

Preservation of meats -1

History

- ▶ 1782 - A Swedish Chemist introduced canning of vinegar.
- ▶ 1810 - Preservation of food by canning was patented by Appert.
- ▶ 1856 - A patent for the manufacture of unsweetened condensed milk was granted to Gail Borden in the U.S
- ▶ 1888 - The pasteurisation of milk began in Germany.
- ▶ 1954 - Nissin a bacteriocin was permitted in England for use in certain processed foods to control clostridium defects.
- ▶ 1955 - Sorbic acid was approved for use as a food preservative.
- ▶ 1967 - The first commercial facility designed to irradiate foods was planned and designed in the United States



FACTORS INFLUENCING GROWTH OF MICRO ORGANISM

- ▶ **pH** of the food-Most microorganisms grow well at a **pH** of around 7 (6.6 – 7.5). yeast and moulds, which manage to grow across a **pH** range of 0 – 11.
- ▶ **Moisture content** -water activity (a_w) of the food
- ▶ Most spoilage and pathogenic bacteria in meat require a water activity in equal to more than 0.9, and the most tolerant bacteria is *Staphylococcus aureus* which continues to grow at a a_w of 0.86.
- ▶ Most spoilage yeasts require a a_w of 0.88, while spoilage moulds manage to grow at a a_w of 0.80. a
- ▶ If foods are dried to a final a_w of 0.60 or lesser, the product becomes shelf stable.



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- ▶ **Oxidation reduction potential (Eh)**-Aerobes require oxidized conditions for growth (a positive Eh value), while anaerobes require reduced condition for growth (a negative Eh value).
 - ▶ Microaerophiles, require slightly reduced conditions whereas facultative anaerobes grow in both reduced and oxidized conditions.
 - ▶ **Nutrient content**-A source of energy, A source of nitrogen, Vitamins and related growth factors and Minerals
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Extrinsic parameters that affect microbial growth

- ▶ *Temperature of storage* – Most microorganisms in food are mesophiles, (30 - 40⁰C), while some of them optimally need a temperature range of 20 -30⁰C, but grow well at 7⁰C or below and are known as psychrotrophs.
- ▶ Some optimally need a temperature range of 55 - 65⁰C, but grow well at 45⁰C or above and are referred to as thermophiles.
- ▶ *Gases in the environment* - It is common knowledge that oxygen is required for aerobes and anaerobes do well in the absence of oxygen.
- ▶ *Relative humidity* - Relative humidity has a role to play in both surface spoilage as well as deep seated spoilage.



PRINCIPLES OF FOOD PRESERVATION

- ▶ ***Preservation or delay of microbial decomposition***
 - ▶ By keeping out microorganisms (asepsis)
 - ▶ By removal of microorganisms e.g. by filtration.
 - ▶ By hindering the growth and activity of microorganisms e.g. by low temperature, drying, anaerobic conditions or chemicals.
 - ▶ By killing the microorganisms e.g. by heating or irradiation.

- ▶ ***Preservation or delay of self-decomposition of the foods***
 - ▶ By destruction or inactivation of food enzymes e.g. by blanching.
 - ▶ By prevention or delay of purely chemical reactions e.g. prevention of oxidation by means of an antioxidant.



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- ▶ **Prevention of damage because of insects, animals, mechanical causes, etc.**
 - ▶ The methods used to control the activities of the microorganisms usually are effective against enzymatic activity in the food or chemical reactions.
 - ▶ Methods like drying or use of low temperature, however, permit auto decomposition to continue unless special precautions are taken.
 - ▶ For example, most vegetables are blanched (heated) to inactivate their enzymes before being frozen.

 - ▶ **Generation time-** It is the time that elapses between the formation of a daughter cell and its division into two new cells. The generation time shorten as conditions become more favorable and lengthen, as they become less favourable.
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PRINCIPLES OF PRESERVATION OF MEAT

- ▶ The primary purpose of food preservation is to prevent food spoilage. The primary cause of spoilage is the action of micro-organisms such as bacteria, moulds or yeasts, aided by enzymes.
- ▶ The preservation of red meat, poultry and their products is accomplished by ensuring that their immediate micro-environment is unfavourable for the growth of spoilage organisms (bacteria, yeasts, moulds and parasites), and also by controlling the action of autolytic enzymes and preventing the chemical oxidation of lipids, which leads to rancidity.
- ▶ Most of the processed meats available today originated from techniques that were developed to extend the length of time between the slaughter of the animal and the consumption of the meat derived from the animals.



CLASSIFICATION

- ▶ Preservation by Moisture Control
 - ▶ Drying
 - ▶ Intermediate Moisture Foods
 - ▶ Freeze Drying or Lyophilisation
 - ▶ Salting
 - ▶ Curing and smoking
 - ▶ Preservation by Temperature Control
 - ▶ Preservation by Low Temperature
 - ▶ Chilling
 - ▶ Freezing
 - ▶ Preservation by High Temperature
 - ▶ Canning
 - ▶ Retort Processing
 - ▶ Preservation by Direct Microbial Inhibition
 - ▶ Irradiation
 - ▶ Antibiotics
 - ▶ Chemicals
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POINTS FOR CONSIDERATION TO CHOOSE A METHOD OF PRESERVATION OF FOOD

- ▶ **Most of the edible tissues of the healthy animal at the time of slaughter are either sterile or contain few micro-organisms, owing to the several level of defence in place against microbial invasion. Unfortunately, these efficient defence mechanisms are nullified at the time of animal's death.**
- ▶ **The momentary state of shock concomitant with exsanguination probably facilitates bacterial invasion from the intestinal tract.**
- ▶ **The slaughtering operation contaminates the vascular system with numerous micro-organisms that may disseminate through the body before bleeding has been completed.**



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- ▶ **Bleeding largely depletes the body of the circulating antibodies and leucocytes. Therefore, a sudden cessation of the body's defence against microbial invasion and as a consequence growth of foreign micro-organisms accompany the death of the meat animal.**
 - ▶ **There appear to be no residual bacteriostatic or bactericidal properties in the tissues of the freshly slaughtered animal.**
 - ▶ ***Fresh meat is highly perishable* because of almost neutral **pH** (low acid food), high moisture content and being rich in all the nutrients required for microbial growth.**
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- ▶ ***Cured and processed meats* are generally more stable than fresh meats with respect to microbial deterioration because of additives such as salt or moisture reduction (as in the case with dry sausages) or a combination of these agents.**
 - ▶ **The widespread availability of refrigeration has decreased the need to rely on curing and processing , for example, salt levels have been reduced to meet palatability and consumer health considerations.**
 - ▶ **Important advances in preservation have resulted through application of appropriate packaging materials and methods.**
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