Microbiology

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Sterilization and disinfection

Fight bacteria → inside the body → antibiotics

Fight bacteria → outside the body → sterilization and disinfection

- **Sterilization:**
  - *Removal* or *killing* of **all** forms of living microorganisms including bacterial spores by physical or chemical method
  - Absolute term killing or removing all microorganisms
  - Need for what *surgical instruments*:
    - ✓ Syringes / gloves/ catheters/ culture media
  - **2 methods:**
    - ✓ *Physical methods:* heat / radiation / filtration
    - ✓ *Chemical methods:* gaseous/ liquids

- **Disinfection:**
  - Removal **most** (if not all) pathogenic organisms except bacterial spore by physical or chemical methods
  - *Disinfectant*: chemical substances that used to achieve disinfection
  - Physical or chemical methods
  - Disinfectants may be:
    - ✓ *High* level disinfectant
      Kill all microbes except large number of bacterial spore.
      Example: H2O2 for contact lens
    - ✓ *Intermediate* level disinfectant
      Kill all microbes except bacterial spore.
      Example: alcohol
    - ✓ *Low* level disinfectant
      Kill most vegetative bacteria except *Mycobacterium tuberculosis*

- **Antiseptics**
  - Removal **most** (if not all) microbes except bacterial spore (Non- toxic)

- **Germicide**
  - Agent *destroy* microorganism :
    - ✓ Virucide / bactericide/ fungicide
  - Agent *destroy* microorganism and can *act as:*
    - ✓ Disinfectant/ antiseptic/sterilant
  - We call the germicide an antiseptic, when it is non-toxic achieves disinfection

- **Cleaning**
  - Removal of foreign material from medical devices by water and soap

- **Decontamination**
  - Reduction of organisms to a level which items are *safe* to handle
    Include: cleaning/ disinfection / sterilization

- **Disinfection method:**
  - *Physical method:* moist heat / radiation
  - *Chemical method:* chemical substances

- **Physical methods for disinfection:**
  - ***Moist heat***
    - Moist heat below 100°C (*pasteurization*)
      - ✓ Heat → cooling
      - ✓ 2 methods: At 63°C for 30 min or at 72°C for 20 sec
      - ✓ Not sterilizing
      - ✓ ***Kills:*** *M. tuberculosis / N.abortus /Salmonella /C.burnetti*
    - Moist heat at 100°C (*boiling*)
      - ✓ Boiling (100°C) for 20 min
      - ✓ Kill all vegetative bacteria
      - ✓ Use in: emergency
      - ✓ Use for: Glass syringes/ surgical instruments

  - ***Radiation***
    - ✓ *Ultraviolet rays*
    - ✓ *Artificially by mercury lambs*
      - The effect of ultraviolet rays: Bactericidal/ carcinogen
      - Use in: Operation room/ drug filling cubicles/ safety cabinets

- **Chemical methods for disinfection** (*disinfectant*)
  - Why there is resistant to antibiotics and usually no resistant for chemical disinfectants?
    - ✓ Because chemical disinfectants have *a combination action*:
      - Oxidation/ denaturation / break DNA / cell membrane and cell wall damage
  - ***Low level disinfectants***
    - ✓ Kills most microbes, except TB and bacterial spore
      1. ***Quaternary Ammonium Compounds***
         - Benzethonium Chloride /Benzalkonium Chloride
         - Use in Disinfection of : floors/ blood spills
  - ***Intermediate level disinfectants***
    - ✓ Kills most (all) microbes, except bacterial spore
      1. ***Alcohols 70% :***
         - bactericidal/ fungicidal/ viricidal (enveloped)
         - *Kill* microbes *by* : denaturation/ membrane damage / disruption of lipid contining
         - Types: Ethanol (Ethyl alchol)/ Isopropanol (isopropyl alchol)
         - Used as: antiseptics/ hand sanitizers
         - Methanol (methal alchol) : inhalation it cause; blindess/ damage in brain / death
      2. ***Phenols:***
         - First used in the operation room by lister in 1867
         - Phenol *derivatives* : cresol (Lysol)/ chloroxylenol
         - Phenol *kill* derivatives by : denaturation/ membrane damage
         - *Disinfectants* for: floor/ culture spills

3. ***Biguanides:***
   - Types: Chlorhexidine / antiseptic (mouth washing)
4. ***Halogens:***
   - Types: Chlorines / Iodines/ Fluorine
   - Kill microbes *by* : oxidation/ denaturation
   - Iodines: tincture iodine: (2% iodine + 2.4% sodium iodide in 50% ethanol) *use in* skin antiseptics
   - Betadine (povidone + iodine) *use in* skin antiseptics
   - Fluoride use in : toothpaste
5. ***Heavy metals:***
   - *Include*: Copper / Nickle/ Zinc
   - Kill microbes *by*: denaturation/ inhibition enzymatic activity
   - Toxic to human and animal in excessive concentration (*argyia*)
   - Silver : (drinking water was stored in silver jugs)
   - Silver nitrate drops for opthalmia neonatorum
   - Zinic (zinic oxide) *use in* : calamine lotion /baby powder

➢ *High level disinfectants*

✓ Kills all microbes *except* large numbers of bacterial spore

1. ***Chlorine***

✓ In: Water/ swimming pool
Sodium hypochlorite (chlorine + sodium+ oxygen) / disinfectant in home and hospitals

2. ***Hydrogen peroxide*: *antiseptic***
3. ***Glutaraldehyde 2%***
4. ***Peracetic acid***

Need 10 hours

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