Disinfection and antiseptics

Disinfection and antiseptics are substances that kill microorganisms and are used for disinfection and asepsis. Their effect is not very selective, so they often have a toxic effect not only on the microorganism, but also on the cells of the host organism. Therefore, they are used:

- in an inanimate environment – **disinfection**,
- only locally, e.g. they are applied to the surface of the tissue – **antiseptics**.

In general, disinfectants and antiseptics tend to have a limited spectrum of effectiveness. Their effectiveness also depends significantly on concentration, exposure time and other parameters (temperature, ...).

Alcohols and phenols

The mechanism of action of alcohols is primarily based on breaking the cell membrane of bacteria and denaturing proteins. **Ethanol** has a bactericidal effect in a concentration of 60-70%, in lower and higher concentrations it is less effective. 70% **isopropanol** is also often used to disinfect the surface of the skin.

The generally accepted claim that the consumption of more concentrated alcoholic beverages can protect against alimentary infections, cannot be substantiated by the disinfecting effect of ethanol. The concentration of ethanol in alcoholic beverages is completely insufficient in terms of their disinfecting effect, further dilution will occur in the digestive tract. However, the ingestion of an alcoholic beverage can, similar to e.g. the ingestion of strongly spiced food, stimulate gastric secretion and thus promote the antibacterial effect of gastric juice.

Phenol acts as a strong denaturing agent. It has long been used to disinfect surfaces ("carbolka"), but it is strongly irritating and has an unpleasant smell. Today, some phenol, derivatives are used , especially chlorinated (e.g. **chlorhexidine**), which also act as oxidizing agents (see below).

Aldehydes

Aldehydes quickly bind to proteins (the aldehyde group forms a Schiff base with amino groups) and denature them. **Formaldehyde** is an effective disinfectant, under certain conditions it can also be used for chemical sterilization. Similarly, **glutaraldehyde** is used as a disinfectant.

Oxidizing agents

The effect of a number of disinfectants and antiseptics is based on the oxidizing action of their components. This damages the proteins of microorganisms, their biological membranes and possibly also nucleic acids.

Hydrogen peroxide is used as a 3% aqueous solution. The release of molecular oxygen upon contact with tissues also contributes to the mechanical cleaning of the disinfected area. **Potassium permanganate** also has an antibacterial and fungicidal effect. **Peroxyacetic acid** (Persteril®), which is also used at a higher level of disinfection, has strong disinfecting effects ..

Oxidizing properties are probably also involved in the effect of **iodine**, although the mechanism of its action has not yet been reliably explained. Iodine dissolves poorly in water and is not very stable in solution, so it is used either in the form of an ethanol solution (*iodine tincture*) or, more often today, bound to polyvinylpyrrolidone. A complex (*iodopovidone*), is formed, which releases free iodine into the solution. Iodine is among the most effective antiseptics used to disinfect skin, mucous membranes and wounds.

A number of substances containing chlorine also have oxidizing properties (e.g. **chloramine B**, **hypochlrites** – known as Savo® atd.). Chlorine itself is also used to disinfect water, which gives hypochloric acid after dissolution; it also has oxidizing effects, it is easily reduced to chlorides, or back to molecular chlorine.

Surfactants

Due to their detergent properties, surface-active substances enable the removal of impurities, including multiplying microorganisms, from the treated surface. **Anionically active surfactants**, especially **soaps**, have only a weak disinfecting effect; the main role is played by the mentioned mechanical cleaning of the surface.

Cationic active substances have more pronounced disinfection effects. These include **quaternary ammonium salts** (e.g.. **benzalkonium chloride**), they are a frequent part of disinfectant solutions used to wash tools or surfaces. Cationic surfactants permeabilize cell membranes, which is why they have a bactericidal effect. Their effect is practically canceled by anionic surfactants (soaps), preparations based on quaternary ammonium salts must therefore not be combined with other cleaning agents.

Heavy metals

Compounds containing complexed **mercury** are still widely used in some countries. Mercury binds to sulfhydryl groups and thus denatures proteins. Mercury compounds are widely used for the preservation of various products (e.g. **thimerosal** as an additive in cosmetics, reagents, etc.).

Silveralso has significant disinfecting properties . Its ions denature proteins. Plastics are often impregnated with silver, including products used in the healthcare sector, as well as, for example, filters used to treat solutions or air.

Acids

The disinfectant and antiseptic effect is mainly due to the ability to denature proteins. In addition to the peroxoacetic acid mentioned above, **boric acid** is mainly used today. **Salicylic acid**, , used in dermatology, has fungicidal effects . Even 1% acetic acid and other organic and inorganic acids have a microbicidal effect.

Links

Related articles

- Disinfection and sterilization
- Disinfection
- Antisepsis

References

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