

CHEMICAL METHODS OF STERILIZATION

Action of chemical agents

Mechanism:

- Protein coagulation
- Disruption of cell membrane resulting in exposure, damage/loss of contents
- Removal of sulfhydryl group essential for normal functioning Of enzyme
- Substrate competition.

Commonly used chemical

1. Reagents:

Alcohol

- Frequently used are Ethyl alcohol ,Isopropyl alcohol
- These must be used at concentration 60-90%.
- Isopropyl alcohol used in disinfection of clinical thermometer.
- Methyl alcohol is effective against fungal spores, treating cabinets and incubators.
- Methyl alcohol is also toxic and inflammable.

Aldehyde

- Formaldehyde:
- Having Bactericidal, sporicidal and has lethal effect on viruses.
- Used to preserve anatomical specimens, destroying anthrax
- spores on hair and wool.

Glutaldehyde:

- Effective against tubercle bacilli, fungi, viruses.
- Less toxic and irritant to eyes, skin
- Used to treat anaesthetic rubber, face masks, plastic endotracheal tubes, metal instruments and polythene tubing.

2. Dyes:

Two groups of dyes:

1. Aniline dye

2. Acridine dye

- Both are bacteriostatic in high dilution but are of low bactericidal activity.
- Aniline dye is more active against gram +ve than gram-ve organisms.

Some important dyes:

- Proflavine
- Acriflavine
- Euflavine
- Aminacrine
- These Impair the DNA complexes of the organisms and thus kill or destroy the reproductive capacity of the cell.

Halogens

- **Iodine**
- Used as Skin disinfectant
- Having Active bactericidal activity & moderate action on spores.
- **Chlorine**
- Used to disinfect Water supplies, swimming pools and food and dairy industries.
- Along with hypochlorides are bactericidal. Also act on viruses.

Phenols

- These are obtained from distillation of coal tar between 170- 270 C.
- Lethal effects are:
- Capacity to cause cell membrane damage, releasing cell contents and causing lysis.
- Low concentration will precipitate proteins.

3. Gases:

- Types of gases used for sterilization:
- Ethylene oxide
- Formaldehyde gas
- Beta propiolactone (BPL).

Ethylene oxide:

- Action is due to its alkylating the amino, carboxyl, hydroxyl and sulphhydryl groups in protein molecules.
- Also on DNA and RNA.
- Items: heart-lung machines, respirators, sutures, dental equipment, books, clothing.

Formaldehyde gas:

- This is widely employed for fumigation of Operation Theatre and other rooms.
- Formaldehyde is produced by adding 150g of KMnO_4 to 280ml of formalin for every 1000cu.ft of roomvolume, after closing the windows and other outlets.
- After fumigation, the doors should be sealed and left unopened for 48 hours.

Beta propiolactone:

- Product of ketane and formaldehyde with a boiling point of 163 C.
- Having rapid bactericidal activity but carcinogenic.
- Capable of killing all microorganisms and is very active against viruses.