

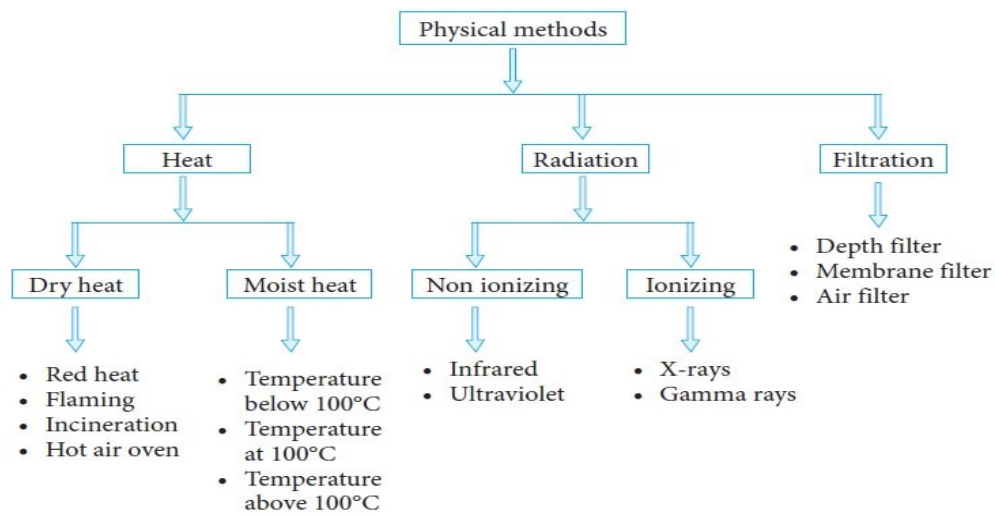
STERILIZATION

CONTENT:- Introduction, definition, sterilization methods.

INTRODUCTION:- Sterilization is an essential stage in the processing of any product used for parental administration, broken skin, mucosal surfaces or internal organs. Sterilization of microbiological materials, surgical dressings & equipments & other contaminated items is necessary to minimize the health hazard associated with these articles.

DEFINITION:- Sterilization is a process by which an article, surface or medium is free of all micro-organisms either in the vegetative or spore state.

STERILIZATION METHODS:-



Flowchart 4.1: Physical Methods of Sterilization

PHYSICAL METHODS:-

DRY HEAT STERILIZATION:-

Heat is the most reliable & rapid method of sterilization. The killing effect of dry heat is due to protein denaturation, oxidative damage & the toxic effect of elevated levels of electrolyte. The factors influencing sterilization by heat are nature of heat, number of micro-organisms present, temperature and time, characteristics of the micro-organisms etc. Examples :

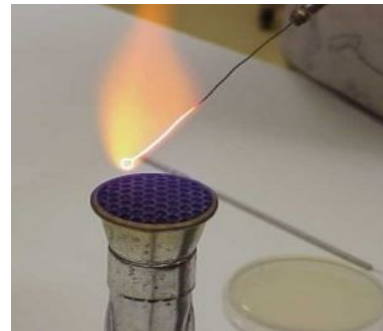


Fig: 1 RED HEAT

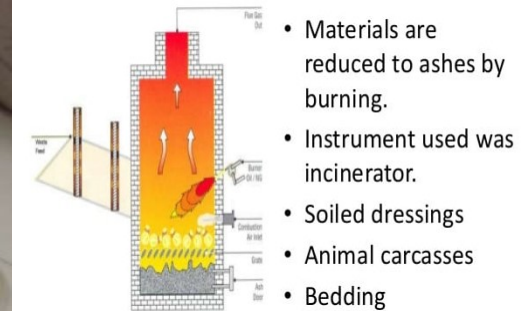


Fig:2 INCINERATION



Fig:3 FLAMING

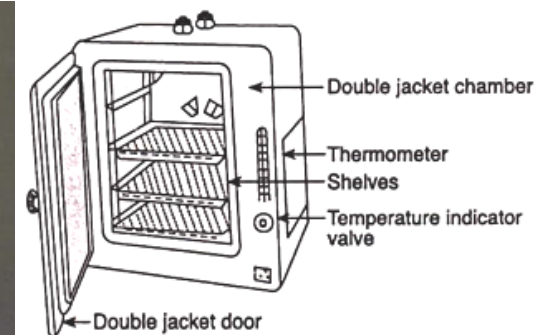


Fig:4 HOT AIR OVEN

HOT AIR OVEN :-

Table 1 : Temperature & time relationship required for sterilization in hot air oven.

Temperature(°C)	Time(min)
170	60
160	120
150	150
140	180

Hot air oven is used to sterilize glasswares, forceps, scalpels, spatula, swabs, some pharmaceutical substances such as glycerin, fixed oil , liquid paraffin ,propylene glycol, sulphonamides and dusting powders such as kaolin, talc, zinc oxide, starch etc.

It is not suitable for surgical dressings, rubbers, plastics, volatile and heat labile substances.

Substances that are not heat liable and can tolerate temperature upto 250°C may be sterilised by hot air oven.

Normally the spores as well as the vegetative forms of all micro organisms are killed in two hours at a temperature of 160C .

The relation between the temperature and relative time required for sterilization in hot air oven is given in Table 1.

MOIST HEAT STERILIZATION:-

It is divided into 3 forms :-

Temperature below 100°C

•The temperature employed is either 63°C for 30 mins(holder method) or 70°C for 20 sec(flash method) .

Temperature at 100°C

• Boiling at 100°Cfor 10 to 30 minutes kills all vegetative bacteria and some bacterial spores

Temperature above 100°C

•Heat in the form of saturated steam under pressure is the most practical and dependable agent for sterilization..

Table 2:Autoclaving conditions (temperature/time/pressure relationship)

Temperature(°C)	Steam pressure(lb/sq.inch)	Holding time (min)
115-118	10	30
121-124	15	15
126-129	20	10
135-138	30	3

AUTOCLAVE:-



Fig:5 VERTICAL AUTOCLAVE

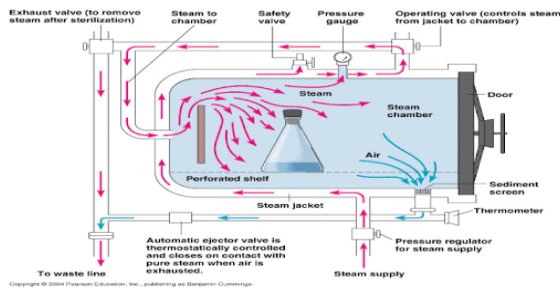


Fig:6 HORIZONTAL AUTOCLAVE

RADIATION:-

NON IONIZING RADIATION

(ultra violet radiations)

It is commonly employed in the reduction of air borne contamination.

It is absorbed by the nucleic acid of the cell where it does the greatest damage.

IONIZING RADIATION

(cold sterilization)

X-rays

Gamma rays

#Cathode rays

Are highly lethal to DNA & other vital cell constituents.

FILTRATION METHODS:-

#ASBESTOS FILTER :-

It is also known as seitz filter. They are disposable, single use discs made up of asbestos (magnesium trisilicate). The pore size of filter range from 0.01 to 5 microns.

#SINTERED GLASS FILTER :-

It is also fritted glass filter or morton filters. The sintered discs are finally fused into funnels of a suitable size and shape . Sintered glass filters are available in several different porosities but for filtration sterilization a number or grade 5 or 5 on 3 must be used . They are brittle and expensive and have a small area of filtration.

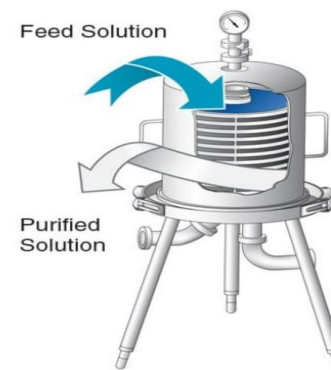


Fig:7 SEITZ FILTER



Fig:8 SINTERED GLASS FILTER

FILTER CANDLE :- It is also known as ceramic or berkefield filter. These are manufactured in different grades of porosity and have been used widely for purification of water for industrial and drinking purposes. These are depth filters with cellular walls and are available in various sizes.

#MEMBRANE FILTER :-

It is also known as millipore or ultra filter .These are made up of various types of cellulose & cellulose ester. They are 150 micrometer thick & contain millions of microscopic pores ranging from 0.01 to 10 micrometer in diameter.

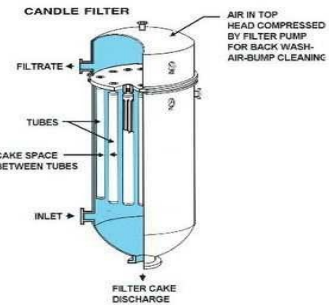


Fig:9 FILTER CANDLE



Fig:10 MEMBRANE FILTER

CHEMICAL METHODS:-

(a) GASEOUS STERILIZATION:-

Gaseous sterilization may be defined as the destruction of all living microorganisms with a chemical in a gaseous or vapour state.

(i)Formaldehyde(HCHO) :-It kills both vegetative cells & spores .

(ii)beta-propiolactone (BPL):-It is capable of killing all micro organism & is very active against viruses.

(iii)Ethylene oxide :-Most widely used gaseous sterilization agent in pharmaceutical & medical field.

(b) BY USING DISINFECTANTS

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- 2) R Ananthanarayan,CK Jayaram Paniker, Ananthanarayan & Paniker's Textbook of Microbiology Published by Oreint Longman ,seventh edition

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