

Advancing Food Design

Shelf-life – Past & Future

Dr. Declan Bolton, Teagasc

Overview

- Safety and Shelf-life in the context of food design
- Shelf-life past: A brief history of food preservation
- Shelf-life future

Food Design

Eating quality: appearance, taste, texture

Convenience: availability, ease of preparation

Cost: affordable

Stability: quality retention, shelf-life

Wholesomeness: safety, purity

Nutritive value: nutrient content, nutrient availability, caloric value



Food Design

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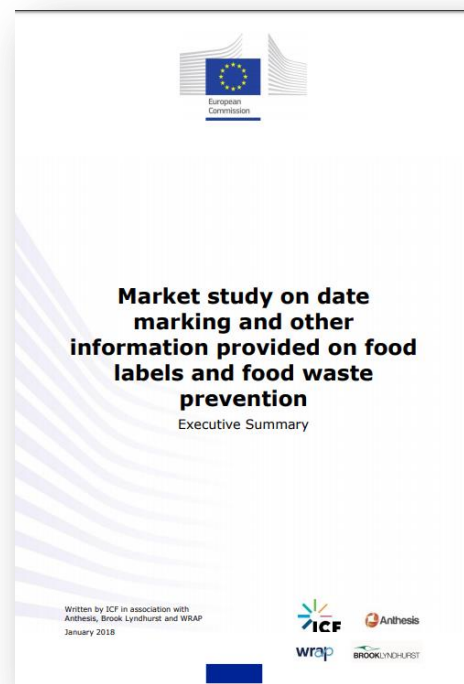
Stability: quality retention, **shelf-life**

Wholesomeness: **safety**, purity

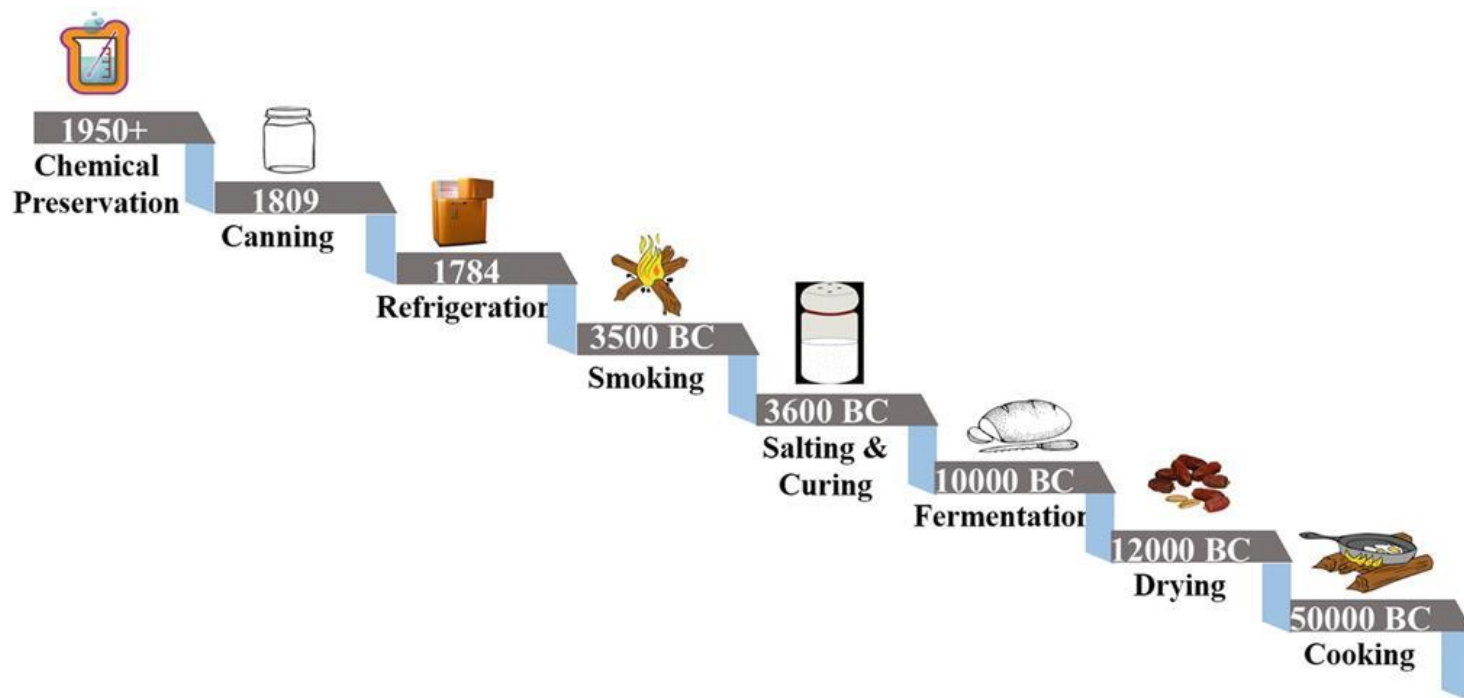
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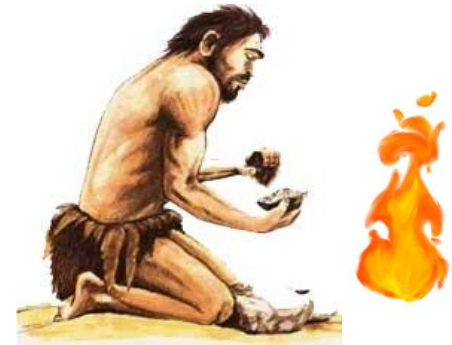
Shelf-life Past: A brief history of food preservation



Tuesday 11th June 2019



Cooking – (9000 BC) – stone age technology.



Chilling

- Stone age technology
- 1700 BC - ice houses built near the Euphrates.
- 1809 (AD)- Jacob Perkins patented the first refrigerating machine.

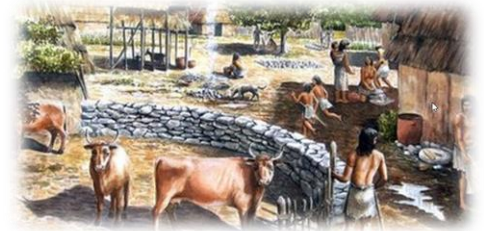


Curing: drying (12000 BC), salt (3600 BC) or smoke (3500 BC).



Biopreservation

Lactic acid bacteria – metabolites – lactic acid, acetic acid, hydrogen peroxide and peptide bacteriocins - yeast, bacteriophage.



Pickling – India 2400 BC



Sugar (preserves) – Roman cookery book,
De Re Coquinaria (The Art of Cooking) –
1st century AD



Canning

Nicholas Appert (1809) French confectioner



MAP & Controlled Atmosphere Storage

- 1821, Jacques Etienne Berard, France, delayed ripening of fruit and increased shelf life in low-oxygen storage conditions.
- 1930s, CAS, ships transporting fresh apples and pears, high levels of CO₂
- 1970s, MAP bacon & fish in retail packs.

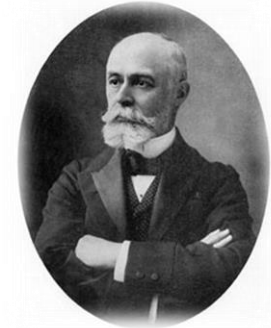


Pasteurisation - Louis Pasteur (1862)



Irradiation

- Henri Becquerel's discovery of radioactivity in 1895.
- First food applications 1950s - beta particles and gamma rays.
- WHO and FAO – 500,000 tons/40 countries.



High Pressure

- 1899, B. H. Hite (USA) first to demonstrate the inactivation of microorganisms by pressure.
- 1914, Hite et al. release a detailed report.
- 1990, commercial products preserved in Japan.



Freezing

Clarence Birdseye (1924).



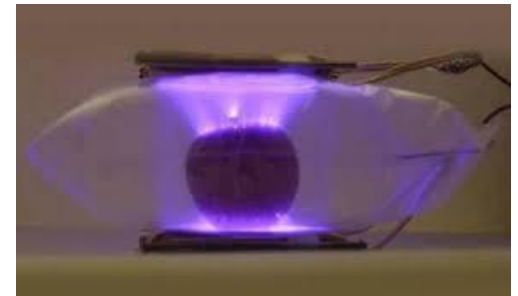
Food Additives

Spices (3000 BC) to 20th century – artificial substances to improve taste, shelf-life, appearance, etc.



Non-thermal Plasma/Cold Plasma

1960s & 1970s, add energy to a gas, electrons leave its atoms, 'flame' or 'flow' of ionized gas molecules (helium or nitrogen).



Hurdle technology

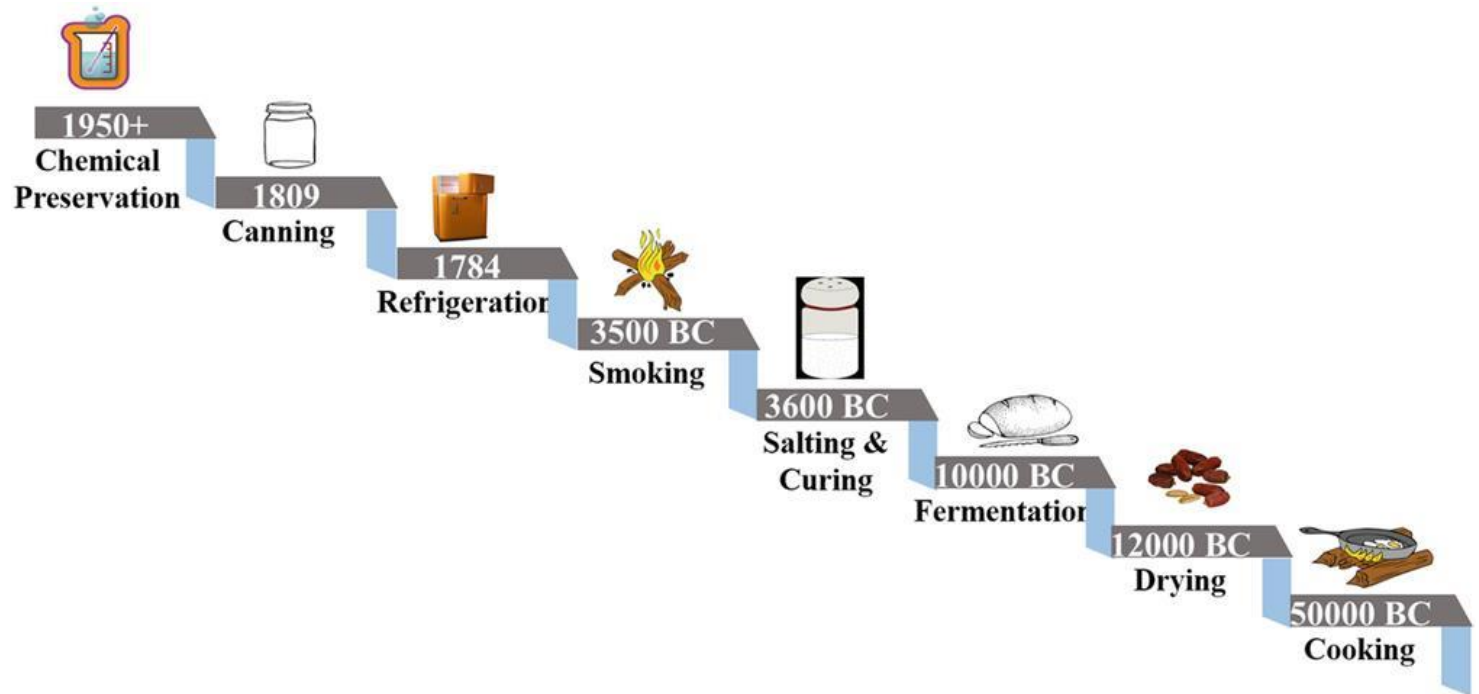
Leistner (2000) – ‘an intelligent combination of hurdles that secures the microbial safety and stability as well as the organoleptic and nutritional quality and the economic viability of food products’



Many years of R&D



Shelf-life: Future



Personalised Nutrition

- Using genetic tests to provide foods tailored to the group or individual.
- Tailoring the product to the needs of the group (age, race, religion, health status, lifestyle, etc.).
- Including shelf-life (shop once a day, once a week, once a month..., consumer preference, etc.).



Bioengineering

- White carrots, salty peaches, small, hard, bitter watermelons.
- More nutritious.
- Safety & shelf-life.



Neurogastronomy

- The science of taste perception. Combining our understanding of neurology and food science to enhance the eating experience.
- Sound of the sea increased saltiness of seafoods, desserts taste creamier when served in a round bowl, background hissing or humming makes food taste less sweet, etc.
- Aromatic mists, sound effects, controlled lighting, augmented reality headsets that superimpose digital imagery, etc.



Nanoscience & Nanotechnology

- The study and application of extremely small things and can be used across a range of scientific fields including food science.
- Polymer nanomaterials in food packaging, antimicrobial applications.
- Encapsulation of nutraceuticals and functional anti-microbial ingredients for preservation and bioavailability.
- Nanoparticles that give delayed bursts of flavour.
- Tiny magnetic particles that bind to and remove off-tasting flavour compounds (eg. red wine) while preserving aroma, etc.



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