

Sub Name:FOOD PROCESSING AND PRESERVATION

Sub Code: C-10

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CHANGES IN FOOD DURING FREEZING, FROZEN STORAGE AND THAWING

You may have had the unfortunate experience of placing a beverage or other container of liquid food in a freezer to chill it quickly, only to find the container has cracked or the lid popped off because of the expansion of the water in the food as the water froze. The same phenomenon occurs within the cells of food during freezing if the conditions are not carefully controlled.

1.Rupture of cell walls and membranes during freezing and thawing can lead to formation of drip when the product is thawed. The process of freezing foods has great influence on the ultimate quality of the food once it is thawed and prepared for consumption. Changes that occur in foods during freezing, storage and thawing can be both chemical and physical in nature.

2.Various chemical, enzymatic and physical changes are promoted as a result of the concentration of components (concentration effects) in the unfrozen water phase within the frozen foods.

- Chemical changes such as oxidative rancidity or oxidation of flavour components, pigments and vitamins.
- Enzymatic reactions such as enzymatic browning or lipolytic rancidity.
- Meats become tougher due to protein denaturation by chemical effects and cell breakage by ice crystals

3.In freezing foods, the objective is to promote the formation of tiny ice crystals rather than the formation of fewer but larger ice crystals that cause cellular damage. Ice crystal damage can lead to loss of water from the food product once it is thawed.

The drip that is found in thawed strawberries or beef is due in part to ice crystal damage to the cells, leading to leakage of cellular fluids into extracellular spaces, and to the loss of water-holding capacity of food components as a result of concentration effects.

4.Emulsions and other dispersions are destabilized by the growth of numerous small ice crystals to larger, less numerous but more damaging ice crystals; such growth in ice crystal size is usually caused by temperature fluctuations.

5.You may have noted shrinkage and development of graininess in ice cream stored in the frost-free freezer section of your refrigerator. This is due to partial melting of the ice cream during temperature fluctuations that result from the defrost cycles. This leads to foam destabilization and crystallization of lactose as a consequence of concentration effects.

6.Other undesirable changes include formation of package ice and freeze dehydration which is popularly called freezer burn and can produce unsightly food surfaces and loss of nutrients. "Freezer burn" is a misnomer since the food does not "burn" in the freezer but rather takes on an appearance of having been burnt because of the moisture loss that occurs during this freeze dehydration.