

FAQs

1. How low temperatures help preserve meat?

Low temperature and low pH due to rigor are the only two hurdles to slow bacterial proliferation in fresh meats. Low temperatures retard microbial growth, enzymatic and chemical reactions, which are responsible for deterioration and spoilage. The temperature of chilling of meat is generally 0 - 4 °C. The life of fresh meat under chilled condition is 72 h in the present marketing conditions. The maintenance of low temperature at all stages of operation and particularly during display is important in order to secure 1 - 3 days stable life.

2. What are the different methods of chilling?

The mechanical chilling and cooling by ice are the two simple methods of chilling. In mechanical chilling, meat is stored in chill room where cold air is constantly blown on its surface thereby bringing down the temperature of meat quickly. This method of chilling is quite faster and the time required to chill the meat is very less. The temperature of air is 3 °C and chilling loss is only 2 - 3 %. The bloom of meat is enhanced by this method. In quick chilling, the temperature should not be too low. High air circulation is avoided. Otherwise, it leads to cold shortening in which case meat becomes tough. In cooling by ice, meat is kept in insulated boxes containing ice and salt, which cool the meat. It is a slow process and the surface of meat becomes moist and unattractive. Discoloration of meat starts during long storage.

3. Explain process of freezing meat.

Freezing is a process of removing heat so that the water in meat is converted into ice. Freezing is superior to other methods of preservation due to: (i) Lowering of temperature retards or stops most reactions including bacterial activity, (ii) Water in ice form is not available for bacteria for their biological functions, and hence their growth is prevented and (iii) There is complete immobilization of the system, thereby reducing spread of organisms by convection. Meat preserved by freezing retains its original quality attributes without significant modification.

4. What is freezing point?

Meat starts freezing only after its surface temperature drops below the initial freezing temperature of the meat. Meat will start freezing from the outside towards the inside. The surface layer freezes first and then the frozen layer will become thicker overtime. The inner boundary of the frozen layer is known as frozen front, which moves gradually inwards toward the center of the meat. Once the freezing temperature front has started moving, the temperature of the unfrozen region will usually have dropped to the freezing temperature of meat.

5. Distinguish between slow freezing and quick freezing.

Fresh meat contains 75 - 80 % of water. The duration with which the conversion of water to ice takes place has a significant bearing on the quality of the frozen product. Slow freezing causes cell damage due to the formation of large ice crystals in intercellular space, leading to drip loss

and deterioration of texture. In quick freezing, on the other hand, the ice crystals formed are small and uniformly distributed in intra - cellular space, causing less damage to the structure. As a rule at any given point the product should cross the temperature range between - 1 °C and - 5 °C within 1 - 2 h, the process may be called fast - freezing, as major portion (75 %) of the water in the meat gets frozen within this range.

6. How meat freezes in air blast freezer?

The air blast freezer (or tunnel freezer) operates on the principle of cooling the carcass / meat by a blast of cold air sweeping over them, circulated in a closed system. The working temperature of most blast freezers is in the range of - 40 °C to - 45 °C with air velocities around 2500 ft per minute. The main advantage of this method is that large size objects of assorted shape and dimensions can be frozen simultaneously. In the case of carcasses moisture loss and consequent weight reduction may result due to the high velocity air circulation. This can be minimized by appropriate packaging.

7. How meat is frozen in contact plate freezer?

In surface contact plate freezers, the freezing of material takes place by contact with a cold metallic surface such as plates, belts, drums or shelves. Among these, the plate freezers are the most common in use. They may be vertical, horizontal or rotary and may be manual or automatic in operation. The horizontal plate freezers require a product packed into trays of uniform depth, with minimum air spaces and a top surface capable of slight compression. Vertical plate freezers do not require trays and the products may be top - fed between the plates. The main advantage is that the plate freezers produce frozen blocks of uniform thickness. The use of plate freezer is usually limited to meat pieces which are relatively thin (*e.g.* steaks), deboned and pre - packed meat and minced products (*e.g.* hamburger patties).

8. Explain cryogenic freezing.

Recent development is the use of liquid nitrogen, carbon dioxide or freon (chlorofluorocarbon compounds) where these freezants are directly sprayed on to the material to be frozen. Freezing takes place due to removal of heat as heat of evaporation needed by the liquefied gases. This kind of freezing is termed "Cryogenic freezing". The evaporated gas is discharged to the atmosphere. This process is expensive, although the initial installation cost is relatively less as compared to the conventional systems, which depend on heavy components like compressors.

9. What is the appropriate method of frozen storage of meat?

The ideal temperature for each kind of product is dependent on the fat content, lower temperatures being preferred for more fatty materials. As a rule, a temperature range of - 18 to - 23 °C has been recognized as ideal for meat and meat products. It is desired to have the product temperatures immediately after freezing as close to the storage temperature as possible. A properly packed meat, poultry or their products may remain in sound conditions for several months at such storage temperatures.

10. What is thawing?

Thawing, the reverse process of freezing, involves the melting of the ice in the frozen product, by absorption of heat from external source. However, due to differences in thermal conductivity and diffusivity between ice and water, thawing is not an exact reversal of freezing under identical conditions of temperature differential. Under practical conditions, thawing of frozen meat is a very slow process and poses serious operational problem in commercial practice. The normal procedure is to thaw in cold or warm air or circulating water. Recently, microwave energy has been extensively used both for home and commercial thawing of frozen products. Quick thawing minimizes drip loss and surface growth of microorganisms to a large extent.

11. Define freeze dehydration.

Freeze dehydration is removal of water from meat by sublimation. Freeze dehydration incorporates plates to enhance heat exchange during initial phase of sublimation and to supply heat to them to aid drying during the second phase. This process is also called accelerated freeze drying (AFD).

12. What are the advantages of freeze drying?

The advantages of freeze drying are:

- (i) Process of dehydration is faster,
- (ii) Avoids translocation of salts etc,
- (iii) Formation of honey comb texture by the direct sublimation of ice from the minute interstices of the tissue
- (iv) Least damage to meat proteins and
- (v) Meat quality almost resembles fresh meat.
- (vi)

13. How to prevent toughening of meat due to faster cooling?

When meat is chilled to temperature below 10 °C while its pH is still above 6.2, the muscle will contract and this cold shortening results in to toughening of meat. If the muscle pH is below about 6.0, it can be cooled rapidly without shortening. For tenderness, chilling must be slow enough to prevent cold shortening.

14. What is ageing of meat?

Holding of carcass / meat at chill temperature is called as ageing of meat. This will help tenderize meat, which is caused by the activity of proteolytic enzymes that are already present in muscle. These enzymes breakdown muscle proteins resulting in to tender meat.

15. How to rehydrate dried meat?

Dried meat has a very low water content which can be brought back to water content of fresh meat by rehydration by placing dried meat in water. Rehydration of freeze - dried meat only with water may produce meat with slightly higher toughness than fresh unfrozen meat. Rehydration with aqueous solution of proteolytic (tenderizing) enzymes, such as papain, helps minimize this adverse effect of freeze drying on tenderness.