

FILTRATION BY SEITZ FILTER AND MEMBRANE FILTER

ASSEMBLY

By

Dr. AJAY RAI

Assistant Professor

FILTRATION

USE OF FILTRATION TECHNIQUE / FILTER –

- 1) For separation of viruses from bacteria
- 2) For the presence of a virus
- 3) Approximate size of the virus
- 4) Sterilization of certain thermo-labile material

- 1) For **separation of viruses from bacteria** - The filters remove bacteria either by mechanically withholding them from passing through the minute pores of filters or by absorption of bacteria to the filter because of the difference in their electrical charges.
- 2) For **the presence of a virus** - If a filtrate proved infectious and no bacteria could be demonstrated, then a virus was presumed to be present.
- 3) **Approximate size of the virus** - Filters of various porosities were manufactured and by passing a virus through series of filters having pores of known size, the approximate size of the virus was determined by noting which filter allowed the passage of the virus and which retained it.
- 4) For **sterilization of certain thermo-labile material** like serum, trypsin solutions, cell culture media etc.

COMMONLY USED MICROBIOLOGICAL FILTERS –

- 1) Berkefeld and Mandler filters
 - 2) Chamberland and Selas type filters
 - 3) Seitz filters
 - 4) Sintered glass filters
 - 5) Membrane filters
- } Candle filters

1) BERKEFELD AND MANDLER FILTERS –

- These are made of **diatomaceous earth**.
- Berkefeld is graded into three porosity -
 - a) **V (Viel) grade** - is coarse, used for preliminary filtration to remove some bacteria and large particles from a solution.
 - b) **N (Normal) grade** - retains all bacteria while nearly all viruses will pass through.
 - c) **W (Wenig) grade** - have very small pores and will retain all bacteria as well as some large viruses.
- Mandler filter - is graded into (a) **preliminary**, (b) **regular** and (c) **fine** grades.

2) CHAMBERLAND AND SELAS TYPE FILTERS –

- These are made of **unglazed porcelain**, molded into a candle form.
- Chamberland is graded in porosities of Li-coarse grade to L13- the finest grade.
- Selas filters are graded from XF, XFF, No-10 and No-01, which are coarse grades to No-015, No-02 and No-03 which retain bacteria.

3) SEITZ FILTER -

- These filters are **asbestos pads**
- Manufactured in two grades - K, which is coarse, and EK, which retains bacteria.
- These pads are held in a metal holder and are discarded after being used once to eliminate cleaning.

4) SINTERED GLASS FILTER -

- These are made of **fused porous glass**.
- They are graded into specially fine (“grade 5”) and a coarser (“grade 3”) layer and is known as the “375” type.
- These filters are attached to the filtering apparatus in same way as Seitz filter.

5) MEMBRANE FILTER -

- These are made of **cellulose membrane** or **cellulose derivatives**.
- They are manufactured in a variety of porosities.
- Those used in the virology are - **coarse** with the pore diameter 3μ to 0.75μ **medium** 0.75μ to 0.5μ , **dense** 0.5μ to 0.2μ and **very dense** below 0.2μ .

PREPARATION OF FILTERS FOR USE -

- Before a filter is used, it must be clean, sterile and free from leaks.
- New filter of the **Berkefeld or Mandler type** should be washed free of dust by passing distilled water through them from the outside to the inside of the filter and then reversing the flow.
- Sterilization of filter of the **molded candle type** is usually accomplished by autoclaving for 5 hours at 121°C after which they are gradually cooled and allowed to dry.
- Sterilization of **asbestos pad filter** is done by autoclaving the pad assembled in its receptacle for 30 minutes at 121°C.

DRAW DIFFERENT TYPES OF FILTERS SHOWN (SPOTTING)

- Blotting paper
- Whatman's filter paper no. 1
- Mandler filter
- Sintered glass filter (Buchner funnel type)
- Sintered glass filter (Crucible type)
- Seitz filter
- Membrane filter
- Seitz filter assembly
- Membrane filter assembly
- Syringe membrane filter
- Vacuum pump
- Seitz filter assembly along with vacuum pump
- Membrane filter assembly along with vacuum pump

EXERCISE - 1

- **Filtration of liquid by seitz filter assembly and membrane filter assembly**

REQUIREMENT –

- Laminar flow cabinet
- sterile seitz filter,
- seitz filter assembly,
- vacuum and pressure pump,
- liquid for filtration,
- sterile Erlenmeyer flask,
- sterile funnel

PRINCIPLE - Successful filtration is to a great extent dependent on the **porosities and charge of the filters** and **size of the virus** to be filtered. Filter must be chosen which has pores larger than virus to be passed into the filtrate. On the other hand, the filter pores must be small enough to withhold bacteria, which may be present.

PROCEDURE –

1. Sterilize the **asbestos pad filter** assembled in its receptacle (filter assembly) by autoclaving for 30 minutes at 121°C.
2. Connect the vacuum and pressure pump side nozzle to the Erlenmeyer flask of the filter assembly.
3. Pour liquid in the funnel of the filter and let the vacuum and pressure pump function.
4. By means of negative pressure the liquid will pass through the asbestos filter pad into the empty flask which will be bacteria free.