Chapter 2:

Refrigerated /frozen foods

Expected outcome:

a) Able to apply the principles of dehydration in food
b) Able to and analyze dehydration in food

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Content

- Introduction
- Type of frozen foods
- Product quality
- Transportation and cold chain management
- Storage

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Introduction

- The most elegant method of long-term preservation → perishable foods at economical cost
- Products that cannot be frozen; salad vegetables, bananas, whole fruits, etc
- Perishable products → transported across the world and to span the seasons

Introduction

- Retains most nutrients → Vit. C, Vit B1, etc are degraded by 10 – 30 % over a year's storage at -18^{o}C in most products
- A multitude of high-quality perishable products available year-round anywhere in the world
- Maintain cold chain

Low temperature storage

- Refrigeration → storage at 0 °C –7°C
- Freezing → storage below 0°C
- → Slow/stop growth of microorganisms, chemical changes

Photo credit: N-Lange.de; Wikimedia; PD

Chilling/refrigerate

- Temperature → 0°C – 7°C.
- Chilling allows → 5 –7 days
- Rapid cooling of the surface - bulk of bacterial contamination occurs
  → Interior cooling should then take place

Photo credit: Wisegeek; wisegeek; PD

Freezing

- Freezing → long term storage of food
- Kill some, not all vegetative organisms
  → Spores are generally resistant to freezing
- Slows chemical and enzymic processes
- Useful storage times at -18°C:
  - Red meat: 6 –12 months
  - Poultry: 3 months
  - Fruit & Vegetables: 3 –6 months
  - Fish: 6 month

Photo credit: canadacouponing; canadacouponing; PD

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Freezing

- Rate of freezing → impact on food quality
- Slow freezing → more damage to food structure
- Fewer microorganisms survive slow freezing
- Slower freezing results in larger ice crystals forming
  - → Physical damage to food structure
    Reduced water holding capacity
    Darker colour - meat
- Best to freeze rapidly

Photo credit: Wisegeek; wisegeek; PD

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Types of frozen foods

Meat

- Meats freeze excellently.
  - ➔ indistinguishable from the original material
- Quality retention during long term storage is very high,
  - ➔ meats containing highly saturated fat

Photo credit: Wisegeek; wisegeek; PD

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Types of frozen foods

Seafood

- Salmon, catfish, trout, shrimp, mussels and oysters

  ➔ relies exclusively on freezing to transport the catch after processing

Photo credit: Faroclom ; wikipedia; CC BY-SA 3.0

Types of frozen foods

Vegetables

- Enable the growing of each species of vegetable to be located in the area most conducive to obtain high yields of quality crops
- → far away from area of consumption

Photo credit: domeckopol; pixabay; PD

Product quality

- Freshness and quality during freezing affect the condition of frozen foods
- Frozen at peak quality → foods taste better than frozen near end of useful life
- Enzyme activity → deterioration of food quality

  → Enzyme promotes chemical reaction
- Freezing slows down the activity.

Photo credit: Wisegeek; wisegeek; PD

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Transportation

- Transportation of refrigerated raw materials, ingredients, and food products → essential link between food industry and consumers
- Modes – sea, road trailers, road delivery vehicles, air, rail
- Each food product possesses characteristics that decide its PSL
- Temperature control → vital factor in determining PSL
- Good transport meets the requirements in the chilled / frozen food chains
- Other factors → packaging, humidity, and protection from damaging product integrity

Storage

- Ensure availability
- Cope with fluctuations
- Take advantage of bulk purpose
- Year round supply of seasonal items

Photo credit: Samuell; wikipedia; PD

Storage facilities

- Fit for purpose (dry store, chill, frozen etc.)
- Separate types of food → Raw, cooked
- Protect from contamination/infestation
- Weather proof
- Keep out light
- Easy to clean
- Transport
  - Access
  - Condition of vehicles

Food storage chart

Product	Chiller (0°C - 4 °C)	Freezer (-18 °C or below)
Fresh eggs	3 to 5 weeks	Do not freeze
Fresh milk - If unopened - After opening	 "Use-by" date 2 to 3 days	Do not freeze
Fresh beef, veal, lamb and pork	3 to 5 days	6 to 12 months
Fresh poultry	1 to 2 days	6 to 12 months
Shrimp, scallops, crayfish, squid, shucked clams, mussels and oysters	1 to 2 days	3 to 6 months
Live clams, mussels, crab, lobsters and oysters	2 to 3 days	2 to 3 months
Lean fish (e.g. cod, sole)	1 to 2 days	6 months
Fatty fish (e.g. mackerel, salmon)	1 to 2 days	2 to 3 months
Soup and stews	3 to 4 days	2 to 3 months

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