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Preservation by Heat



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Methods

- **The temperature and time used in heat processing of food depend upon the effect of heat on food and other preservative material used**
- **Sterilization – refers to the complete destruction of microbes with wet heating at 121°C for 15 min to kill certain bacterial spores**
 - **Depending on the size of the can the effective time to achieve true sterility may be several hours where there can be many changes in the food which reduces its quality**
- **Commercially Sterile – is the degree of sterilization at which all pathogenic and toxin producing organisms are destroyed**



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Commercial Sterilization

- **Commercial sterility means the absence of microorganisms capable of growing in the food at normal non-refrigerated conditions at which the food is likely to be held during manufacture, distribution and storage.” (Ref: Codex Alimentarius Commission (WHO/ FAO) CAC/RCP 40-1993)**
- **May contain small number of bacterial spores**
- **Canned and bottled products have shelf life of 2 years or more**
- **Deterioration is generally in texture and flavour**



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Commercial Sterilization

- **“UHT treatment is achieved by a treatment: (i) involving a continuous flow of heat at a high temperature for a short time (not less than 135°C in combination with a suitable holding time) such that there are no viable microorganisms or spores capable of growing in the treated product when kept in an aseptic container at ambient temperature, and (ii) sufficient to ensure that the products remain microbiologically stable after incubating for 15 days at 30°C in closed containers or for seven days at 55°C in closed containers or after any method demonstrating that the appropriate heat treatment has been applied.” (Ref: Commission Regulation (EC) No 1662/2006 (amending Regulation (EC) No 853/2004)).**



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Methods

- **Pasteurization – heat treatment kills some but not all the microbes at temperatures below 100°C**
 - Kill pathogenic microbes and inactivate enzymes
 - Extends shelf life (fruit juices, beer, wine)
 - Heating is by steam, hot water, dry heat with prompt cooling
 - Combined with refrigeration, sealed containers
- **Blanching – is a kind of pasteurization applied to fruits and vegetables to inactivate natural food enzymes and deaerate the product before processing**
 - If not blanched, off flavour, vitamin losses and colour changes occur during frozen storage, removes hardness
 - The products are dipped in boiling water for 2-3 minutes and cooled immediately



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Methods

- **Canning – involves application of temperatures to food high enough to destroy microbes in addition to air-tight sealing in sterilized**
 - **Most canning is in “tin cans” made of tin coated steel or in glass containers , aluminium**
 - **Acid foods like tomatoes, fruit juices, those having a pH of 4.4 or less are easily processed than low acid foods**
 - **Acid foods can be processed if internal temperatures reach 82.2°C**
 - **Non-acid food such as meat are cooked, filled in the can leaving a little head space, sealed and heat processed at 121.1 °C in an autoclave for 60 min and cooled by dipping in cold water**



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Canning Procedure

- **Raw product is examined for any undesirable material, cleaned, blanched to reduce volume and for softening of the tissue and for colour retention**
- **Food is placed in containers and a weak brine or water is added to vegetables and syrup to fruits**
- **Canned food is exhausted (expel air and gas from the can so that its internal pressure after heating and consequent cooling will be at atmospheric pressure)**
- **Gas is removed by heating and results in creation of vacuum when the container cools**



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Canning Procedure

- Filled cans are permanently sealed and subjected to heat treatment to destroy the heat resistant microbes
- Processed cans are cooled by water in a cooling spray and temperature is reduced to 38 °C
- The cans are placed in cases and stored at appropriate temperatures
- In hot pack method of canning, food is heated to 77 °C in syrup before being packed – apples, pears
- Old or raw method is used for fruits with delicate texture such as berries