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# Quick Freeze for Best Food

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The development of food storage and distribution was an essential part of the growth of cities, particularly through the 19th and the 20th centuries. Before then most cities had been largely self-sufficient, with farms, orchards and markets all within the city limits and capable of feeding the residents without reliance on shipment over any significant distance.

As cities grew, and the food source was pushed further from the center, the first step in the development of the food distribution network was the establishment of city center abattoirs. Livestock was herded into the center of town to be killed and processed on the spot. However, further growth in the population of cities reversed this trend, culminating in the development of transshipment of meat half way round the world to bring lamb and beef from Australia and New Zealand to Europe in the 1870s.

Now we take frozen food for granted, but there still seems to be a (totally false) public perception that the top quality foodstuffs are shipped and sold fresh, and only inferior grades are sent for freezing. Understanding why such a misconception could arise goes some way toward knowing how to counter it.

The quality of frozen food is determined to a great extent by the rate at which it is first frozen and then the stability of the temperature regime in which it is held before it is thawed, cooked and eaten. Many foods consist mainly of water, salts and fats, and it is the water that freezes. This causes two things to happen. The strength of the salt solution in the water that remains unfrozen increases, and the stronger salts tend to migrate through the product ahead of the freezing front. Therefore, it is really important to freeze the product quickly to prevent this migration and then to hold it at a steady temperature so that the ice crystals that formed in the initial freeze remain the same size.

Cycling the temperature, even through a few degrees, causes the crystals to grow and damages the texture of the product. This is why it is far better to buy food which has been frozen by professionals and then maintained under strictly controlled conditions rather than bringing home fresh produce and sticking it in the freezer.

The idea that food quality is better if it is frozen quickly was first suggested 100 years ago by Clarence Birdseye, a field naturalist who worked for the U.S. Biological Survey, part of the United States Department of Agriculture. While on a field trip in Newfoundland in 1915, he noticed that the Inuit froze fish rapidly in winter in very low temperatures and the quality of the thawed product was far better than mechanically frozen food at that time. It took Birdseye a further 10 years to develop his ideas partly because the market was not ready for frozen food on a large scale, but once the idea took hold there was no going back.

The method of freezing foods is generally selected based on product and production needs, rather than considerations of efficiency or minimum heat load. Factors influencing the choice of method include whether the product is wet or dry (or liquid), whether it is wrapped, supplied to the freezer continuously or in batches and if it is likely to be damaged by the handling process.

Batch freezing is done in rooms filled with moveable racks of product over which cold air is blown at high speed, or in plate freezers—an array of refrigerant-filled metal shelves moved hydraulically to compress the product, ensuring good thermal contact.

Continuous freezing is usually done by passing a conveyor through an insulated box arranged either in a straight line or in a helix (known as a “spiral freezer”). Cold air is then blown over the product to achieve the freezing, with the airflow arrangement depending on the size and shape of the product. There are many variants of these two basic types. For example, carton freezers use a complex material handling system (similar to the baggage sorting machines in airports) to pass boxed product through a blast freezer automatically. This allows different sized boxes to remain in the freezer for different times, so these arrangements are sometimes called variable retention time freezers. Another hybrid style uses a hollow plate, similar to the plate freezer as a table to provide a frozen crust to delicate product that would otherwise be marked by the conveyor belt in a spiral or tunnel freezer. This is particularly useful with seafood and soft fruit. ■

Clarence liked his cod fresh.



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