

Pharmacology- Part ii

Lesson 1

Antiseptics and Disinfectants



Lesson Outcomes

At the end of this lesson students should be able to

- Explain the impact of antiseptics and disinfectants in hospital
- Describe the commonly used antiseptic and disinfectants

Introduction

- Antiseptics and disinfectants are extensively used in hospitals and other health care settings for a variety of topical and hard-surface applications
- In particular, they are an essential part of infection control practices and aid in the prevention of nosocomial(disease, originating in hospital) infections

Introduction cont...

- A wide variety of active chemical agents (biocides) are found in these products, many of which have been used for hundreds of years for antiseptics, disinfection and preservation, including alcohols, phenols, iodine, and chlorine

Introduction cont...

- Most of these active agents demonstrate broad-spectrum antimicrobial activity;
- disinfectant-are products that are applied to non-living objects to destroy microorganism(m.o.) that are living on the object.
- Antiseptic-which destroy m.o. on living tissue
- Biocide-which destroy all forms of life, not just m.o.
- sensitizer-simultaneously both clean & disinfectant.

Characteristics of good antiseptic/disinfectant should be:

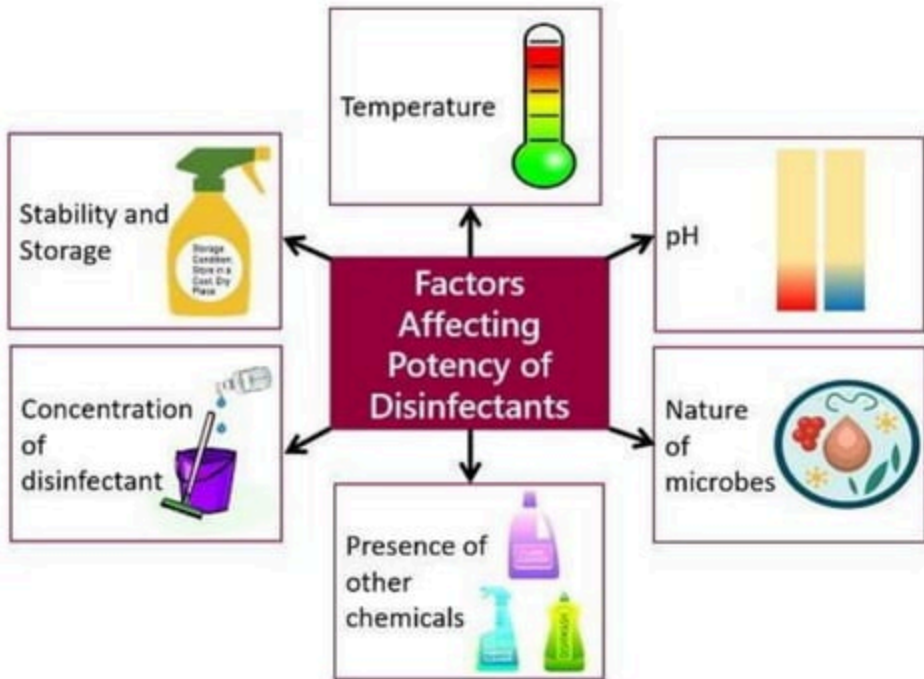
- Broad spectrum
- Non toxic
- Fast acting
- Odourless
- Surface compatibility

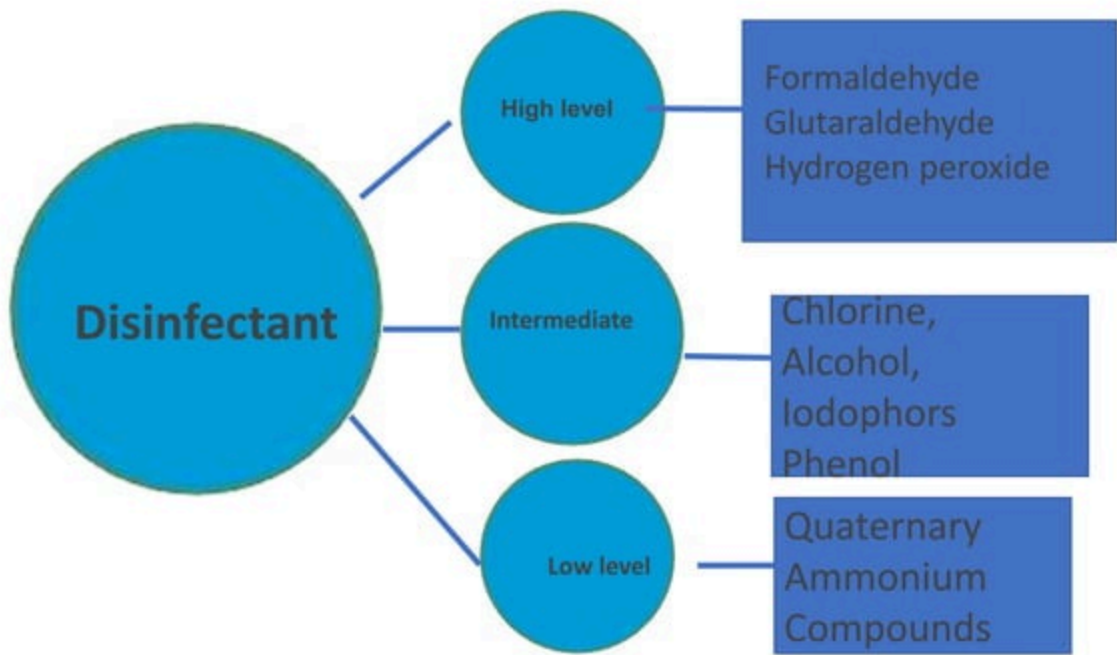
Characteristics of good antiseptic/disinfectant should be:

- Economical
- Easy to use
- Soluble and miscibility
- Not affected by the physical factors
- Stable on storage

Mechanisms of action

- Oxidation of bacterial protoplasm.
- Denaturation of bacterial proteins including enzymes.
- Detergent like action increasing permeability of bacterial membrane.





Aldehyde

- **Formaldehyde** is used as a disinfectant and sterilant both in the liquid and gaseous states.
- Formaldehyde is sold and used principally as a water-based solution called formalin, which is 37% formaldehyde by weight.
- The aqueous solution is bactericidal, tuberculocidal, fungicidal, virucidal and sporicidal

Formalin uses

- 10% formaldehyde solution in saline is used as preservative for biopsy specimens .
- operation theater sterilization .
- Used in sterilization of surgical gloves & instrument

Formaldehyde

- Formaldehyde should be handled in the workplace as a potential carcinogen
- For this reason, employees should have limited direct contact with formaldehyde and these considerations limit its role in sterilization and disinfection processes

Aldehyde cont.....

- Gluteraldehyde (Cidex)
- High level disinfectant
- Destroys microorganisms by alkylation of amino acids
- Efficient bactericidal, fungicidal & virucidal activity but slow myco-bactericidal activity (> 40 min)
- Use: for medical equipment such as endoscope, spirometry tubing, dialyzer, anaesthesia and respiratory equipment



Gluteraldehyde (Cidex) cnt...

- Activate by adding the entire contents of the activator vial to the container.
- Shake well.
- Activated solution turns green immediately.
- Record the date of activation.
- Test activated solution with “Cidex solution test strips” prior to each time it is used.

Gluteraldehyde (Cidex) cont...

- Use sterilized stainless steel tray for cidex
- Avoid using plastic tray for cidex
- If test results are satisfactory re-use upto a maximum of 14 days or 20 cycles whichever comes first.
- Harmful by inhalation.
- Use only in well ventilated areas.

Gluteraldehyde (Cidex) cont.....

- Irritating to respiratory system, skin and eyes.
- Wear eye protection, face mask, gloves & fluid resistant apron.
- After disinfection, 30 min cycle, rinse the instrument 3 times in separate volumes of water for at least 1 min. (use sterile water for critical & semi-critical instruments)
- S/e: irritant, dermatitis, mucosal irritation, pulmonary syndrome, epistaxis, asthma, rhinitis

Peracetic acid

- Perasafe
- 0.08% Peracetic acid plus 1.0% hydrogen peroxide
- Mode of action - Denatures protein and destroys cell membrane
- Advantage - Effectively inactivates Mycobacteria resistant to glutaraldehyde

Perasafe cont...

- Use lukewarm water (35^o C).
- 16.2g of “Perasafe” in 1 L of water.
- Stir till a clear blue solution is obtained.
- Soak time - 10 mins
- Usable for 24 hrs after preparation.
- Irritant to skin, mucous membranes and eyes

Oxidizing agents

- 20 volume hydrogen peroxide
- Has Bactericidal, virucidal, sporicidal & fungicidal properties
- Mode of Action –Hydroxyl free radicals that can attack membrane lipids, DNA, and other essential cell components.

Hydrogen peroxide cont...

- Accelerated hydrogen peroxide(0.5%) --- kills viruses in 1 minute and Mycobacteria and fungi in 5 minutes.
- It destroys anaerobic organism & therefore used for cleaning the wounds.
- It produces frothing & brings out debris from the depth of the wound .

Hydrogen peroxide cont...

- It produces heat when it comes in contact with the tissues .
- Thus, it prevent capillary oozing, & hence it is used as haemostatic solution whenever there is capillary oozing
- Ex: after incision
- Used in cleaning wounds

Alcohol agents

- Isopropyl alcohol (Surgical spirit) or ethanol
Most effective at 60% to 70% concentrations
“Cidal” activity decreases at more than 95% or less than 60%
- Used as a skin astringent, cleansing agent, and to disinfect utensils

Alcohol agents

- Isopropyl alcohol should not be applied to open wounds.
- Why? Because the drug can increase tissue damage and, by causing coagulation of proteins, can form a mass under which bacteria can thrive.
- Ethanol for antiseptics is available in three formulations: solutions, gels, and foams.

Biguanide agents

- Chlorhexidine gluconate (Hibiclens/ Hibitain)
- Used as a bactericidal skin-cleansing solution
- surgical scrub, handwashing agent, and a skin wound cleanser
- Available ,4% chlorhexidine gluconate / 2% chlorhexidine gluconate

Biguanide agents cont....

- Dilute stock solution of chlorhexidine with sterile water to required percentage.
- Concentrated stock solution is available in the indoor dispensary. Ototoxicity possible if instilled to middle ear.
- High concentrations and preparations containing alcohol / surfactant may cause eye damage

Carbolic Acid

- 2% Lysol/ 5% Lysol
- Used as disinfectant
- Dilute stock solution of Lysol with water to required percentage.
- Irritant, avoid contact with eyes and skin.
- Avoid use in infant bassinets & incubators (causes hyperbilirubinaemia).

Lysol cont..

- Avoid use on plastic & rubber (mackintosh, mattress covers) since it is absorbed and may increase permeability to body fluids.
- Avoid use on porous material as it leaves a film leading to irritation to skin and tissues.

Carbolic Acid

- Phenol---0.5-1% carbolic acid
- Phenols disrupt cell membrane& precipitate proteins powerful microbicidal substance - derived from coal tar -widely used disinfectant in hospitals
- it is in dark pink in colour & a strong irritant .

Phenol cont...

- Pure form may cause skin burns .
- It has the smell of lifebuoy soap .
- Disinfection of sharp instruments .
- In 100% solution, the instruments should be immersed for 2-3 hours , & in 20% solution for 24 hours .

Halogen

- Povidone-iodine(5-10%) topical solution.
- iodine is recognized as an effective & useful germicide
- it is very effective against a variety of microorganism such as viruses, bacteria .
- broad spectrum of action .

Povidone-iodine cont.....

- Povidone-iodine is employed primarily for prophylaxis of postoperative infection.
- Additional uses include hand washing, surgical scrubbing, and preparing the skin prior to invasive procedures (eg, surgery, aspiration, injection).
- used for wound dressing , irrigation of bladder , peritoneal cavity

Povidone-iodine cont.....

- In addition, povidone-iodine is employed to sterilize equipment,
- The drug is supplied in a variety of formulations (ointments, solutions, aerosols, gels).
- It is also impregnated in swabs, sponges, and wipes.
- Trade names include ACU-dyne, Betadine, and Operand.

povidone-iodine cont.....

- 10% povidone iodine Ready to use preparation.
- Do not dilute
- Can cause hypersensitivity & skin irritation.
- Avoid use on large body surface areas for prolonged periods (increases serum iodine levels).

Povidone-iodine cont.....

- Contraindicated in hyperthyroidism and other disorders of thyroid function.
- Avoid in pregnant/nursing mothers, newborns.
- Avoid in patients allergic

Halogen cont....

- Calcium hypochlorite powder (35%w/w)
- Tropical chloride of lime (TCL) Solutions
- Chlorine reacts with water to form hypochlorous acid, which is microbicidal.
- Dissolve 30.0g of the powder in 1 L of water to get 1% (10,000 ppm) solution (used for high level disinfection, blood spills).
- Dilute this solution 10 times to make 0.1% (1000 ppm) solution (used for surface cleaning).

TCL cont....

- Avoid inhalation, contact with skin, eyes & clothing.
- Do not mix or allow contact with other chemicals (soaps, detergents, paints, solvents, combustible substances).
- Prepare in a well ventilated room to avoid inhalation.
- Wear gloves and masks.
- Bulk solution made daily.

TCL cont....

- Store as indicated earlier.
- Do not add water to the powder, add powder to water. (Chlorine release is toxic at room temperature)
- Do not use on metal objects (corrosive)
- Can form carcinogenic products in the presence of formaldehyde.

Nurses responsibility related Antiseptics and disinfectants

- Assess for drug and other allergies, or previous sensitivities to antiseptics or other topical agents
- If an iodine-based agent is to be used, assess for allergies to iodine or seafood because such allergies are contraindications

Nurses responsibility related Antiseptics and disinfectants

Before using antiseptics, assess:

- The concentration of the medication
- Length of exposure to the skin
- Condition of the skin
- Size of area affected
- Hydration status of the skin

Nurses responsibility related Antiseptics and disinfectants

- Before applying a topical agent, ensure correct technique and adequate supplies needed for the procedure
- Assess the area to be treated beforehand
- Follow specific directions for cleansing the area

Nurses responsibility related Antiseptics and disinfectants

- Follow the manufacturer's specific guidelines for administration of the agent
- Protect the site as ordered with a dressing if needed
- Teach the patient proper technique for application of the medication and dressings as needed

Nurses responsibility related Antiseptics and disinfectants

- Monitor for therapeutic response
- Improved healing of the affected area
- Decreased symptoms of inflammation or infection
- Prevention of infection
- Monitor for adverse reactions or effects

Nurses responsibility related Antiseptics and disinfectants

- When using these agents on inanimate objects, be sure to protect the patient (and yourself!) from accidental exposure