



Freezing and Thawing Meat

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Proper freezing and storage of meat are essential for maintaining the integrity of the product. Storage temperature is important for extending shelf life and controlling pathogen growth. Understanding proper techniques for freezing and thawing meat will help protect the integrity of the product. Because lean meat contains approximately 70% water, some moisture and proteins are lost during the freezing and thawing process. This can occur in the form of evaporation, purge or drip. The goal is to minimize juice loss as much as possible and the following procedures can help achieve this goal.

Freezing. When freezing, it is important to freeze fast. Fast freezing causes the formation of small ice crystals. Slow freezing causes the formation of large ice crystals, which can damage proteins, resulting in a loss of elasticity, resorption, and water-holding capacity. Freezing at -22°C to -30°C causes 99.9% of the water contained in meat to be frozen. Microbial and enzymatic activity virtually ceases at these temperatures. The most common methods used to achieve a fast freeze are:

Blast freezing. Involves rapid air movement that removes heat from a product. The most common temperature for blast freezing is -40°C with high velocity air movement.

Plate freezing. Plate freezing is used for boxed goods. Products are stored on a series of shelves and frozen to a temperature of -20°C .

Cryogenics. This process is used primarily for ground and cooked products such as beef patties, fresh sausage, chili, soups, and stews. Liquid nitrogen or liquid carbon dioxide can attain extremely cold temperatures of -196°C and -78.5°C , respectively. Typically, patties or trays are passed through a conveyerized tunnel for a set time period to achieve freezing.

Thawing. Thawing should be done slowly at refrigerated temperatures ($\leq 4^{\circ}\text{C}$). Thawing at this temperature will allow for the ice crystals to dissipate with minimal structural damage to the meat product. Also, at these temperatures, pathogenic and spoilage microbial growth is minimized.

It is important to remember that any time meat is frozen and thawed, quality may suffer slightly. However, by following the guidelines listed above, water losses can be minimized, shelf life can be extended, and consumers can receive the best products possible.