Programme: Bachelor of Science (First Year)

Subject: Microbiology

Paper Code: MIC-101

Paper Title: Microbiology and Biochemistry I

Unit: Growth and Nutrition

Module name: Type of chemical disinfectants

Module No.: 37

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Chemical disinfectants are agents used to carry out disinfection. These do not necessarily cause sterilization. Few may achieve sterility but most merely reduce the population to safe levels or remove vegetative forms of the pathogen from the objects being sterilized. In selecting an agent it is important to keep in mind the characteristics of a desirable disinfectant. No single agent is likely to fulfill all criteria, thus the chemical disinfectants of choice should depend on its purpose.

Characteristics of a good disinfectant

A good chemical disinfectant should have some of the following characteristics. It should be effective against a wide range of microbes such as Gram positive, Gram negative, fungi, viruses, acid-fast and bacterial endospores. These should be effective at low concentrations, effective in presence of organic matter, non-toxic to humans, non-corrosive, odorless or have a pleasant odor, soluble in water and lipids for better penetration into microorganisms, have low surface tension to be able to penetrate into crack of surfaces and should be relatively inexpensive. Good disinfectants should also be stable upon storage, even when exposed to light, heat or other environmental factors.

Following are some of the types of disinfectant groups: heavy metal, halogens, alcohols, phenols, quaternary ammonium compounds, aldehydes, dyes and sterilizing gases.

Heavy metals

These are germicidal and controls microbes by combining with sulfhydryl group of proteins thereby inactivating or precipitating them. Some examples of heavy metals are selenium, silver, copper, mercury, arsenic and zinc. Heavy metal such as selenium is used to treat fungal infections. Silver nitrate used in the eyes of new born to prevent gonococcal infections. Silver sulfadiazine is used on burns. Copper sulfate is used as algicide in lakes and swimming pools.

Halogens

Halogens controls microbe by oxidizing cell components in absence of organic matter. Halogens, used as disinfectants, include iodine and chlorine. Halogens such as chlorine is used to treat municipal water supply swimming pools and also for utensils. Iodine compounds, such as tincture of iodine and iodophore, are used as skin antiseptics. Tincture of iodine causes iodination of cell protein. Iodophores are used in hospitals for preoperative skin disinfection and laboratory and hospital disinfection.

Alcohols

Alcohols are used as a disinfectant and antiseptic. They are bactericidal and fungicidal but not sporicidal. It denatures proteins and dissolves plasma membranes. Alcohols such as iso-propyl alcohol and ethanol are surface disinfectants. Iso-propyl is used to disinfect skin and thermometers.

Phenols

Phenols are used as antiseptic and disinfectant. These denature proteins and injure lipid-containing plasma membrane thereby causing leakage of cellular contents. Phenols are active in the presence of organic compounds and therefore suitable for disinfecting pus, saliva and faeces. One example of phenol is cresols, which is a good surface disinfectant and is present in Lysol. It affects the cell wall of mycobacterium. Triclosan, another phenolic compound, is an active ingredient in antibacterial soaps, deodorants and mouthwash.

Quaternary ammonium compounds

These are cationic detergents having antimicrobial activity. They denature proteins and disrupt microbial membranes. These are used for disinfecting food utensils and small instruments. Quaternary ammonium compounds are used as skin antiseptics and mouth washes. Two examples are benzalkonium chloride and cetlypyridiniumchloride.

Dyes

Dyes interfere with cellular oxidation and may also interfere with replication. The dye acridine is used to clean wounds and crystal violet is used treat protozoan and fungal infections.

Aldehyde

Aldehydes combine with nucleic acids and proteins and inactivate them. Two aldehydes that find use as disinfectants are formaldehyde and glutaraldehyde. Formaldehyde is used to sterilize closed areas and laboratory instruments. Glutaraldehyde is used to disinfect hospital and laboratory equipments.

Sterilizing gases

Gases cause sterilization by affecting proteins and nucleic acids. Gases such ethylene oxide, Betapropiolactone, and hydrogen peroxideare used for sterilization. Ethylene oxide is used for heat and moisture sensitive material such as disposable plastic petridishes, syringes and heart-lung machines. Betapropiolactone is used to sterilize vaccines and sera. Betapropiolactone in the liquid form does not penetrate material and may be carcinogenic.Hydrogen peroxide can be used to decontaminate biological safety cabinets, operating rooms, and other large facilities enclosures.