

Disinfectants & antiseptics

Disinfectants – compounds used for killing of germs outside of the body (desinfection of floors, walls, tables, instruments...)

Antiseptics – compounds used for killing of germs on skin and mucous membranes of the body - „externally“
„Intestinal disinfectants“ – non-exact designation for non-absorbable antibacterial chemotherapeutics acting in gastrointestinal tract (will be referred among antidiarrhoics)

Classification of disinfectants and antiseptics

1. Heavy metals and their compounds
2. Compounds with oxidation mechanism
 - 2.1 Peroxo compounds
 - 2.2 Halogens and labile compounds containing them
 - 2.3 KMnO_4
3. Alcohols and phenols
4. Aldehydes
5. Quarternary ammonium salts
6. Biquanide derivatives
7. Dyes

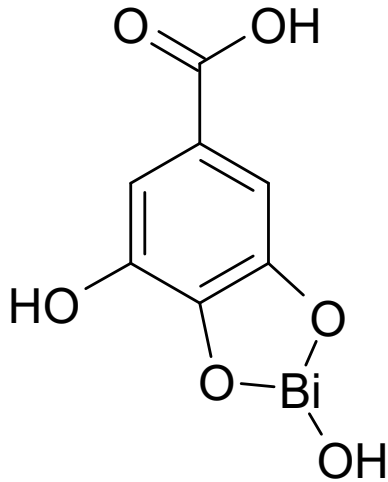
1. Heavy metals and their compounds

- today namely Ag, Bi

Ag: colloidal silver: colloidal particles of metallic silver forming a clear solution in water; contain 70 - 80 % of silver, the rest is a stabilizing protein

Argentum colloidal ad usum externum PhEur

AgNO₃ – sometimes in eye drops; „lapis infernalis“ (= “hell stone“): the stick for treatment of superficial lesions and ulcerations



bismuth subgallate; *Bismuthi subgallas PhEur* – antiseptic powder for wounds healing etc.

2. Compounds with oxidation mechanism

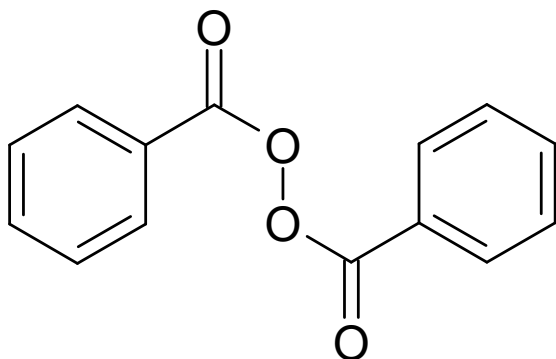
2.1 Peroxo compounds

H_2O_2 – antiseptic in 3% concentration

- oxidative damage of both lipids and proteins of cell membranes of microorganisms

CH_3COOOH – peroxyacetic acid – disinfection of medical instruments etc.

- supplied as approx. 30% solution in CH_3COOH , dilution with water in time of need



dibenzoylperoxide

- topical treatment of *Acne vulgaris*

2.2 Halogens and compounds releasing them

2.2.1 Halogens

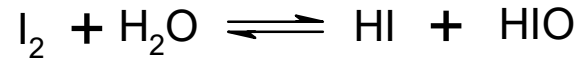
F₂, Cl₂ – disinfection of drinking water and water in pools

(F₂ also for enhancement of teeth growing and against osteoporosis)

Br₂ not used due to its toxicity/reactivity

I₂ *Solutio iodi spirituosa, glycerolica*

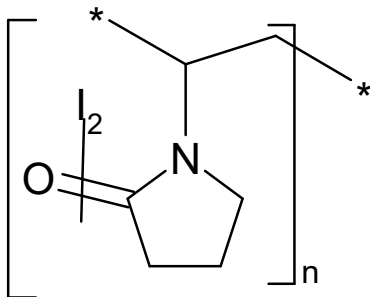
Aqueous solution: iodine is not stable



That is why Lugol solution is prepared



Iodine-polyvidone

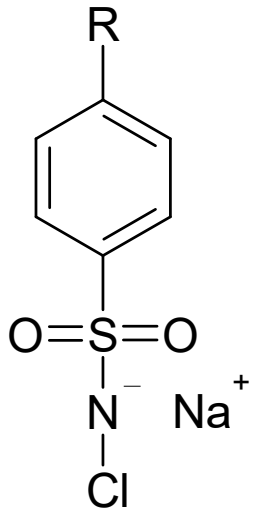


a complex of iodine with poly(1-vinylpyrrolidin-2-one)
Jox®, Betadine®

2.2.2 Labile compounds containing halogens

Sodium hypochlorite NaClO

- approx. 5 % aqueous solution for disinfection of pool water, sanitary ceramics, bleaching of clothes etc.
 - against bacteria, fungi and viruses
- Savo ® , Domestos ®



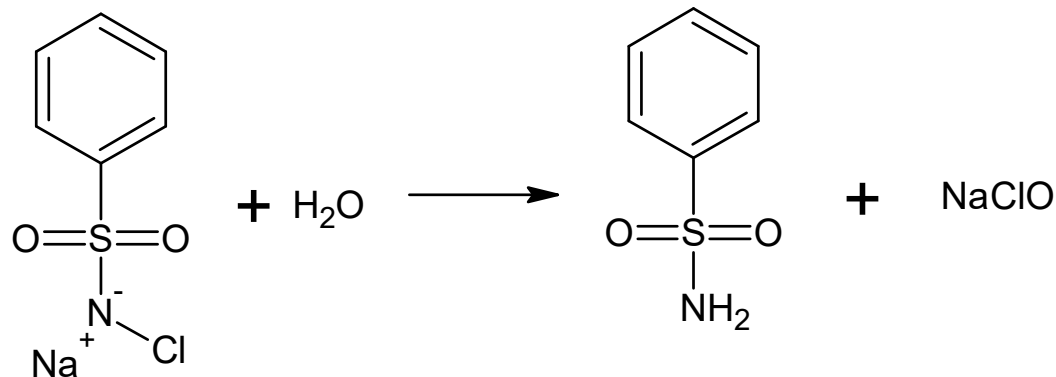
R = -H benzenesulfochloramide sodium salt

Chloramin B ®

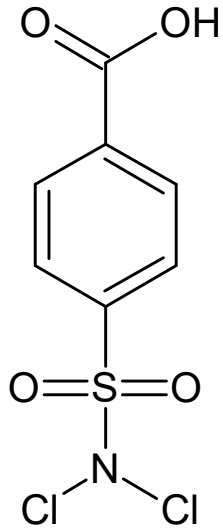
R = -CH₃ *p*-toluenesulfochloramide sodium salt

Chloramin T®

- discovered during 1st World War as a substitution for gaseous Cl₂
- disinfection of floors, water etc.



Labile compounds containing halogens (continued)



N,N-dichloro-4-sulfamoylbenzoic acid

halazone

syn. pantocide

- pressed together with Na_2CO_3 or $\text{Na}_2\text{B}_4\text{O}_7$ into effervescent/soluble tablets
- disinfection of water (= to make drinking water from any surface water)

3. Alcohols & phenols

Lower alcohols – ethanol, propane-2-ol

- ethanol has antimicrobial activity in concentrations > 15 %
- mechanism of action: denaturation of superficial proteins
- abroad („old“ EU countries) propan-2-ol used more than ethanol due to the alcohol tax

Lower alkanediols – propane-1,2-diol (propyleneglycol)

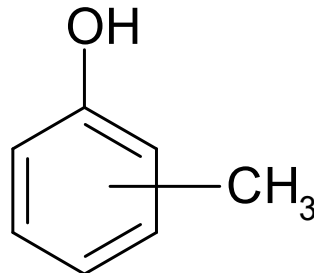
Aryl alcohols – benzylalcohol, phenethylalcohol (= 2-phenylethanol) – vaccines preservatives

Phenols

phenol – today not used as antiseptic, high toxicity, necroses

- inactivation of live components of vaccines
- remains a standard for evaluation of antimicrobial activity

cresols – methylphenols: *o*-, *m*-, *p*-cresol – mixture = tricresol (Lyzol) – disinfection of hospital floors; *Kresolum saponatum*® - solution in potassium soap



4. Aldehydes

formaldehyde – methanal HCO

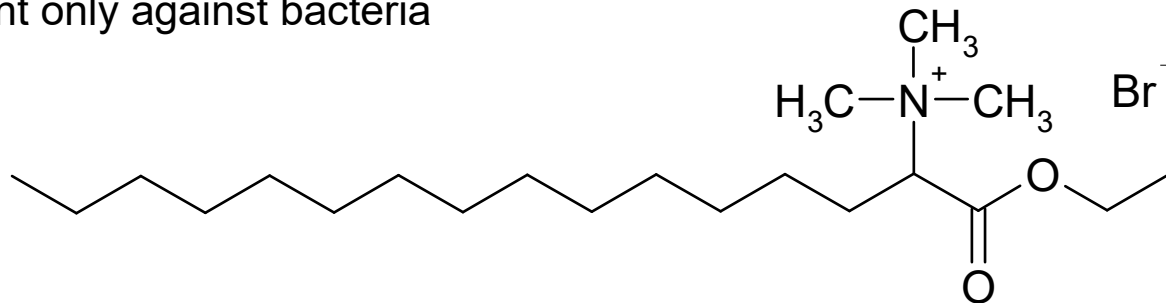
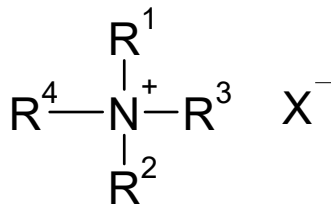
Formaldehydi solutio 35 % PhEur

- preservation of anatomical specimens (aqueous solution – „formalin“)
- antiseptic of mouth and larynx – gargles – *Gargarisma formaldehydi Kutvirt*
- mechanism of action: interaction with bacterial proteins – forming of Schiff bases with free amino groups \Rightarrow protein denaturation

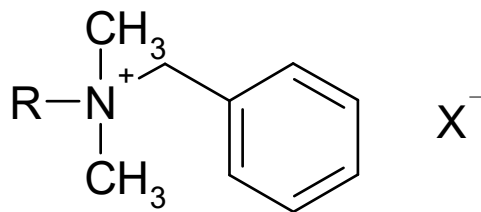
malondialdehyde – propanedial $\text{HOC-CH}_2\text{-COH}$

5. Quaternary ammonium salts

- surface-active compounds – cationic tensides - „inversion soaps“
- mechanism of action: damage surface proteins of bacteria
- efficient only against bacteria



carbethopendecinium bromide
Carbethopendecinii bromidum ČL 2009



R = -C₁₂H₂₅ X = Br

benzododecinium bromide

Benzododecinium bromatum ČSL 4

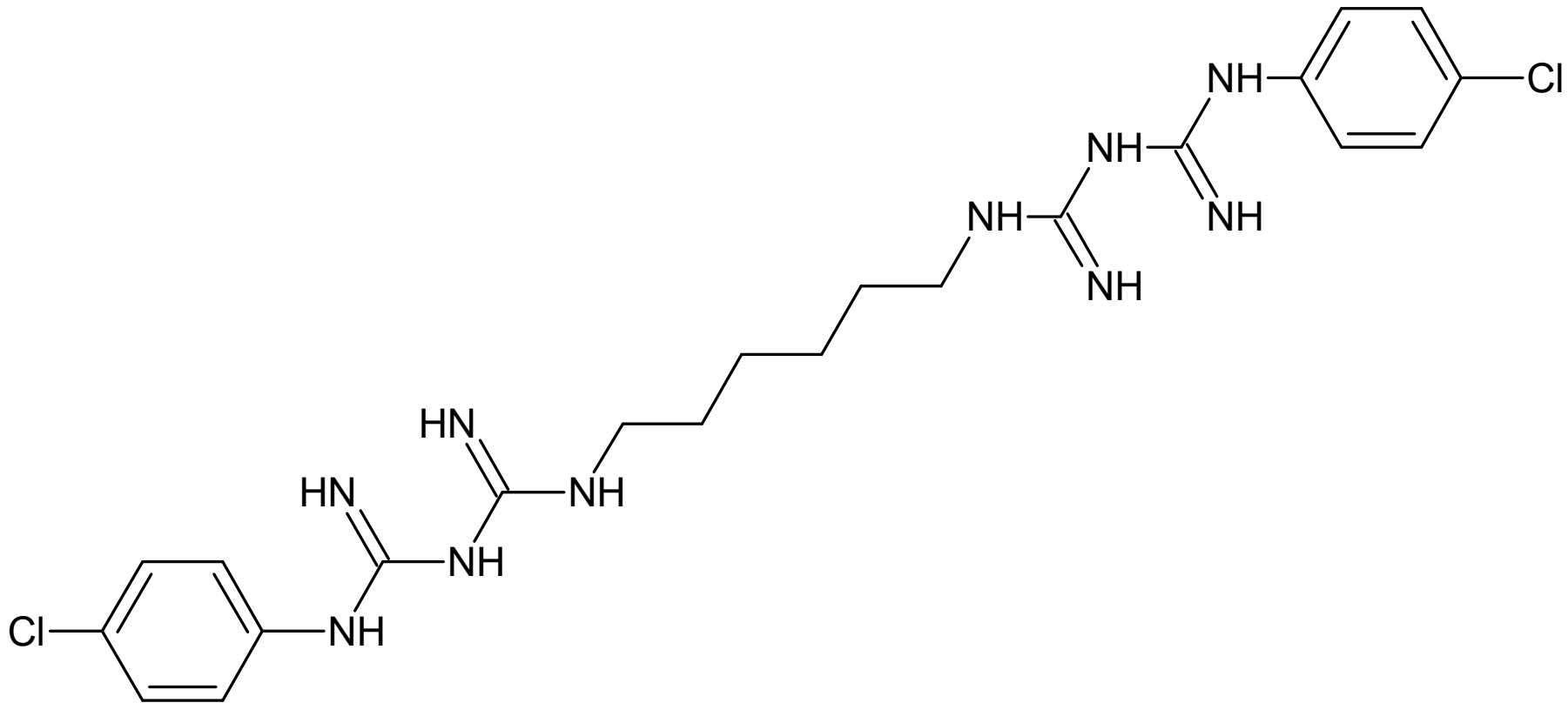
Ajatin

R = C₈H₁₇ - C₁₈H₃₇ X = Cl

benzalkonium chloride

Benzalkonii chloridi solutio PhEur

6. Biguanide derivatives

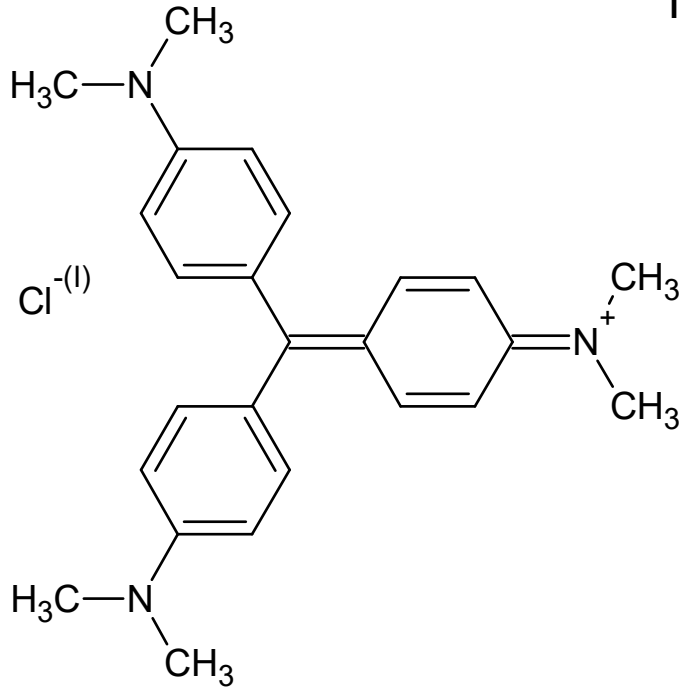


1,1'-Hexamethylenebis[5-(4-chlorophenyl)biguanide] **chlorhexidine**

- antiseptic impregnation of adhesive plasters with a “pillow”, mouth waters
- mechanism of action: interaction with cell membrane – blocks live-important processes there

7. Dyes

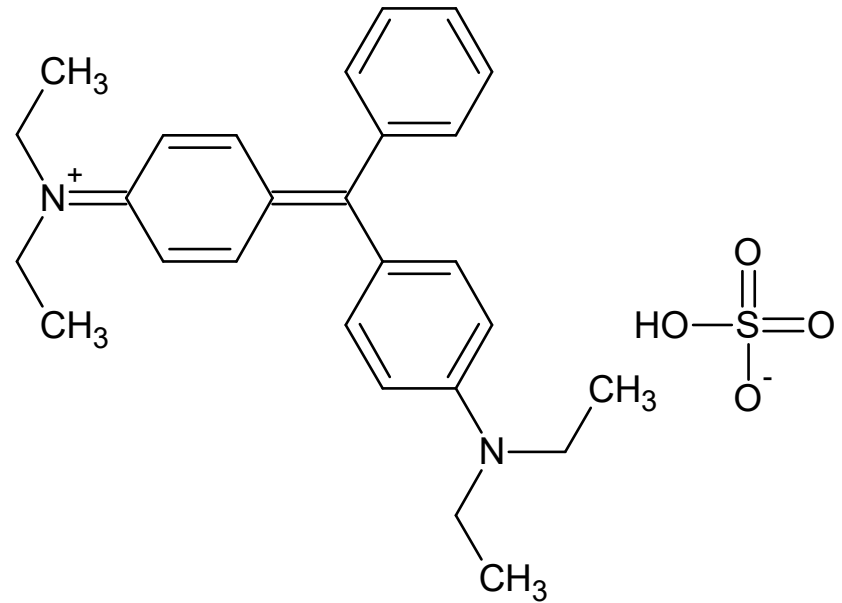
Triphenylmethane dyes



Methylrosaniline chloride

gentian violet

- antibacterial, antifungal, anthelmitic
- local treatment of throat or mouth inflammations by smearing with its solution on a cotton wool roll on a wooden stick
- skin lesions

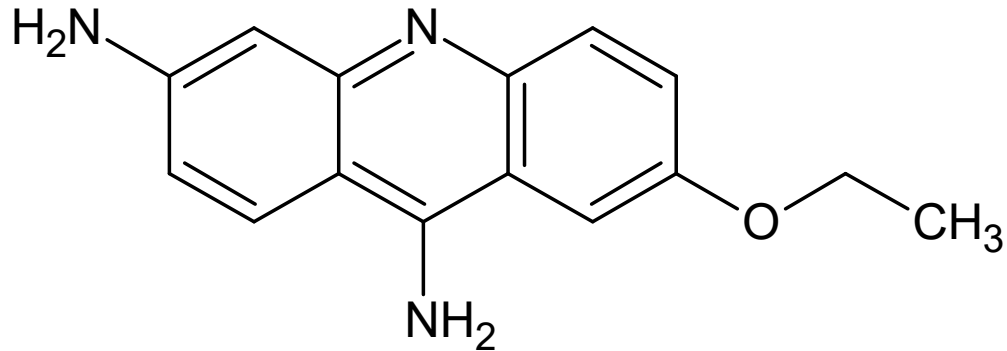


Brilliant green

Viride nitens

- Solutio Novikov*: antiseptic “lacquer” (paint) consisting of collodium (4% of nitrocellulose in ether), brilliant green and ethanol for treatment and covering of scratches

7. Dyes (continued)
Acridine dyes



2,5-Diamino-7-ethoxyacridine

ethacridine

Ethacridini lactas monohydricus PhEur

- mechanism of action: intercalation (= inserting) into DNA of a germ
- wounds, skin disorders