Lecture 6 Part-I

Sterilization & Disinfection

Objectives

Sterilization& Disinfection (Definitions)

Sterilization

Disinfection

Antiseptics

Germicide

Cleaning

Decontamination

Sterilization & Disinfection

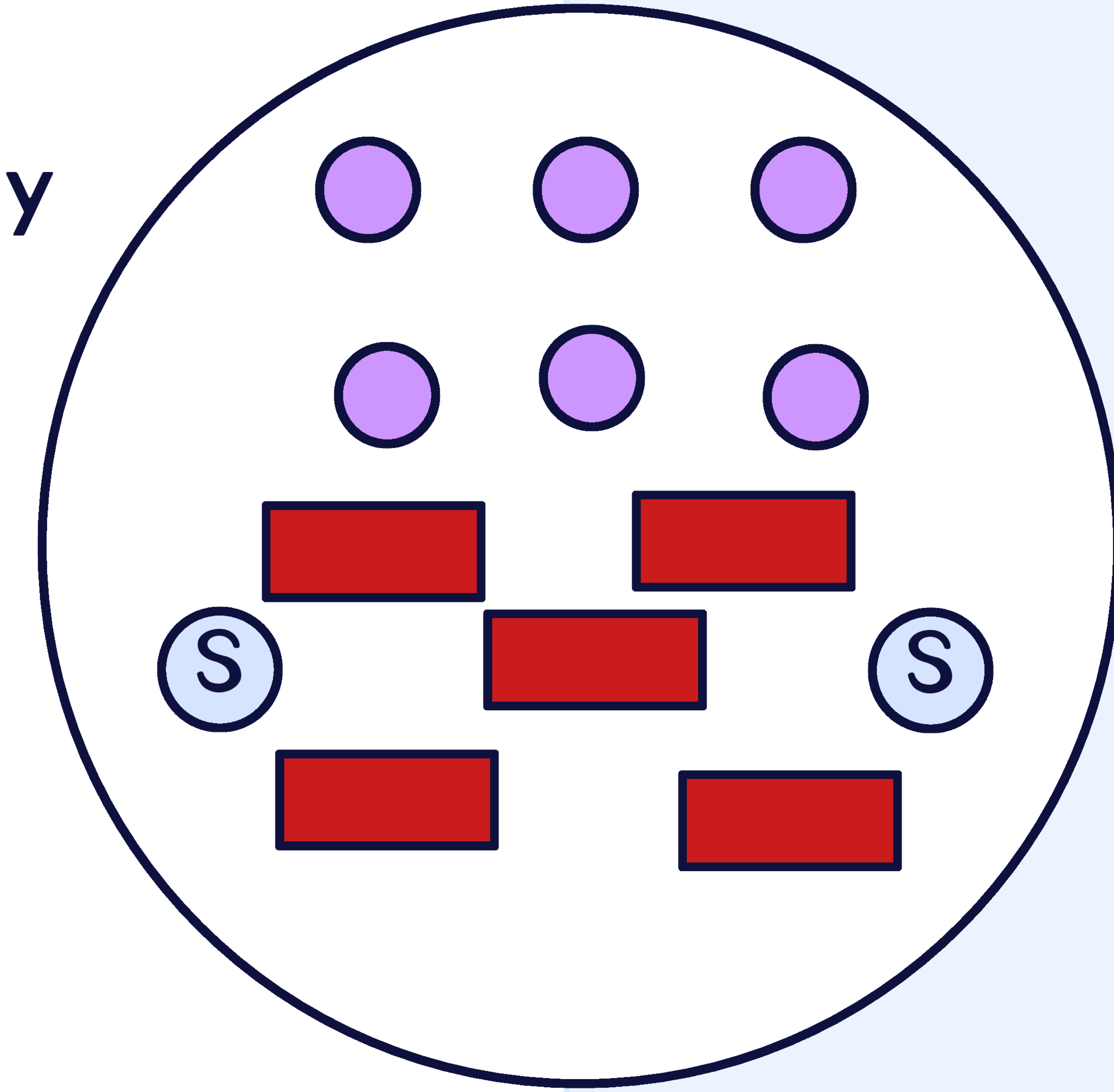
Fight bacteria

Inside the body → Antibiotics

Outside the body → Sterilization & Disinfection

Sterilization

Removal or killing of all forms of living microorganisms, including bacterial spores, by physical or chemical methods.



Sterilization

Absolute term

Killing or removing All Microorganisms

Sterilization

Need for what

Surgical instruments

Sterilization

Syringes

Gloves

catheters

Culture media

Sterilization can be achieved by

Physical methods

Heat

Radiation

Filtration

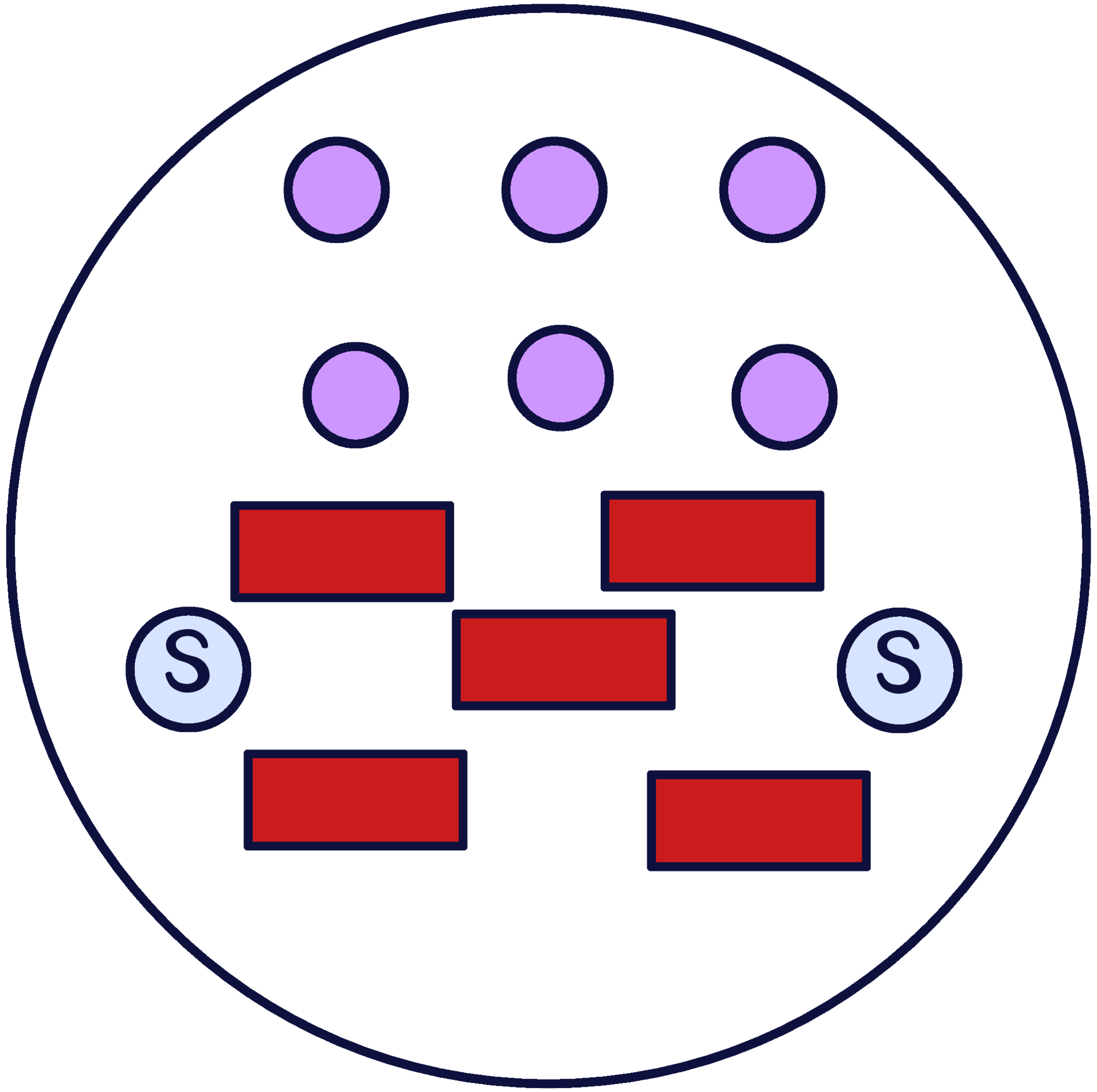
Chemical methods

Gaseous

Liquids

Disinfection

Removal of most (if not all) pathogenic organisms, except bacterial spores, by physical or chemical methods.



Disinfection

- Disinfectants

Chemical substances that used to achieve disinfection

TOXIC

Disinfection

- Disinfectants may be:-

A) Low-level disinfectant

B) Intermediate level disinfectant

C) High-level disinfectant

Disinfection

C) Low level disinfectant

Kill MOST vegetative Bacteria EXCEPT

Mycobacterium tuberculosis and spores

Disinfection

B) Intermediate level disinfectant

Kill all microbes EXCEPT the Bacterial Spore.

e.g. alcohol

Disinfection

A) High level disinfectant

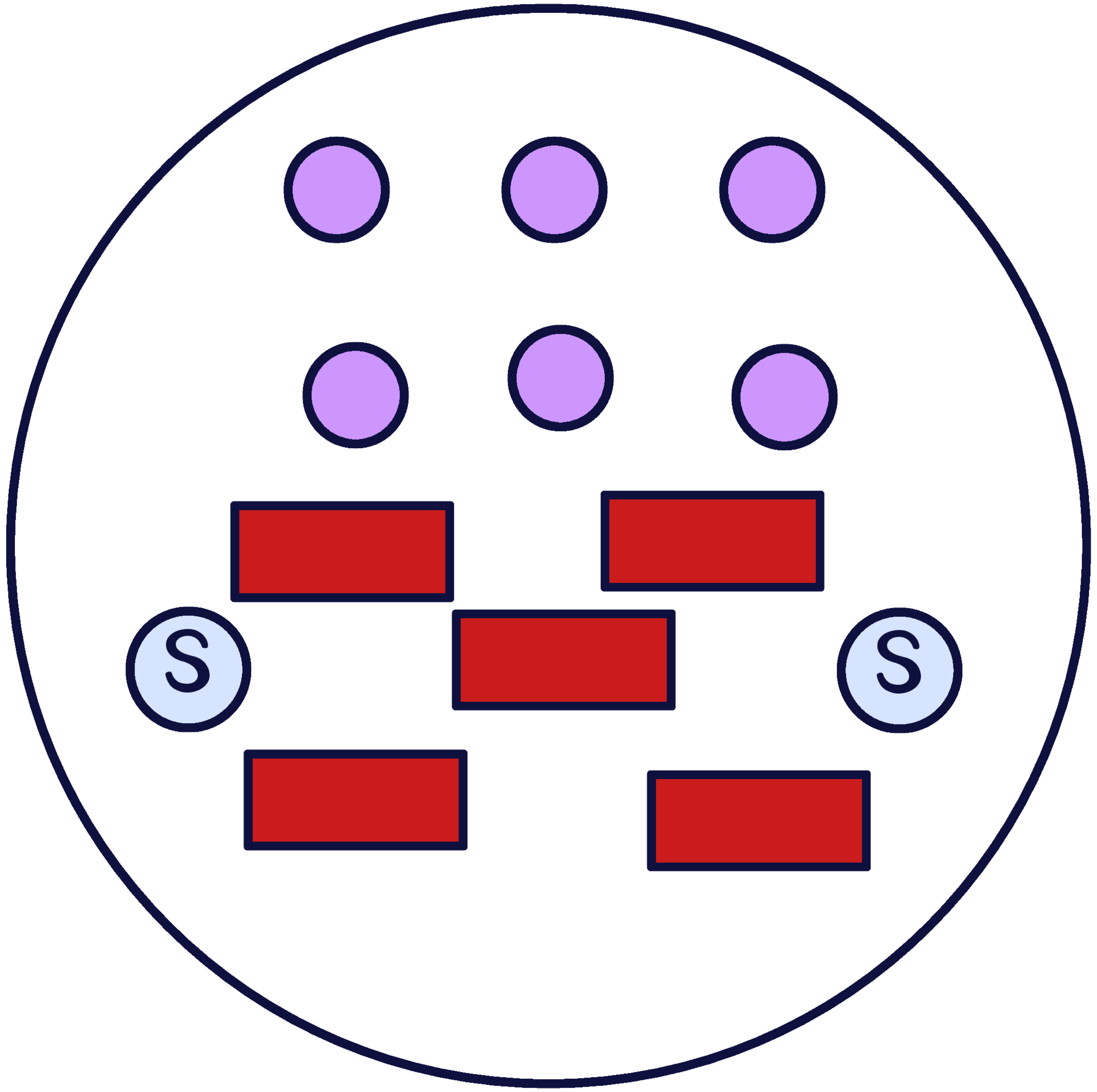
Kill all microbes EXCEPT <u>Large number</u> of bacterial Spore.

e.g. H_2O_2 For contact lens

Antiseptics

Removal most (if not all) microbes Except bacterial spore.

Non-TOXIC



Germicide

Agent destroy microorganism

Virucide

Bactericide

Fungicide

Germicide

Agent destroy microorganism and can act as

Disinfectant

Antiseptic

Sterilant

Germicide

We call the Germicide as Disinfectant, when it achieves disinfection

Germicide

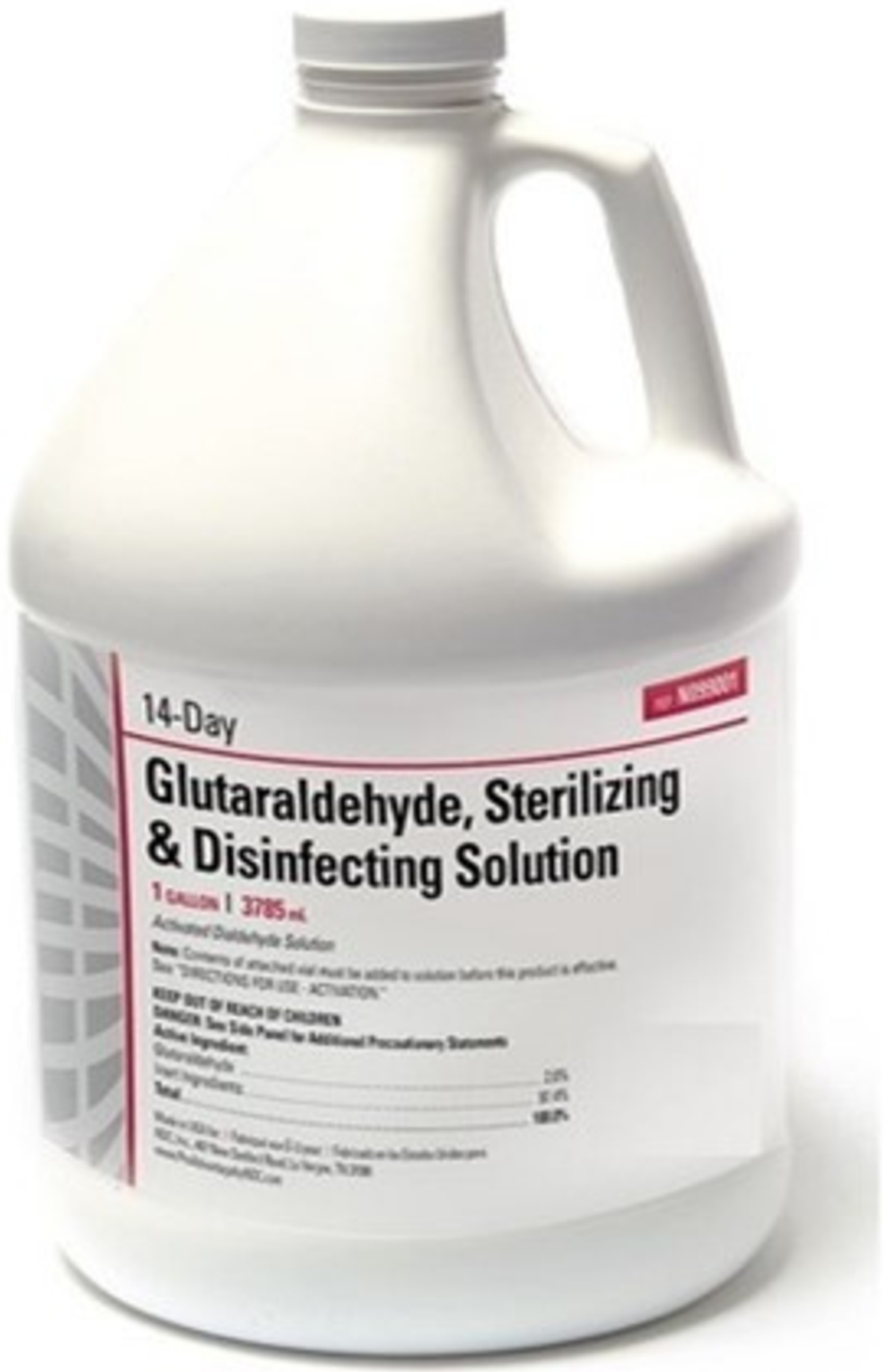
Antiseptic

We call the Germicide an Antiseptic when it is non-toxic and achieves disinfection

Germicide

Sterilant

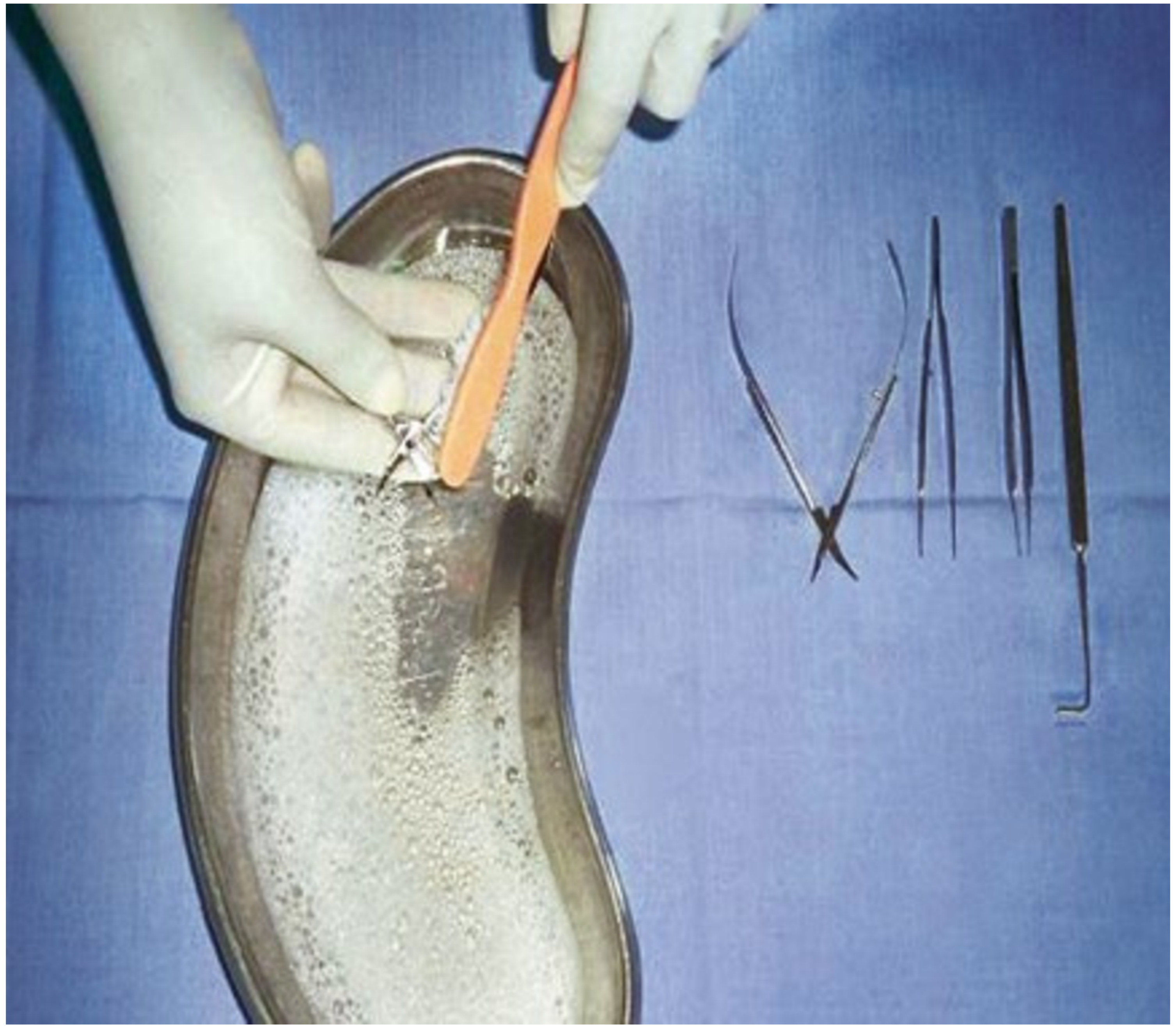
Chemical germicide that achieves sterilization



Cleaning

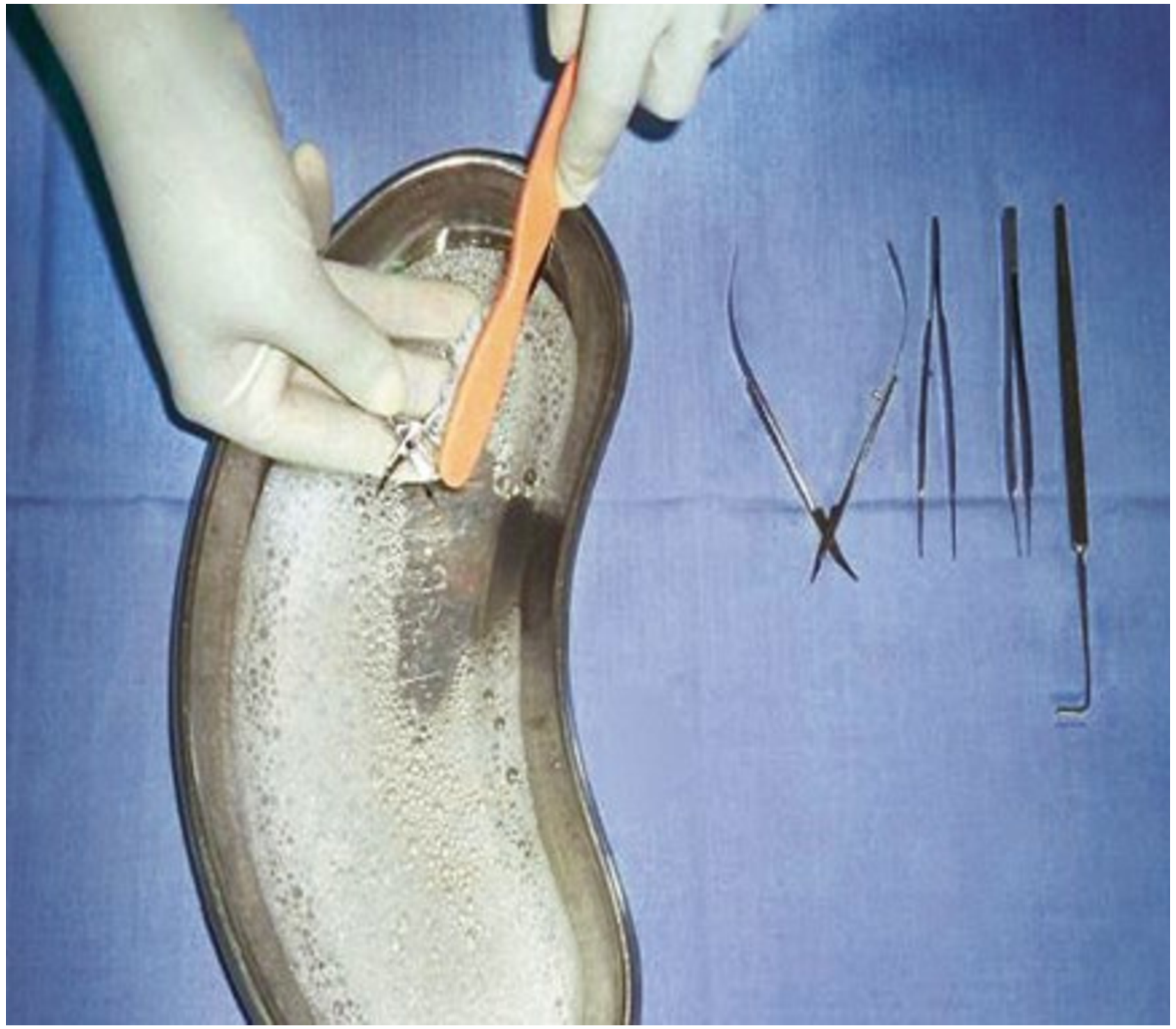
Removal of foreign material from medical devices by water & soap

Precede disinfection & sterilization



Decontamination

Reduction of organisms to a level which items are safe to handle



Include:-

- Cleaning
- Disinfection
- Sterilization

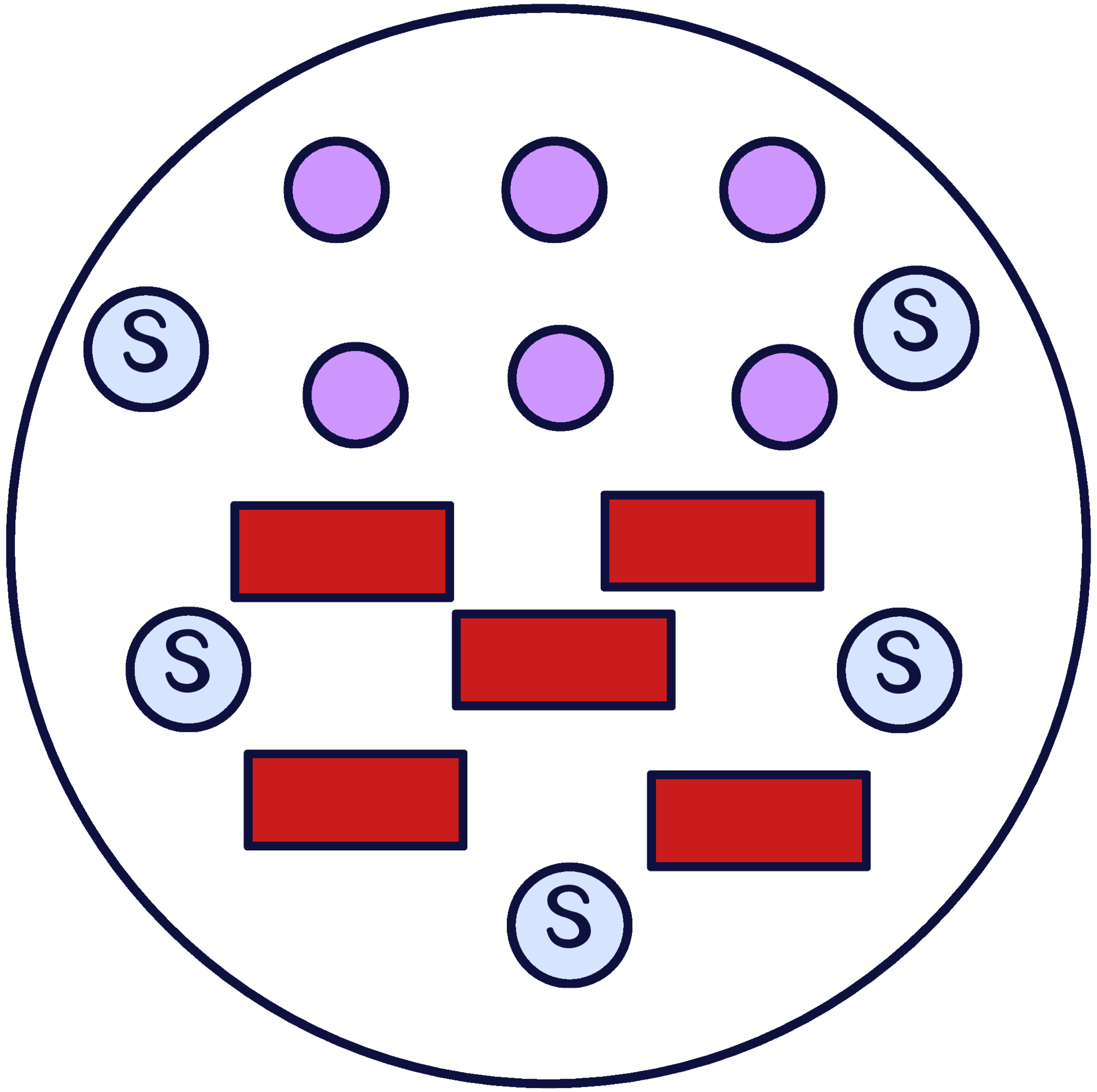
Objectives

Physical methods for disinfection

Chemical methods for disinfection

Disinfection

Removal most (if not all) pathogenic organisms except bacterial spore



Disinfection can be achieved by

Physical

1) Moist Heat

2) Radiation

Chemical

(Disinfectant)

Physical methods for disinfection

Moist heat

1) Moist heat below 100°C

(Pasteurization)

I) Moist heat below 100°C

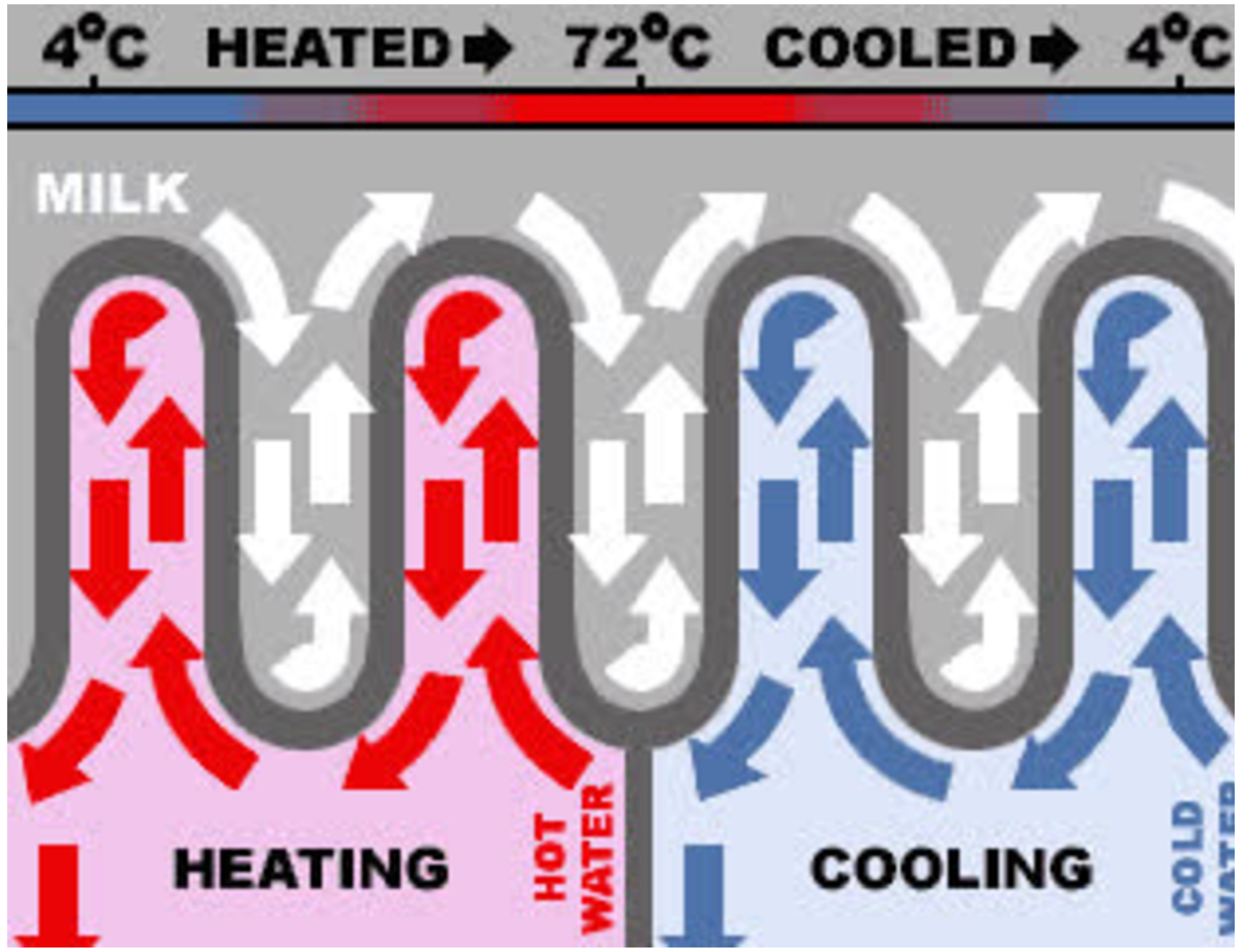
- Pasteurization

At 63°C for 30 min.

At 72°C for 20 sec.

Heat

Cooling

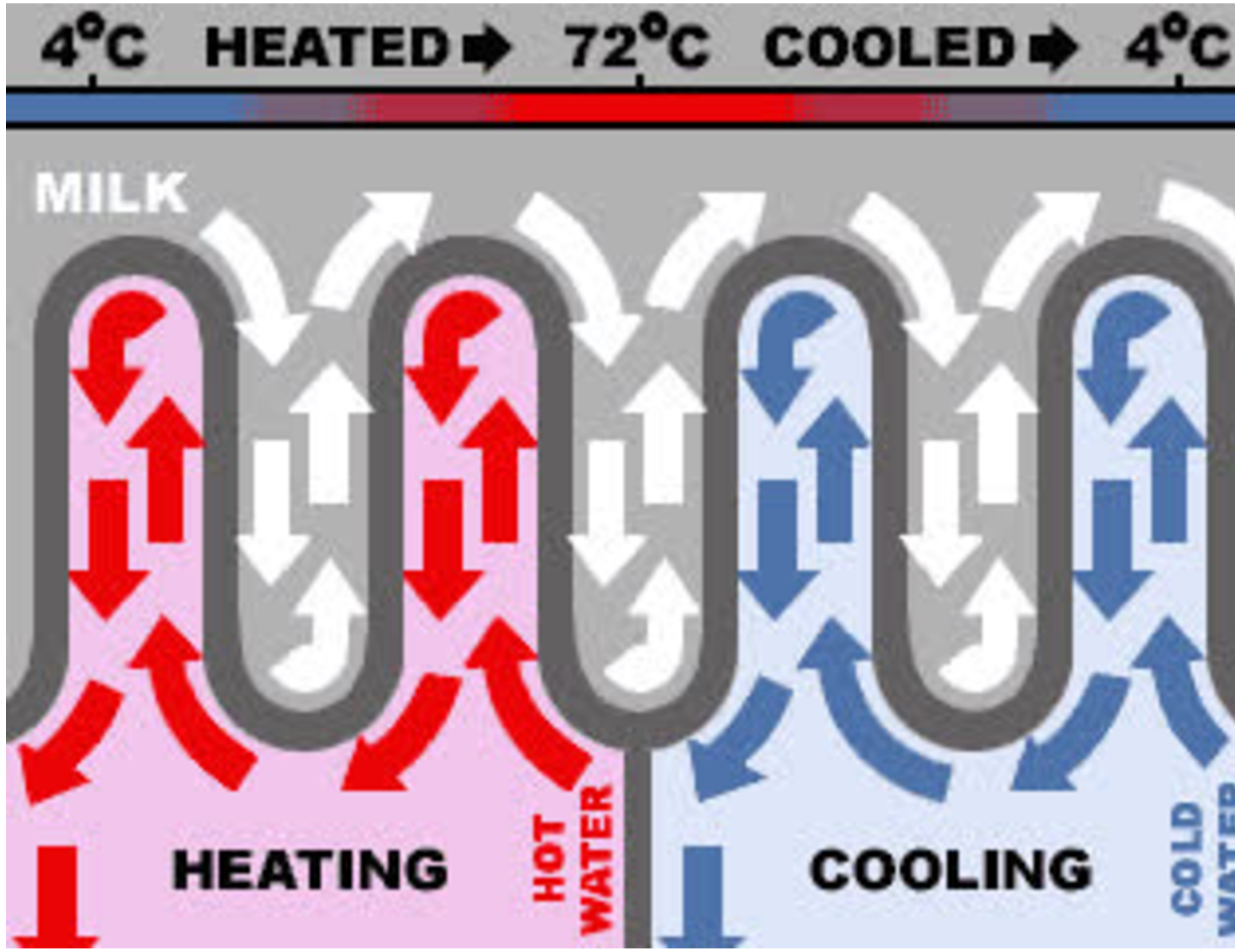


1) Moist heat below 100°C

- Pasteurization

Not sterilizing, Kills

- M. Tuberculosis
- B. abortus
- Salmonella
- C. burnetti



Physical methods for disinfection

1) Moist heat

2) Moist heat at 100°C

(Boiling)

1) Moist heat at 100°C

- Boiling (100°C) for 20 min.

- Kill all vegetative bacteria

- In emergency

I) Moist heat at 100°C

- Boiling (100°C) for 20 min.

- Glass

  Syringes
- Surgical

  instruments

Physical methods for disinfection

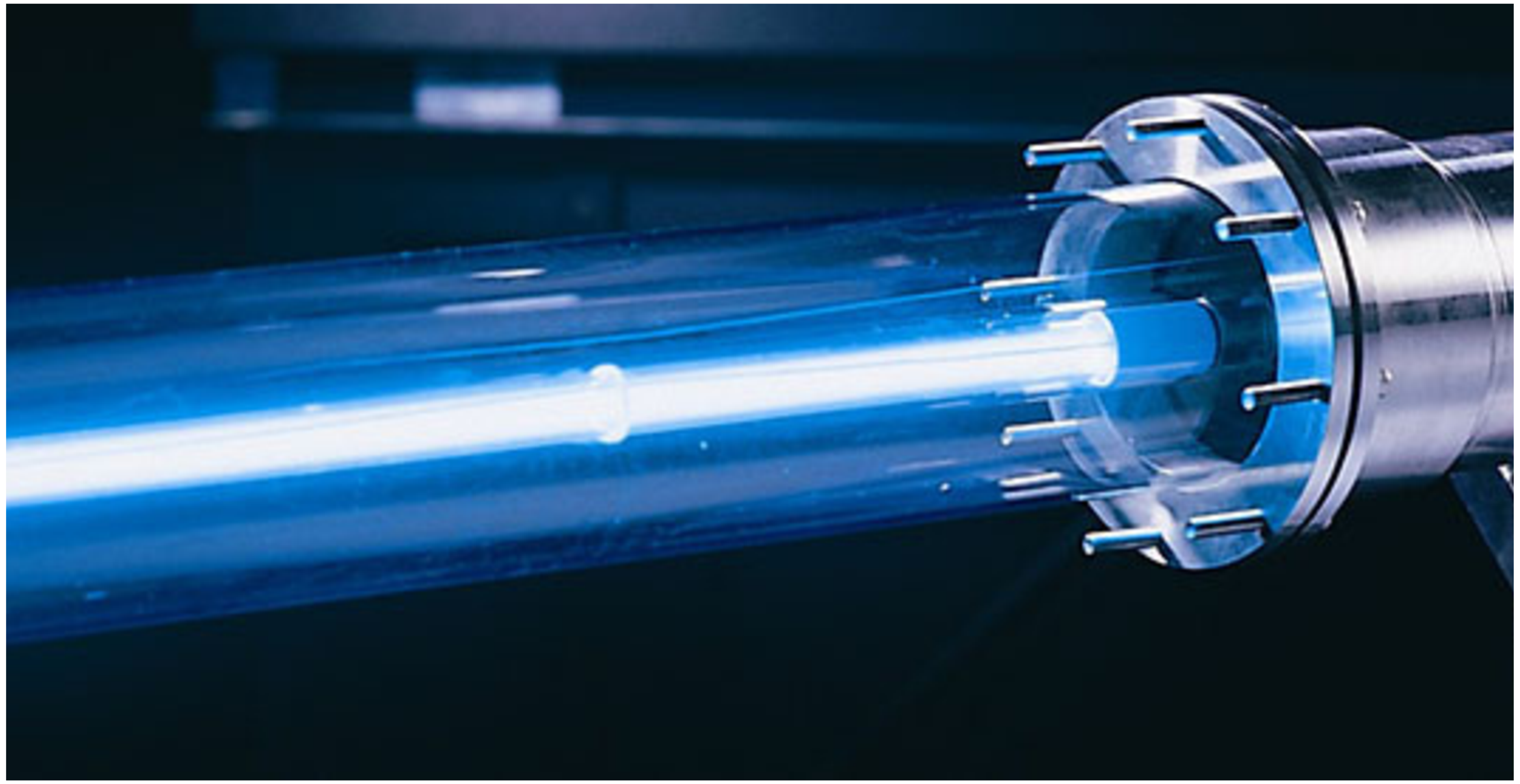
Radiation

Ultraviolet rays

Radiation

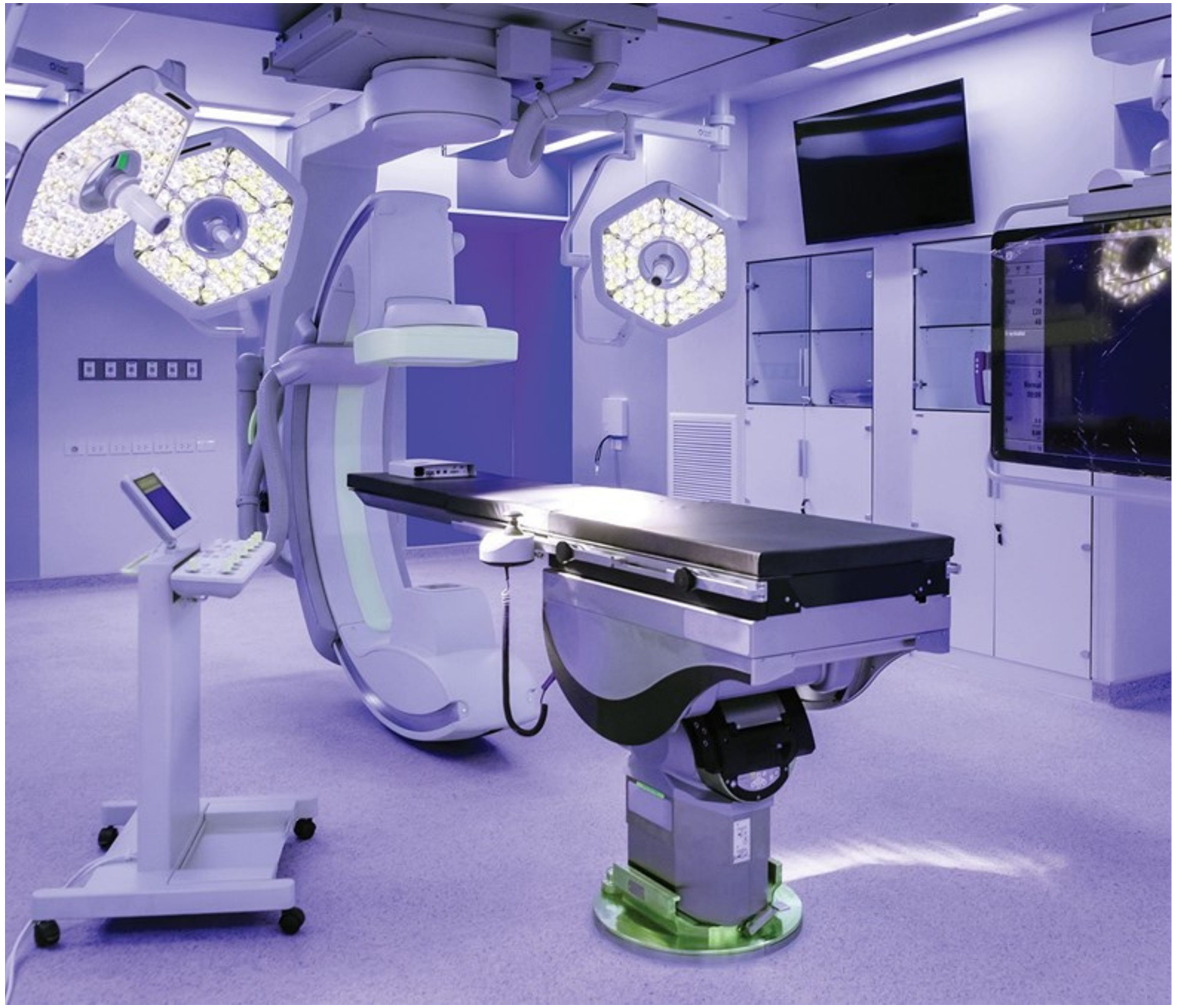
Ultraviolet rays

- Artificially by mercury lamps



Radiation

- Ultraviolet rays
  - Bactericidal
  - Carcinogen

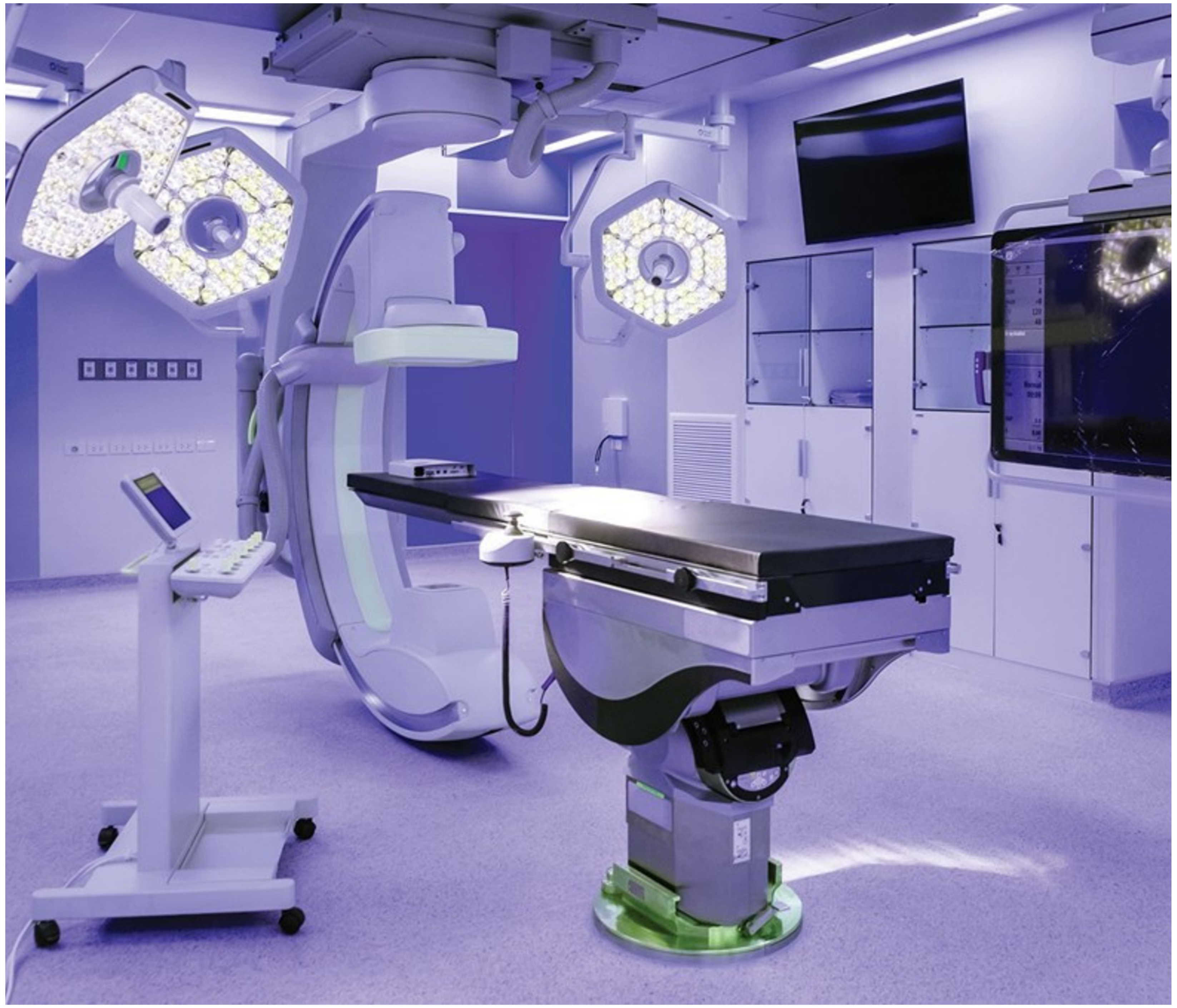


Radiation

- Ultraviolet rays
  - Operation room
  - Drug filling cubicles
  - Safety cabinets

Radiation

- Ultraviolet rays
  - Surface disinfectant
  - Low penetration



Chemical agents for disinfection

Low level disinfectants

Intermediate level disinfectants

High level disinfectants

Chemical agents for disinfection &Antiseptics

Why there is resistant to antibiotics and usually no resistant for chemical disinfectants ?

Chemical agents for disinfection &Antiseptics

Because Chemical disinfectants have a combination action

- Oxidation
- Denaturation
- Breaks DNA
- Cell membrane &cell wall damage

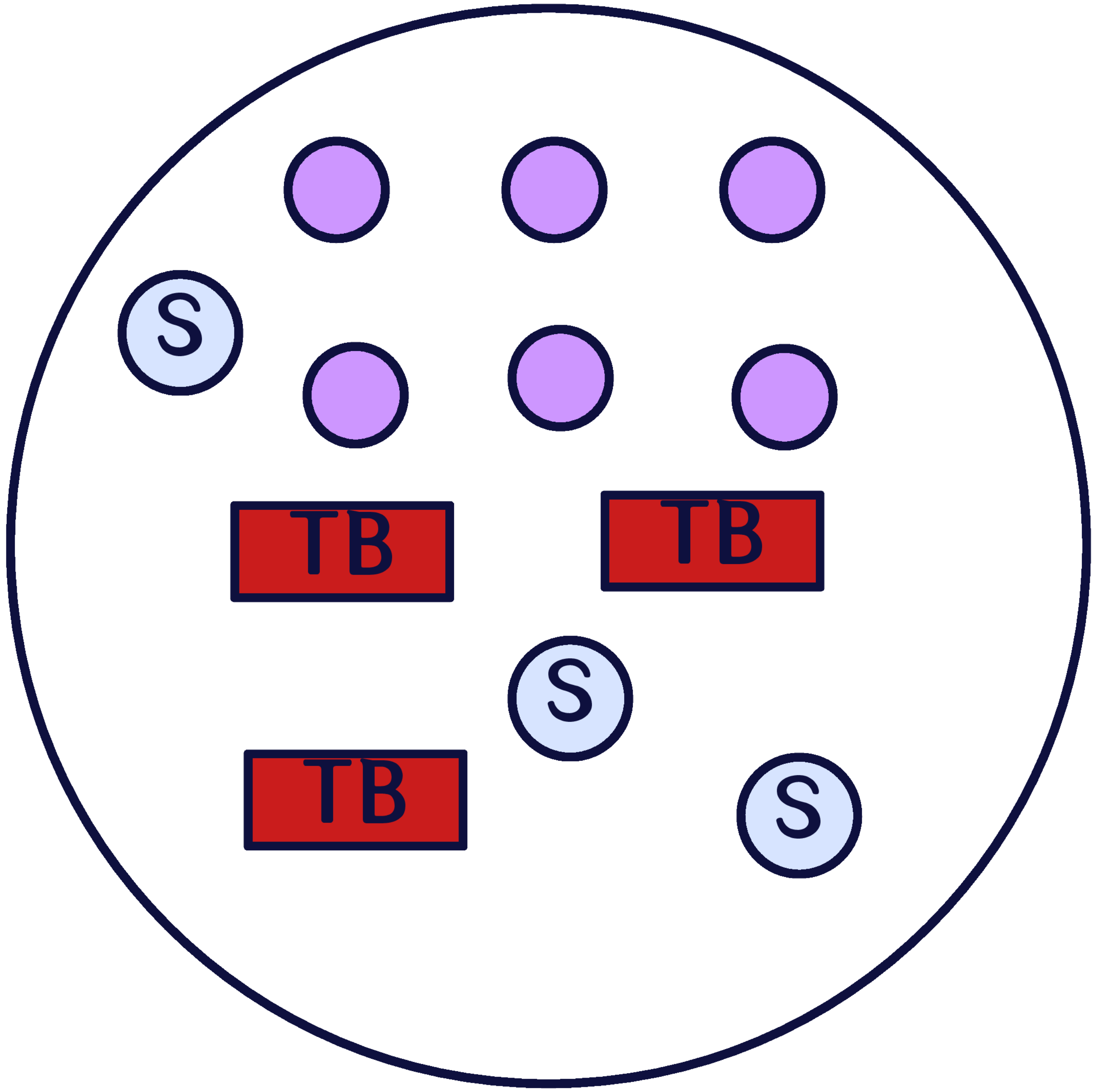
Chemical agents for disinfection & Antiseptics

I) Low level disinfectants

I) Low level disinfectants

Kills MOST

microbes, EXCEPT TB & bacterial Spore



I) Low level disinfectants

1) Quaternary Ammonium Compounds

- Benzethonium Chloride
- Benzalkonium chloride

I) Low level disinfectants

Disinfection of:-

- Floors
- Blood spills

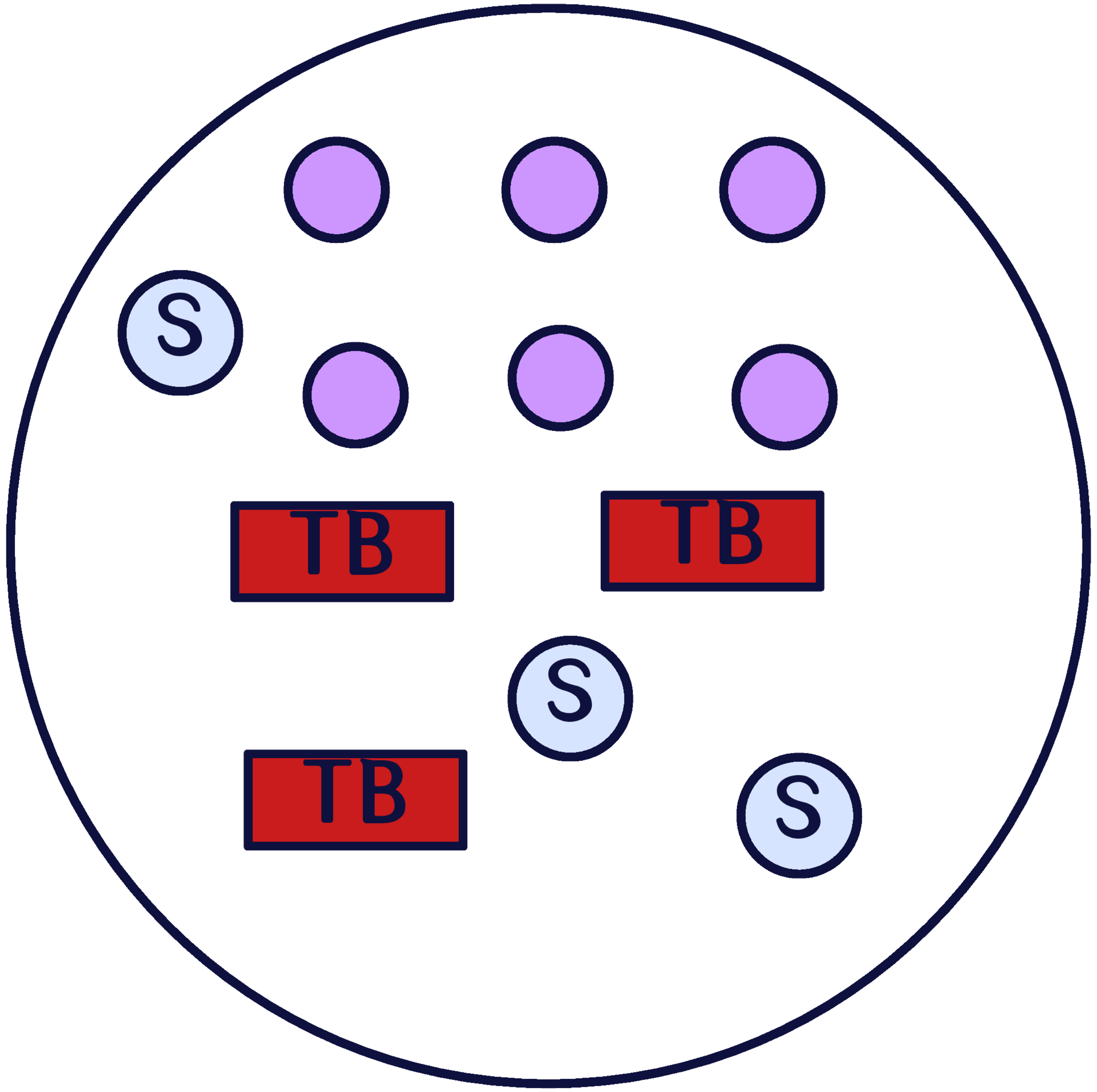
Chemical agents for disinfection or Antiseptics

II) Intermediate level disinfectants

II) Intermediate level disinfection

Kills most (all)

Microbes, EXCEPT bacterial Spore



Chemical agents for disinfection or Antiseptics

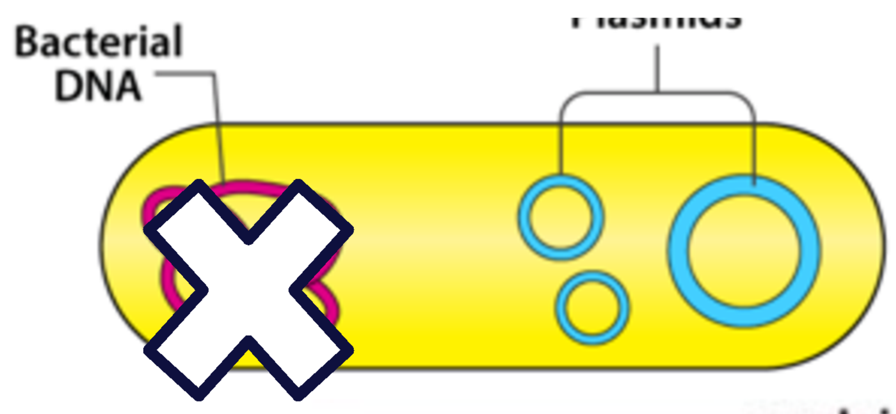
II) Intermediate level disinfectants

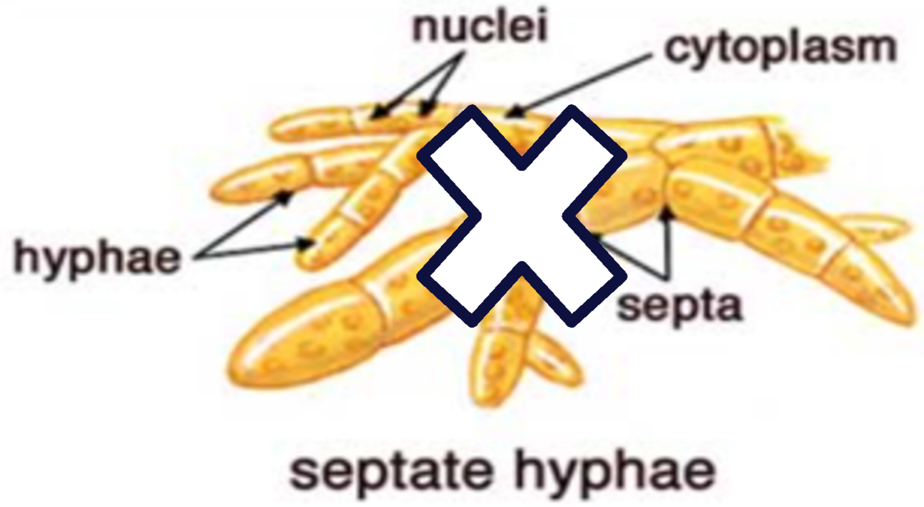
I) Alcohols

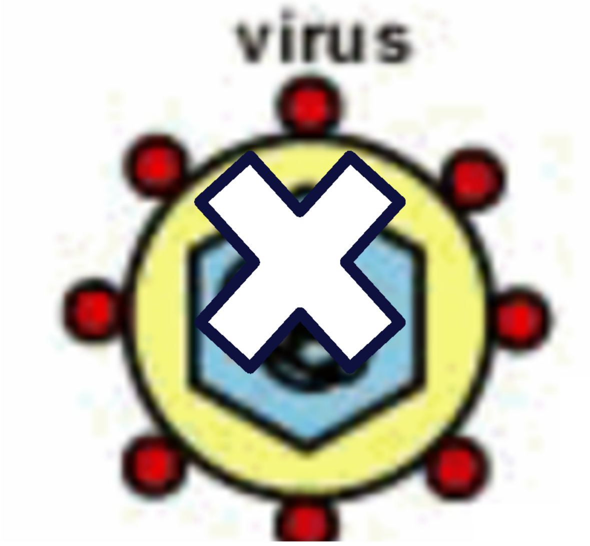
I) Alcohols

Alcohol 70%

- Bactericidal
- Fungicidal
- Viricidal (Enveloped)





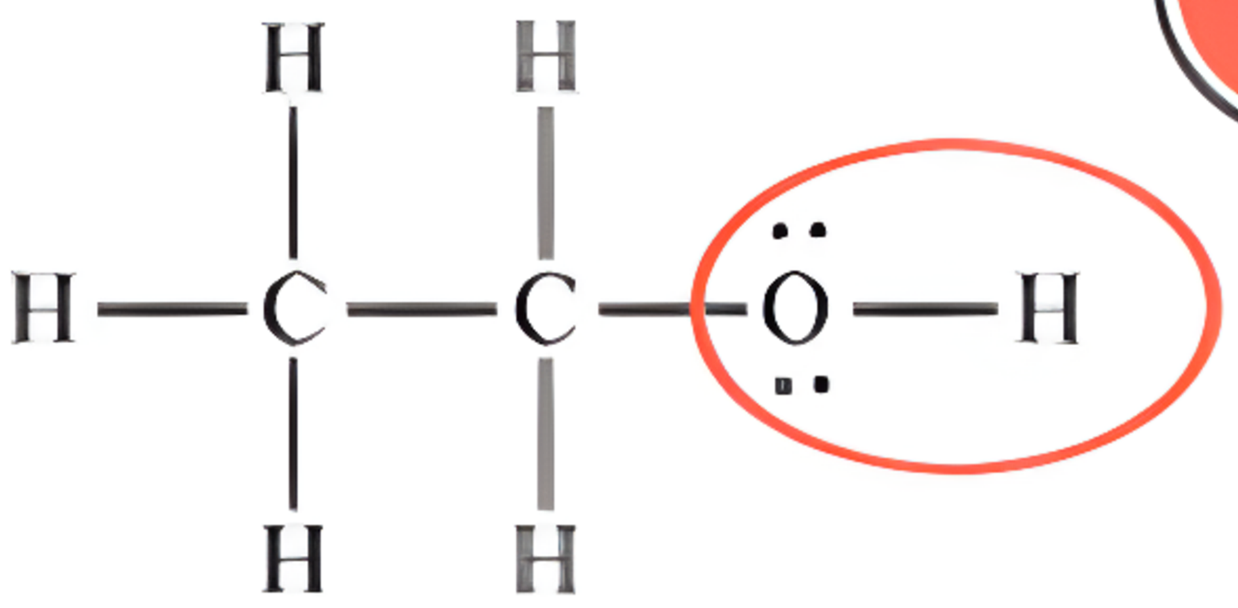


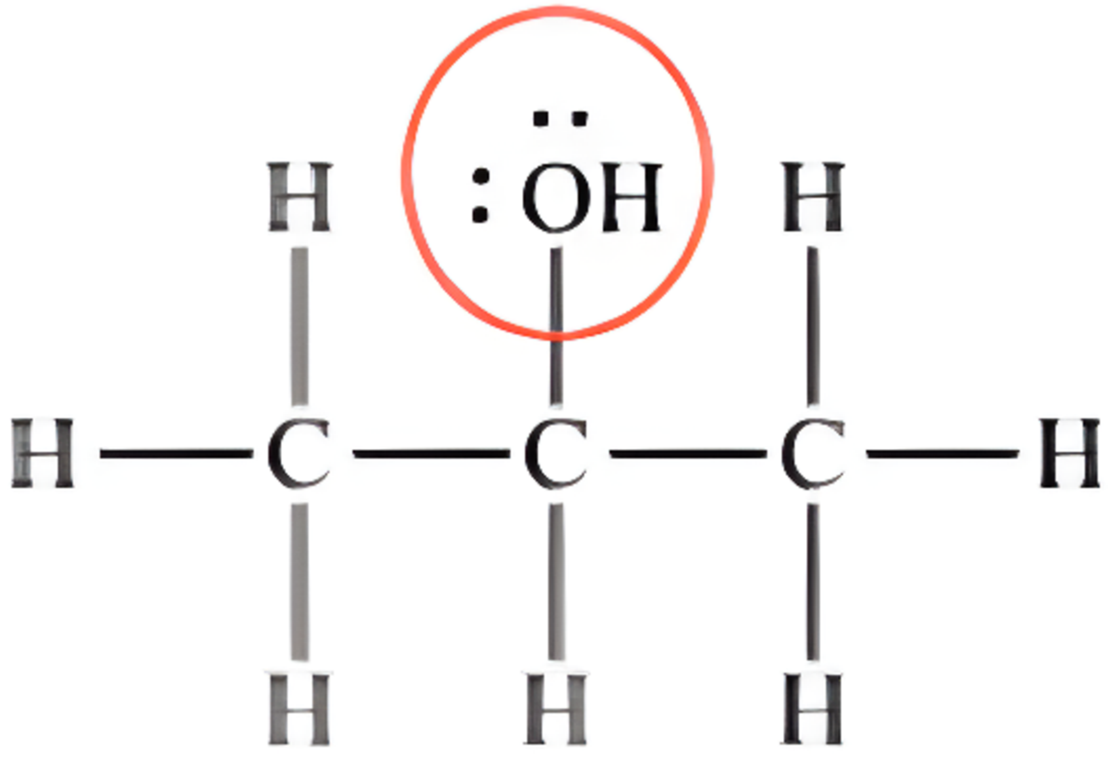
I) Alcohols

Kill microbes by:-

- Denaturation
- Membrane damage
- Disruption of lipid containing

1) Alcohols





ETHANOL

ISOPROPYL ALCOHOL

II) Intermediate level disinfection

- Isopropanol

  (Isopropyl alcohol)

II) Intermediate level disinfection

- Ethanol

  (Ethyl alcohol)

II) Intermediate level disinfection

- Used as:-

- Antiseptics
- Hand sanitizers

II) Intermediate level disinfection

- Methanol

  (Methyl alcohol)

- Blindness
- Damage in brain
- Death

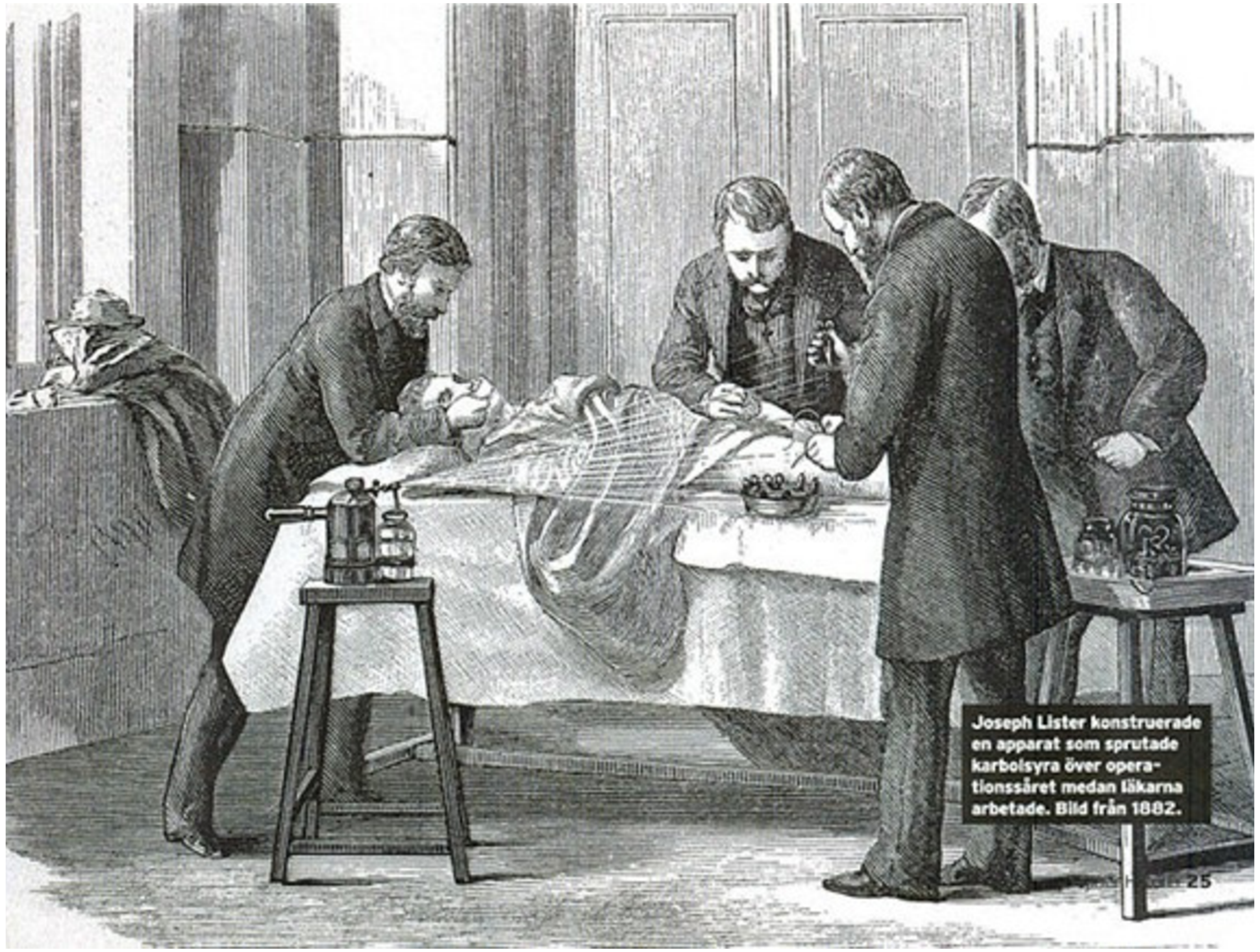
Chemical agents for disinfection or Antiseptics

II) Intermediate level disinfectants

2) Phenols

2) Phenols

First used in the *operation room* by <u>Lister</u> in 1867.



II) Intermediate level disinfection

Phenol derivatives

- Cresol(Lysol)
- Chloroxylenol

II) Intermediate level disinfection

Phenol kill derivatives

- Denaturation

- Membrane damage

II) Intermediate level disinfection

- Disinfectants
  - Floors
- Culture spills

Chemical agents for disinfection or Antiseptics

II) Intermediate level disinfectants

- Biguanides

3) Chlorhexidine

II) Intermediate level disinfection

Biguanides

- Chlorhexidine

- Antiseptic (Mouth washing)

Chemical agents for disinfection or Antiseptics

II) Intermediate level disinfectants

4) Halogens

4) Halogens

- Chlorines
- Iodines
- Fluorine

4) Halogens

- Kill microbes by
- Oxidation
- Denaturation

4) Halogens

- Iodines

- Tincture Iodine (2% Iodine + 2.4% sodium iodide in 50% ethanol)

Skin antiseptics

4) Halogens

Skin antiseptics

Betadine

(Povidone + Iodine)

4) Halogens

- Fluoride

  Toothpaste

Chemical agents for disinfection or Antiseptics

II) Intermediate level disinfectants

5) Heavy metals

5) Heavy metals

- Copper
- Nickle
- Zinc

Antimicrobial activity

5) Heavy metals

kill microbes by:-

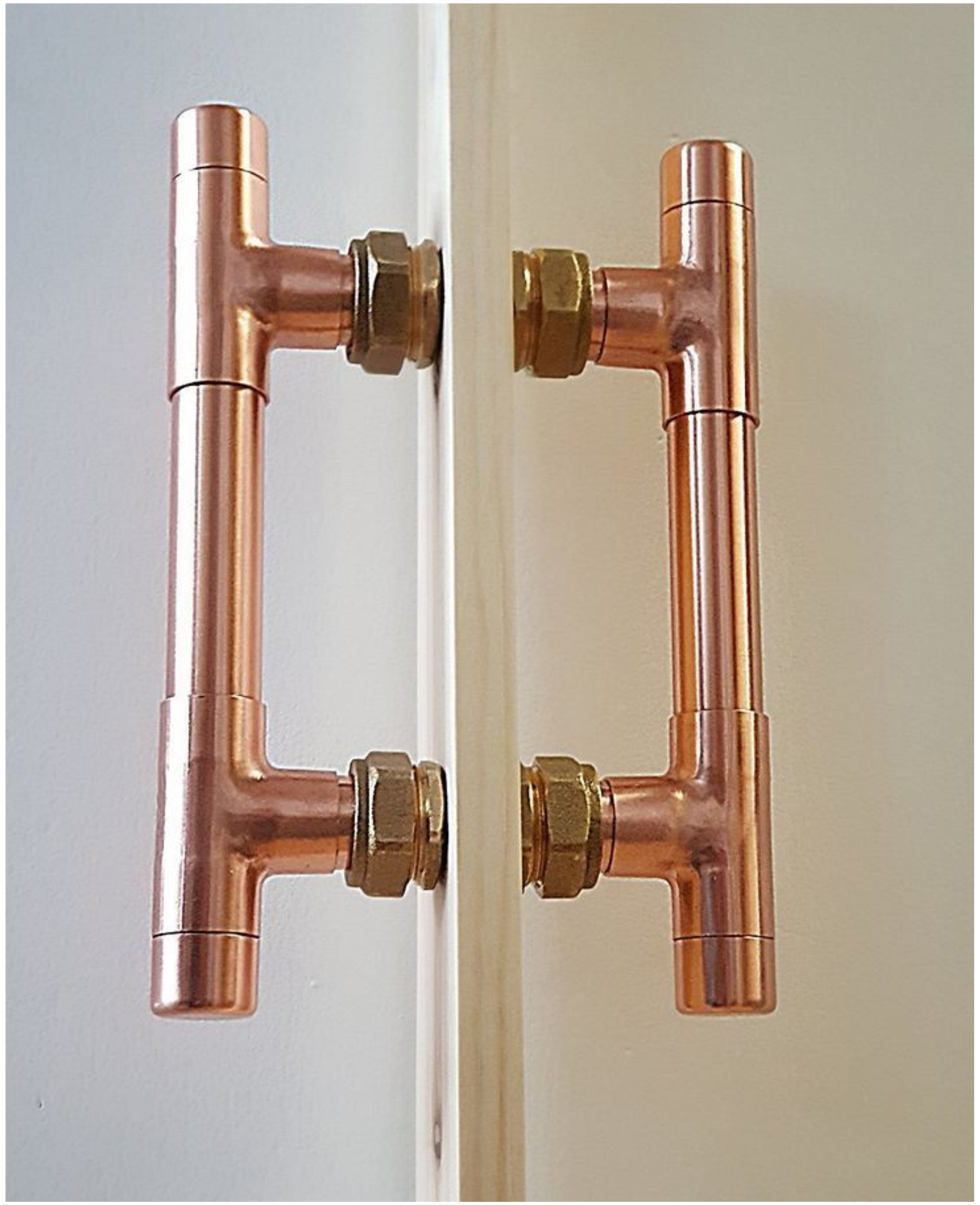
- Denaturation
- Inhibition enzymatic activity

5) Heavy metals

Toxic to human & animal in excessive concentration (Argyria)

5) Heavy metals

- Copper
- Nickle
- Zinc



(Doorknobs)

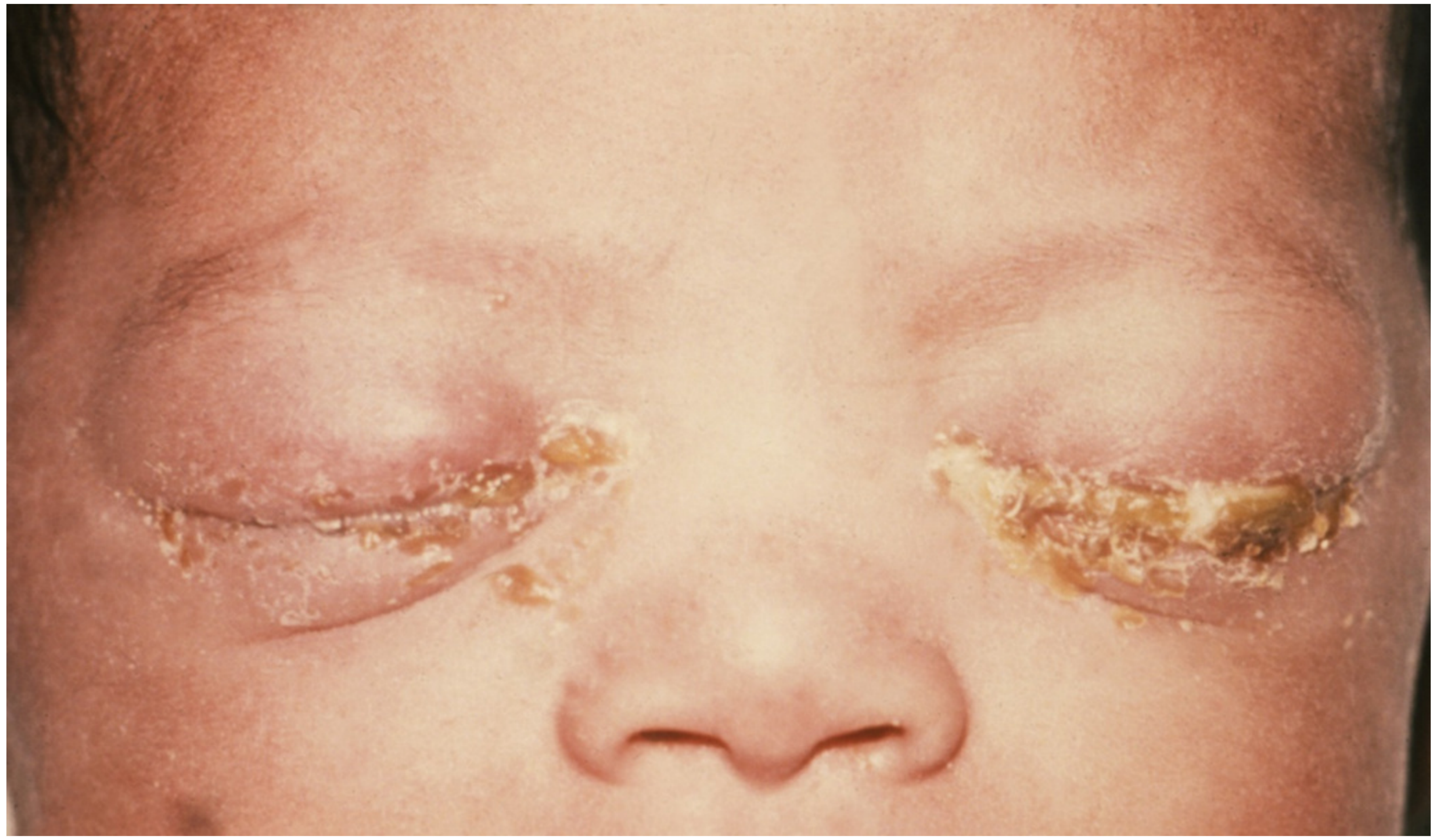
5) Heavy metals

- Silver

(Drinking water was stored in silver jugs)

5) Heavy metals

- Silver nitrate drops



ophthalmia neonatorum

5) Heavy metals

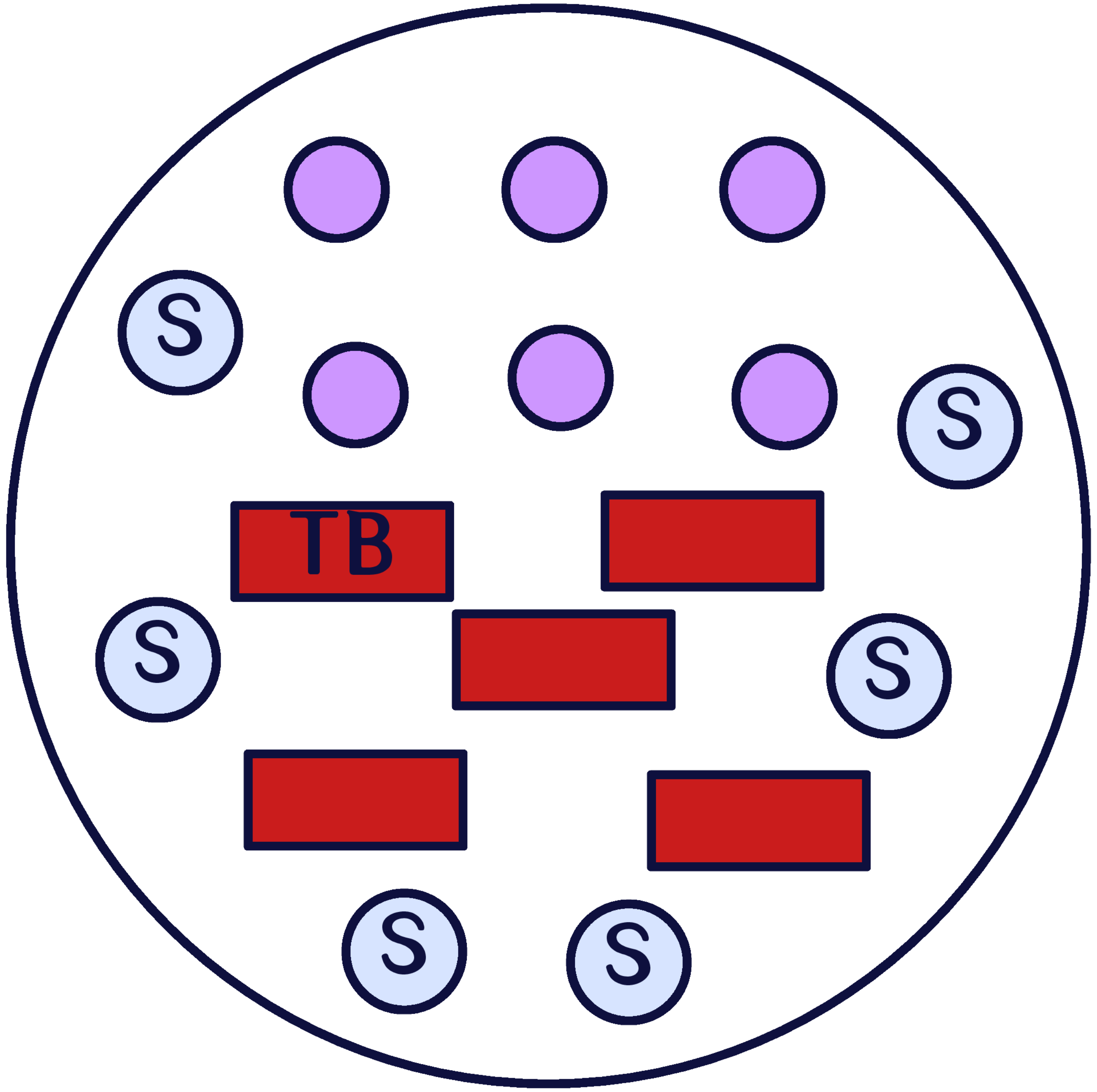
- Zinic (Zinic oxide)
    - Calamine lotion
    - Baby powder

Chemical agents for disinfection or Antiseptics

III) High level disinfectant

High level disinfectant

- Kills all microbes except large numbers of bacterial spores



I) Chlorine

- Water
- Swimming pool

I) Chlorine

Sodium Hypochlorite

(Chlorine+ Sodium + Oxygen)

- Disinfectant in homes & hospitals

- Corrosive

2) Hydrogen peroxide

- Antiseptic

3) Glutaraldehyde 2% and 4) Peracetic acid

- Needs ~10 hours