Disinfectants and antiseptics

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ANTISEPTICS

An antiseptic is a type of disinfectant, which destroys or inhibits growth of micro-organisms on living tissues without causing injurious effects when applied to surfaces of the body or to exposed tissues. Some antiseptics are applied to the unbroken skin or mucous membranes, to burns and to open wounds to prevent sepsis by removing or excluding microbes from these areas. Iodine has been modified for use as an antiseptic. The iodophore, **polyvidone-iodine** , is effective against bacteria, fungi, viruses, protozoa, cysts and spores and significantly reduces surgical wound infections. The solution of polyvidone-iodine releases iodine on contact with the skin. **Chlorhexidine** has a wide spectrum of bactericidal and bacteriostatic activity and is effective against both Gram-positive and Gram-negative bacteria although it is less effective against some species of *Pseudomonas* and *Proteus* and relatively inactive against mycobacteria. It is not active against bacterial spores. Chlorhexidine is incompatible with soaps and other anionic materials, such as bicarbonates, chlorides, and phosphates, forming salts of low solubility which may precipitate out of solution. **Ethanol** has bactericidal activity and is used to disinfect skin prior to injection, venepuncture or surgical procedures.

DISINFECTANTS

A disinfectant is a chemical agent, which destroys or inhibits growth of pathogenic micro-organisms in the non-sporing or vegetative state. Disinfectants do not necessarily kill all organisms but reduce them to a level, which does not harm health or the quality of perishable goods. Disinfectants are applied to inanimate objects and materials such as instruments and surfaces to control and prevent infection. They may also be used to disinfect skin and other tissues prior to surgery (see also Antiseptics, above).

Disinfection of water can be either physical or chemical. Physical methods include boiling, filtration and ultraviolet irradiation. Chemical methods include the addition of **chlorine releasing compounds** , such as sodium hypochlorite solution, chloramine T powder, or

sodium dichloroisocyanurate (NaDCC) powder or tablets. Where water is not disinfected at source it may be disinfected by boiling or by chemical means for drinking., cleaning teeth and food preparation.

Chlorine is a hazardous substance. It is highly corrosive in concentrated solution and splashes can cause burns and damage the eyes. Appropriate precautions must be taken when concentrated chlorine solutions or powders are handled.

The chlorinated phenolic compound, **chloroxylenol** , is effective against a wide range of Gram-positive bacteria. It is less effective against staphylococci and Gram-negative bacteria; it is often ineffective against *Pseudomonas* spp. and inactive against spores.

The aldehyde bactericidal disinfectant, **glutaral** , is strongly active against both Gram-positive and Gram-negative bacteria. It is active against the tuberculosis bacillus, fungi such as *Candida albicans* , and viruses such as HIV and hepatitis B. A 2% w/v aqueous alkaline (buffered to pH 8) glutaral solution can be used to sterilize heat-sensitive pre-cleansed instruments and other equipment.

Chlorhexidine gluconate

Chlorhexidine gluconate is a representative disinfectant and antiseptic. Various agents can serve as alternatives

Solution (Concentrate for solution), chlorhexidine gluconate 5%

Uses:

antiseptic; disinfection of clean instruments

Precautions:

aqueous solutions—susceptible to microbial contamination—use sterilized preparation or freshly prepared solution and avoid contamination during storage or dilution; instruments with cemented glass components (avoid preparations containing surface active agents); irritant—avoid contact with middle ear, eyes, brain and meninges; not for use in body cavities; alcoholic solutions not suitable before diathermy; syringes and needles treated with chlorhexidine (rinse thoroughly with sterile water or saline before use); inactivated by cork (use glass, plastic or rubber closures); alcohol based solutions are flammable

Administration:

Antiseptic (pre-operative skin disinfection and hand washing), *use* 0.5% solution in alcohol (70%)

Antiseptic (wounds, burns and other skin damage), *apply* 0.05% aqueous solution
Disinfection of clean instruments, *immerse* for at least 30 minutes in 0.05% solution containing sodium nitrite 0.1% (to inhibit metal corrosion)
Emergency disinfection of clean instruments, *immerse* for 2 minutes in 0.5% solution in alcohol (70%)

DILUTION AND ADMINISTRATION. According to manufacturer's directions

Adverse effects:
occasional skin sensitivity and irritation

Chlorine releasing compounds

Chlorine releasing compounds are representative disinfectants. Various agents can serve as alternatives
Powder for solution , chlorine releasing compound, 1 g available chlorine/litre (1000 parts per million; 0.1%)

Uses:
disinfection of surfaces, equipment, water

Contraindications:
avoid exposure of product to flame; activity diminished in presence of organic material and increasing pH (can cause release of toxic chlorine gas)

Administration:
Surface disinfection (minor contamination), *apply* solutions containing 1000 parts per million
Instrument disinfection, *soak* in solution containing 1000 parts per million for a minimum of 15 minutes; to avoid corrosion do not soak for more than 30 minutes; rinse with sterile water

DILUTION AND ADMINISTRATION. According to manufacturer's directions

Adverse effects:
irritation and burning sensation on skin

Chloroxylenol

Chloroxylenol is a representative disinfectant and antiseptic. Various agents can serve as alternatives
Solution (Concentrate for solution), chloroxylenol 5%

Uses:
antiseptic; disinfection of instruments and surfaces

Precautions:
aqueous solutions should be freshly prepared; appropriate measures required to prevent contamination during storage or dilution

Administration:
Antiseptic (wounds and other skin damage), *apply* a 1 in 20 dilution of 5% concentrate in water
Disinfection of instruments, *use* a 1 in 20 dilution of 5% concentrate in alcohol (70%)

Dilution and administration. According to manufacturer’s directions

Adverse effects:
skin sensitivity reported

Ethanol

Ethanol is a representative disinfectant. Various agents can serve as alternatives

Cutaneous solution , ethanol 70%

Uses:

disinfection of skin prior to injection, venepuncture or surgical procedures

Precautions:

flammable; avoid broken skin; patients have suffered severe burns when diathermy has been preceded by application of alcoholic skin disinfectants

Administration:

Disinfection of skin, *apply* undiluted solution

Adverse effects:

skin dryness and irritation with frequent application

Glutaral

Solution , glutaral 2% aqueous alkaline (pH 8) solution

Uses:

disinfection and sterilization of instruments and surfaces

Precautions:

minimize occupational exposure by adequate skin protection and measures to avoid inhalation of vapour

Administration:

Disinfection of clean instruments, *immerse* in undiluted solution for 10–20 minutes; up to 2 hours may be required for certain instruments (for example bronchoscopes with possible mycobacterial contamination); rinse with sterile water or alcohol after disinfection

Sterilization of clean instruments, *immerse* in undiluted solution for up to 10 hours; rinse with sterile water or alcohol after disinfection

Adverse effects:

(occupational exposure) nausea, headache, airway obstruction, asthma, rhinitis, eye irritation and dermatitis and skin discoloration

Polyvidone-iodine

Polyvidone-iodine is a representative antiseptic. Various agents can serve as alternatives

Cutaneous solution , polyvidone-iodine 10%

Uses:

antiseptic; skin disinfection

Contraindications:

avoid regular or prolonged use in patients with thyroid disorders or those taking lithium; avoid regular use in neonates; avoid in very low birthweight infants

Precautions:

pregnancy (Appendix 2); breastfeeding (Appendix 3); broken skin (see below); renal impairment (Appendix 4)

LARGE OPEN The application of polyvidone-iodine to large wounds or severe burns may produce

WOUNDS. systemic adverse effects such as metabolic acidosis, hypernatraemia, and impairment of renal function

Administration:

Pre- and post-operative skin disinfection, **ADULT** and **CHILD** *apply* undiluted (see also Contraindications above)

Antiseptic (minor wounds and burns), **ADULT** and **CHILD** *apply* twice daily (see also Contraindications above)

Adverse effects:

irritation of skin and mucous membranes; may interfere with thyroid function tests; systemic effects (see under Precautions)