SNS COLLEGE OF ALLIED HEALTH SCIENCE

Affiliated to The Tamil Nadu Dr M.G.R Medical University, Chennai

DEPARTMENT OF OPERATION THEATRE AND ANAESTHESIA

TECHNOLOGY

COURSE NAME: MICROBIOLOGY

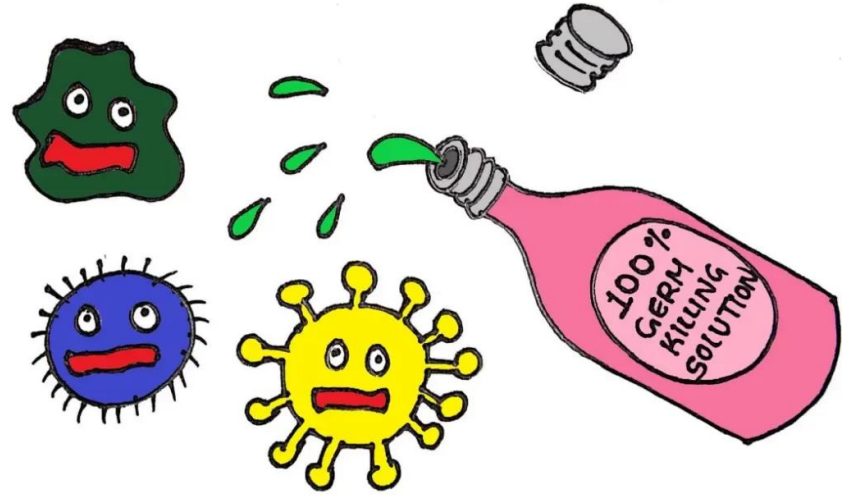
UNIT : 1

TOPIC : STERILIZATION – CHEMICAL METHODS

FACULTY NAME: MITHRA V

INTRODUCTION

- **Chemical methods** use agents to eliminate/reduce pathogens on surfaces, equipment, and skin.
- **Agents**: Disinfectants (surfaces) or antiseptics (skin).
- **Target**: Bacteria, fungi, viruses; some kill spores.
- **Mechanism**: Disrupt cell membranes, proteins, enzymes, or DNA.
- **Uses**: Medical, laboratory, and industrial settings.



- **Common agents**:
- Alcohols
- Aldehydes
- Phenols
- Halogens
- Heavy metals
- Surfactants
- Dyes
- Hydrogen peroxide
- Ethylene oxide

ALCOHOLS

- **Mode of Action**: Dehydrates cells, disrupts membranes, coagulates proteins.
- **Examples**: Ethyl alcohol, isopropyl alcohol, methyl alcohol.
- **Applications**:
  - 70% ethyl alcohol: Antiseptic for skin.
  - Isopropyl alcohol: Disinfects clinical thermometers.
  - Methyl alcohol: Disinfects inoculation hoods
  - **Disadvantages**: Skin irritant, volatile, flammable.

ALDEHYDES

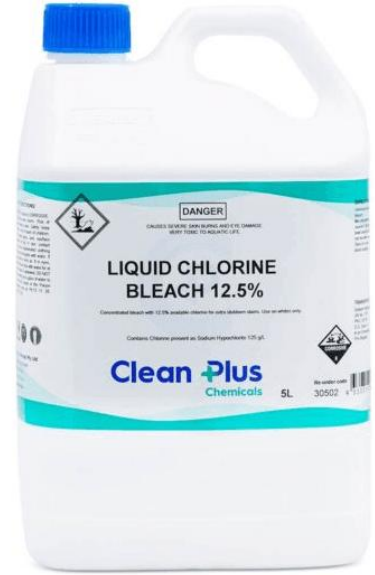
- **Mode of Action**: Kills all microorganisms, including spores.
- **Examples**: Formaldehyde, glutaraldehyde.
- **Applications**:
  - 40% formaldehyde (formalin): Fumigation of rooms
  - 2% glutaraldehyde: Sterilizes thermometers, cystoscopes.
  - **Disadvantages**: Irritating vapors, poor penetration

PHENOLS

- **Mode of Action**: Disrupts membranes, inactivates enzymes.
- **Examples**: 5% phenol, 5% Lysol, chlorhexidine, chloroxylenol (Dettol).
- **Applications**:
  - High concentration: Disinfectant.
  - Low concentration: Antiseptic.
  - Chlorhexidine: Skin disinfection, wound irrigation.
- **Disadvantages**: Toxic, corrosive, skin irritant.

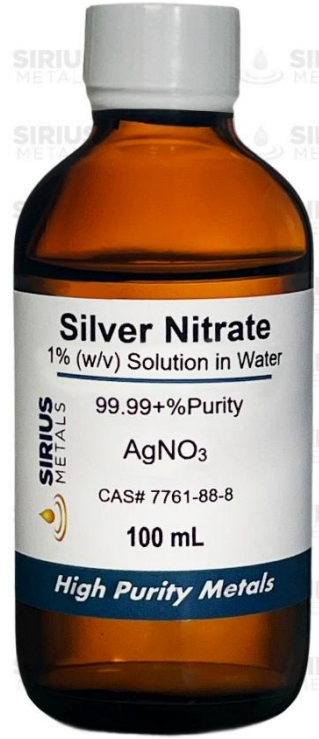
HALOGENS

- **Mode of Action**: Oxidizing agents, damage enzymes.
- **Examples**: Chlorine (hypochlorite), iodine (tincture iodine)
- **Applications**:
  - Tincture iodine (2% in 70% alcohol): Antiseptic.
  - 10% povidone iodine: Pre/postoperative skin disinfection.
  - Chlorine: Swimming pool disinfection.
  - 0.5% sodium hypochlorite: Used in serology & virology.
- **Disadvantages**: Inactivated by organic matter.



HEAVY METALS

- **Mode of Action**: Precipitates proteins, bacteriostatic.
- **Examples**: Mercuric chloride, silver nitrate, copper sulfate.
- **Applications**:
  - 1% silver nitrate: Treats neonatal conjunctivitis.
  - Copper salts: Fungicide.
- **Disadvantages**: Mercuric chloride is toxic



HYDROGEN PEROXIDE

- **Mode of Action**: Releases hydroxyl-free radicals, damages proteins and DNA.
- **Applications**:
  - 6% solution: Decontaminates instruments, ventilators.
  - 3% solution: Skin disinfection, deodorizes wounds/ulcers.
- **Disadvantages**: Decomposes in light, broken down by catalase

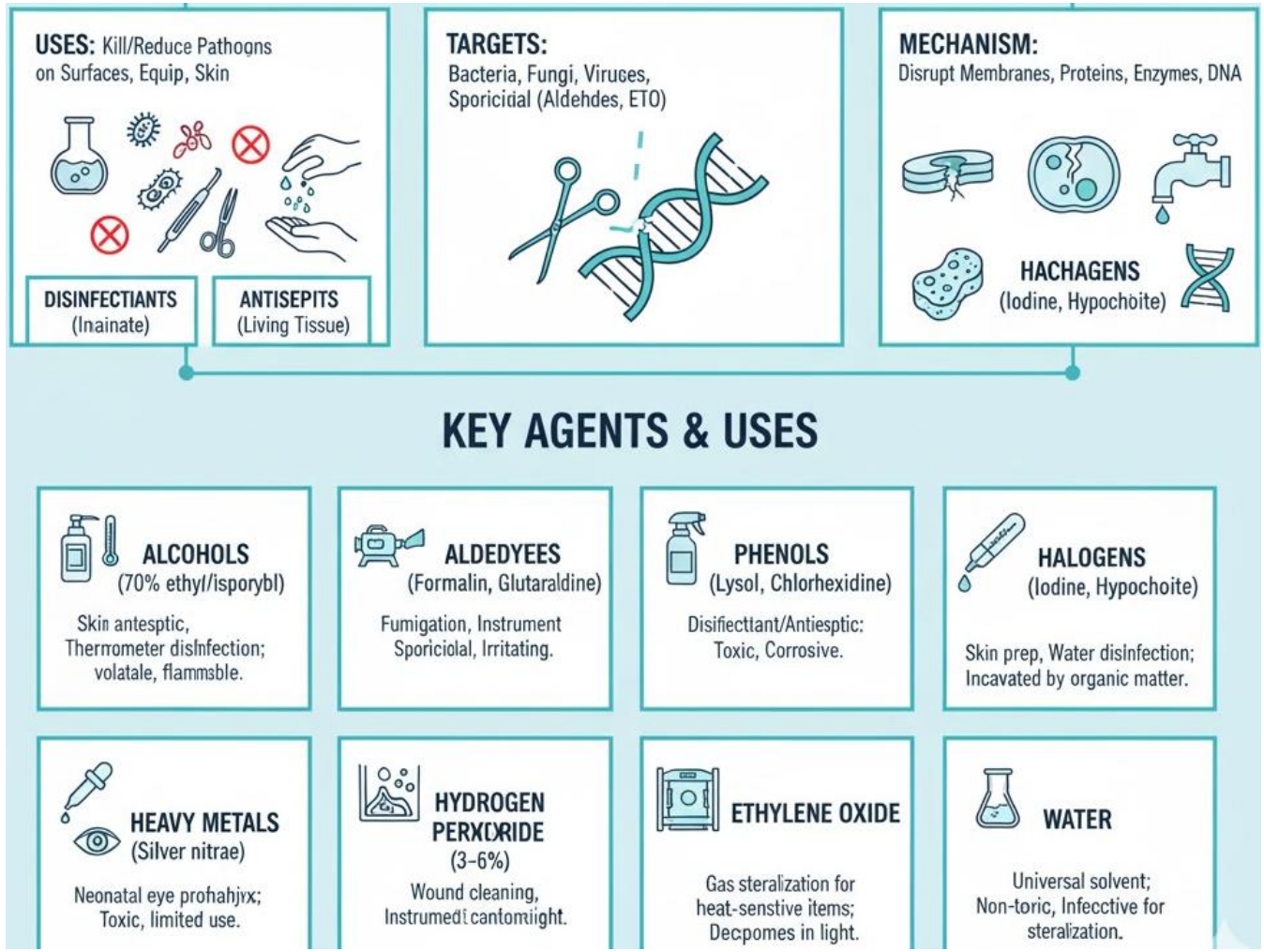
ETHYLENE OXIDE

- **Mode of Action**: Alkylating agent, kills spores rapidly.
- **Properties**: Colorless, flammable liquid with sweet odor.
- **Applications**: Sterilizes heat-labile items

(bedding, textiles, rubber, plastics, syringes, heart-lung machines).

- **Disadvantages**: Toxic, irritating, flammable, mutagenic, carcinogenic.

SUMMARY


USES: Kill/Reduce Pathogens on Surfaces, Equip, Skin
DISINFECTIANTS (Inainate)
ANTISEPITS (Living Tissue)
TARGETS:
Bacteria, Fungi, Viruces, Sporicidal (Aldehdes, ETO)
MECHANISM:
Disrupt Membranes, Proteins, Enzymes, DNA
HACHAGENS (Iodine, Hypochoite)
KEY AGENTS & USES
ALCOHOLS (70% ethyl/isporybl)
Skin antesptic, Thermometer disInfection; volatale, flammsble.
ALDEDYEES (Formalin, Glutaraldine)
Fumigation, Instrument Sporicidal, Irritating.
PHENOLS (Lysol, Chlorhexidine)
Disifiecttant/Antiesptic: Toxic, Corrosive.
HALOGENS (Iodine, Hypochoite)
Skin prep, Water disinfection; Incavated by organic matter.
HEAVY METALS (Silver nitrae)
Neonatal eye prohahjvx; Toxic, limited use.
HYDROGEN PERXOXIDE (3–6%)
Wound cleaning, Instrumedi cantomiight.
ETHYLENE OXIDE
Gas steralization for heat-senstive items; Decpomes in light.
WATER
Universal solvent; Non-toric, Infecctive for steralization.

REFERENCES

- Ananthanarayan and Paniker's Textbook of Microbiology
- Bailey & Scott's Diagnostic Microbiology
- **Centers for Disease Control and Prevention (CDC) – Guideline for Disinfection and Sterilization** URL: https://www.cdc.gov/infectioncontrol/guidelines/disinfection/
- **World Health Organization (WHO) – Decontamination and Sterilization** URL: https://www.who.int/publications/i/item/decontamination-and-reprocessing-of-medical-devices

THANK YOU