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ANTISEPTICS AND DISINFECTANTS

Definition of terms

- **Antiseptic** = agent that causes destruction or inhibition of growth of micro organisms (bacteria, viruses, fungi) on living surfaces such as skin & mucous membranes.

- **Disinfectant** = agent that causes destruction or inhibition of growth of microorganisms (bacteria, viruses, fungi) on non living surfaces (instruments, equipments, pieces of furniture, rooms, etc).

- Spores are (usually) not destroyed !!!

- **GERMICIDE:** An agent that destroys microorganisms, especially pathogenic organisms. Terms with the same suffix (e.g., *virucide*, *fungicide*, *bactericide*, *tuberculocide*, and *sporicide*) indicate agents that destroy the specific microorganism identified by the prefix. Germicides can be used to inactivate microorganisms in or on living tissue (i.e., antiseptics) or on environmental surfaces (i.e., disinfectants).

Mechanisms of action of antiseptic and disinfectants

- Oxidation of bacterial protoplasm
  - Potassium permagnate, H_2O_2, Halogens
- Co-agulation (denaturation) of bacterial proteins & disrupt cell membrane
  - Phenols, chlorhexidine, alcohols, aldehydes
- Detergent like action ↑ permeability of bacterial cell membrane
  - Cetrimide, soaps

Classification

- Phenol derivatives:
  - phenol, cresol, hexachlorophene, chlorohexylenol (dettol)
- Oxidizing agents:
  - Hydrogen peroxide.
- Halogens:
  - Iodine, chlorine, chlorophores.
- Biguanides:
  - Chlorhexidine.
- Quaternary ammonium:
  - Cetrimide.

- Alcohols:
  - Ethanol, isopropanol
- Aldehyde:
  - Formaldehyde
- Acids:
  - Acetic acid, boric acid
- Metallic salt:
  - Mercuric compounds , silver & zinc salts
- Dyes:
  - Gentian violet, acriflavine

Actions of Antiseptics and Disinfectants

Agent	Action
antiseptic	inhibits growth of microorganisms
disinfectant	chemical applied to objects
fungicide	destroys fungi
germicide	destroys bacteria
preservative	prevents decomposition
sanitizer	reduces the number of bacteria
sporicide	destroys spores

- **Acids: boric acid, salicylic** - *Shift the pH to the acid side → protein denaturation of microbial cell protoplasm.* Since proteins of the skin and mucous membranes forming dense, insoluble albuminates, that is providing **anti-microbial, anti-inflammatory, antifungal effects.**
- In high concentrations cauterize tissue **(coagulative necrosis)!**
- **Boric acid:** used for washing and rinsing of the mucous membranes of the mouth, diaper rash, acute and chronic otitis media, colitis, pyoderma, pediculosis.
- **Side effect:** It penetrates through the skin and mucous membranes, especially in children, cumulates. With long-term use in patients with impaired renal function develops **acute and chronic poisoning** (nausea,vomiting, diarrhea, skin rashes, confusion consciousness, convulsions, oliguria, sometimes shock.
- **Salicylic acid:** Weak antiseptic, irritant, low concentrations (1-3%) –keratoplastic, in high (5% -10%) - keratolytic effect.
- **Application:** Oily seborrhea, acne, eczema, psoriasis, ichthyosis, warts, corns, etc.

ALCOHOLS

Ethyl alcohol (70% [60-90]) and isopropyl alcohol are effective antiseptic and disinfectant agents. They reduce the number of bacteria 90% when applied to the skin. They rapidly kill vegetative bacteria, M tuberculosis, many fungi and inactivate lipophilic viruses. They denature proteins and disturb the membrane permeability of bacteria.

They are not effective as sterilizing agents because of their inefficient antibacterial spectrum

ALDEHYDES

- FORMALDEHYDE: It is a gas at room temperature used for fumigation, the 40% aqueous solution is noncorrosive and has a broad antimicrobial spectrum. It has a pungent odour & is highly irritant to respiratory mucosa & eyes.

Mechanism of action of formaldehyde : act by alkylation(transfer of an alkyl group from one molecule to another) of chemical groups in proteins & nucleic acid.

Uses :

I. Used for fumigation & sterilization of instruments which cannot be moistened with solution

II. 40% solution(100% formalin) in h20 is used for disinfection of surgical instruments and gloves.

❖ Halogens

- **Iodine** is effective against all kinds of bacteria, many endospores, fungi, and some viruses. Its mechanism of activity may be its combination with the amino acid tyrosine in enzyme and cellular proteins.

- An **iodophore** is a combination of iodine and an organic molecule. Iodophores do not stain and are less irritating than iodine. Examples are Isodine and Betadine.

- **Chlorine** is used as a gas or in combination with other chemicals. Chlorine gas is used for disinfecting municipal water supplies, swimming pools, and sewage. Sodium hypochlorite – ordinary household bleach- is good disinfectant.

- Chloramines consist of chlorine and ammonia. They are more stable than most chlorine. The U.S. military uses tablets for field disinfection of water.

- Chlorine dioxide in gaseous form is used for area disinfection, most notably to kill endospores of anthrax bacteria.