiation or heat also causes denaturation. Functional properties of proteins are adversely affected by denaturation.

9. How heating affects microbes in meat?

Heating significantly reduces microbial load in meat since most of the spoilage and pathogenic organisms are sensitive to heat. Cooking also reduces bacterial growth by reducing water activity. Heating kills bacteria, inactivates enzyme, denatures protein and increases permeability of membrane. The effect of heating on bacteria depends on their heat resistance, the surrounding environment and kind of bacteria.

10. Define water activity.

Water activity (a_w) is defined as the ratio of the vapor pressure of *water* in a material to the vapor pressure of pure *water* at the same temperature. It is expressed as:

a_w = Vapor pressure of water in food / Vapor pressure of pure water at the same temperature

11. What types of cans are used in meat industry?

Five principal types of cans are used in meat industry, viz,

Square and Pullman base: These containers are used for pasteurized meat. The principal meats packed are chopped products such as spiced luncheon meat, chopped ham and corned beef.

Pear shaped: These cans are used to pack pasteurized hams. These are also a type of Pullman base container.

Round sanitary: Cylindrical or round sanitary cans are available in a variety of diameters and heights to meet the requirements of canned meat products.

Drawn aluminum: Aluminum cans are used principally for sausages and meat spreads.

Oblong: Oblong cans are used for sterile canned meats. Luncheon meat cans are available in either tin plate or aluminum.

12. What is the purpose of canning meats? And how meat safety is ensured?

The purpose of meat canning is to provide safe product. Sterilization of meat is done at a condition which is enough to kill all microbes and spores. It is necessary to estimate the heat required to destroy the most resistant spoilage or toxigenic microbial spores that may be present in the product to establish a suitable processing schedule. Normally heat treatment at 121 ºC for 15 minutes or its equivalent may sterilize the food. However, simply heating a can at 121 ºC in pressure cooker or retort will not destroy all microorganisms. Heat transfer through the food in can is slow and hence requires heating for several hours.

The heat processing efficiency is measured from the survival of *Clostridium botulinum* spores. The time required to destroy these spores, under specific conditions, may be determined at different temperatures. The heat resistance of microorganisms usually is expressed in terms of their thermal death time (TDT), which is defined as the time it takes to kill a stated number of organisms or spores at 121 ºC. The TDT (also designed as F_0) of *Cl. botulinum* is 2.5 min at 121 °C. Meat products given this amount of heat are safe from botulinum hazard. Other organisms, which have a heat resistance greater than *Cl. botulinum*, are likely to be present and if not inactivated, can cause product spoilage. For this reason, many canned cured meats are heated to provide F_0 values of about 3 and non - cured meats of about 6.

13. What is retort pouch processing?

Retort pouch products are also called as "Heat and Eat" food products. A flexible package, in which food is packed, is sealed and sterilized at 121 ºC to make them shelf stable like canned foods. Filling should be accurate and there should not be contamination of sealing area. Before sealing head space should be removed, or else increased pressure inside may cause bursting during retorting. Head space also interferes in uniform heat transfer. Retort pouch processing requires shorter time and hence the product near the surface is not over cooked. Quick heat penetration helps in better quality retention without damaging sensory and nutritional qualities.

Retort pouch products are processed to commercial sterility and are shelf stable without refrigeration.

14. What are retort pouches?

Retort pouches are light and convenient useful especially for defense personnel. Sterilizable flexi – bags are newer developments, which reduce damage on meat. These are sealed multilayer laminates with or without aluminum foil. They are heat resistant plastics suitable for thermal processing at 121 ºC. They are heat sealable with good barrier properties. They reduce the processing time by 30 – 35 %, minimize quality damage, have long shelf life and very convenient for processing, transportation and serving. In India the 3 – ply laminate of PET / Al foil / PP is commonly used.

15. How meat is dehydrated?

Dehydration reduces water activity (a_w) thereby hinder microbial growth and biochemical reactions. Water content of raw meat is in the range of 70 – 80 % (wet basis, a_w = 0.98), which is reduced to the safe value of 12 – 15 % (wet basis) when drying is the sole preservation process, and to 28 – 50 % (a_w = 0.7 – 0.75) when drying is combined with other techniques such as salting. Temperature, relative humidity and velocity of hot air as well as size, structure and proximate composition of the product to be dried are the factors that determine the drying time needed for the end product to reach the safe water content and a_w. Heat transfer from hot air to the material and water transfer in the reverse direction are involved in drying of the material. Evaporation of water from the product surface is accompanied by simultaneous migration of water inside the product toward the surface.