evropský sociální fond v ČR
EVROPSKÁ UNIE
MINISTERSTVO ŠKOLSTVÍ, MLÁDEŽE A TĚLOVÝCHOVY
OP Vzdělávání pro konkurenceschopnost
INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

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 menbranes of the body - „externally“

„Intestinal disinfectants“ – non-exact designation for non-absorbable antibacterial chemotherapeutics acting in gastrointestinal tract (will be reffered among antidiarrhoics)

Classification of disinfectants and antiseptics

1. Heavy metals and their compounds
2. Compounds with oxidation mechanism

2.1 Peroxo compouns

2.2 Halogens and labile compounds containing them

2.3 $KMnO_4$

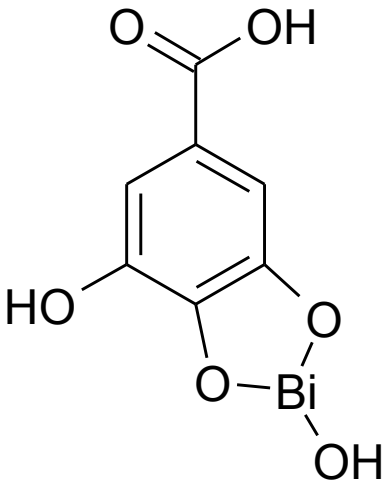
3. Alcohols and phenols
4. Aldehydes
5. Quarternary ammonium salts
6. Biquanide derivatives
7. Dyes

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 colloidale ad usum externum PhEur

$AgNO_3$ – sometimes in eye drops; „lapis infernalis“ (= “hell stone“): the stick for treatment of superficial lessions and ulcerations



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

2. Compounds with oxidation mechanism

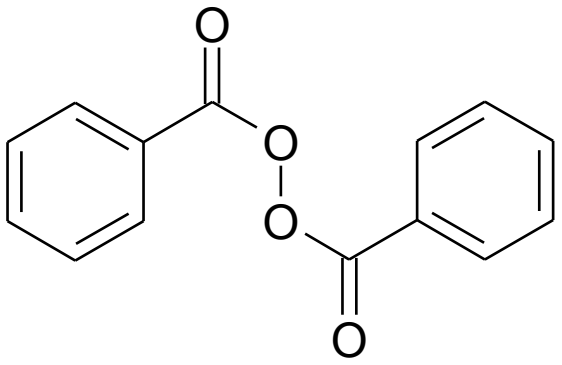
2.1 Peroxo compounds

H_2O_2 – antiseptic in 3% concentration

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

CH_3COOOH – peroxoacetic 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

F_2, Cl_2 – disinfection of drinking water and water in pools

(F_2 also for ehnhancement of teeth growing and against osteoporosis)

Br_2 not used due to its toxicity/reactivity

I_2 *Solutio iodi spirituosa, glycerolica*

Aqueous solution: iodine is not stable

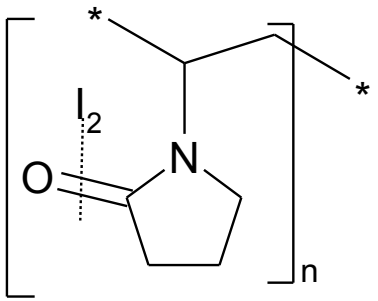
$$I_2 + H_2O \rightleftharpoons HI + HIO$$

That is why Lugol solution is prepared

$$I_2 + KI \rightleftharpoons KI_3$$

potassium triiodide

Iodine-polyvidone



a complex of iodine with poly(1-vinylpyrrolidin-2-one)

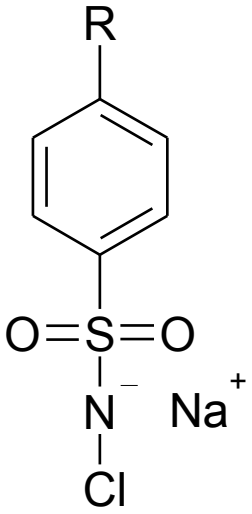
Jox®, Betadine®

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.
- agains bacteria, fungi and viruses

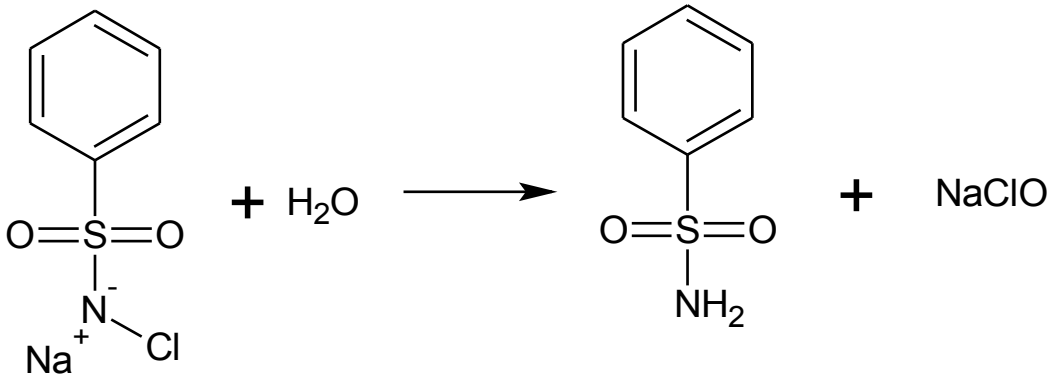
Savo ® , Domestos ®



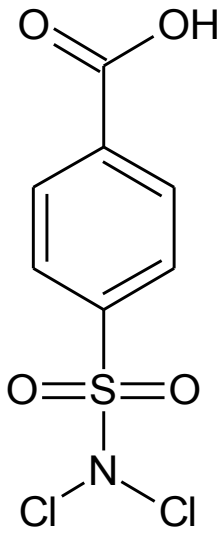
R = -H benzenesulfochloramide sodium salt — Chloramin B ®

R = -CH_3 *p*-toluenesulfochloramide sodium salt — Chloramin T®

- discovered during 1st World War as a substitution for gaseous Cl_2
- 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 $Na_2B_4O_7$ into effervescent/soluble tablets
- disinfection of water (= to make drinking water from any surface water)

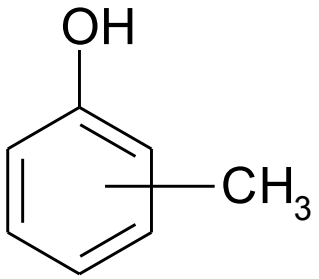
3. Alcohols & phenols

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



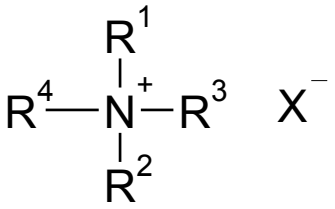
4. Aldehydes

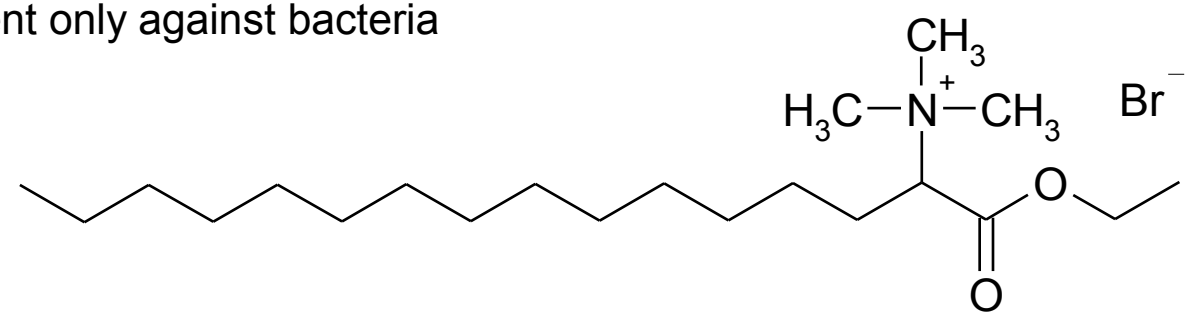
formaldehyde – methanal HCO
Formaldehydi solutio 35 % PhEur
• preservation of anatomical specimens (aquaeous solution – „formalin“)
•antiseptic of mouth and larynx – gargles – *Gargarisma formaldehydi Kutvirt*
•mechanism of action: interaction with bacterial proteins – forming of Schiff bases with free amino groups ⇒ protein denaturation

malondialdehyde – propanedial $HOC\text{-}CH_2\text{-}COH$

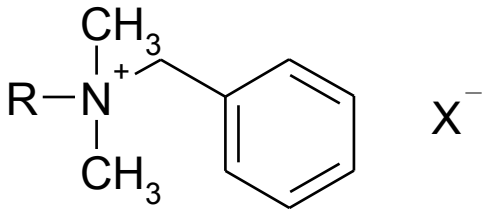
5. Qurternary ammonium salts

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





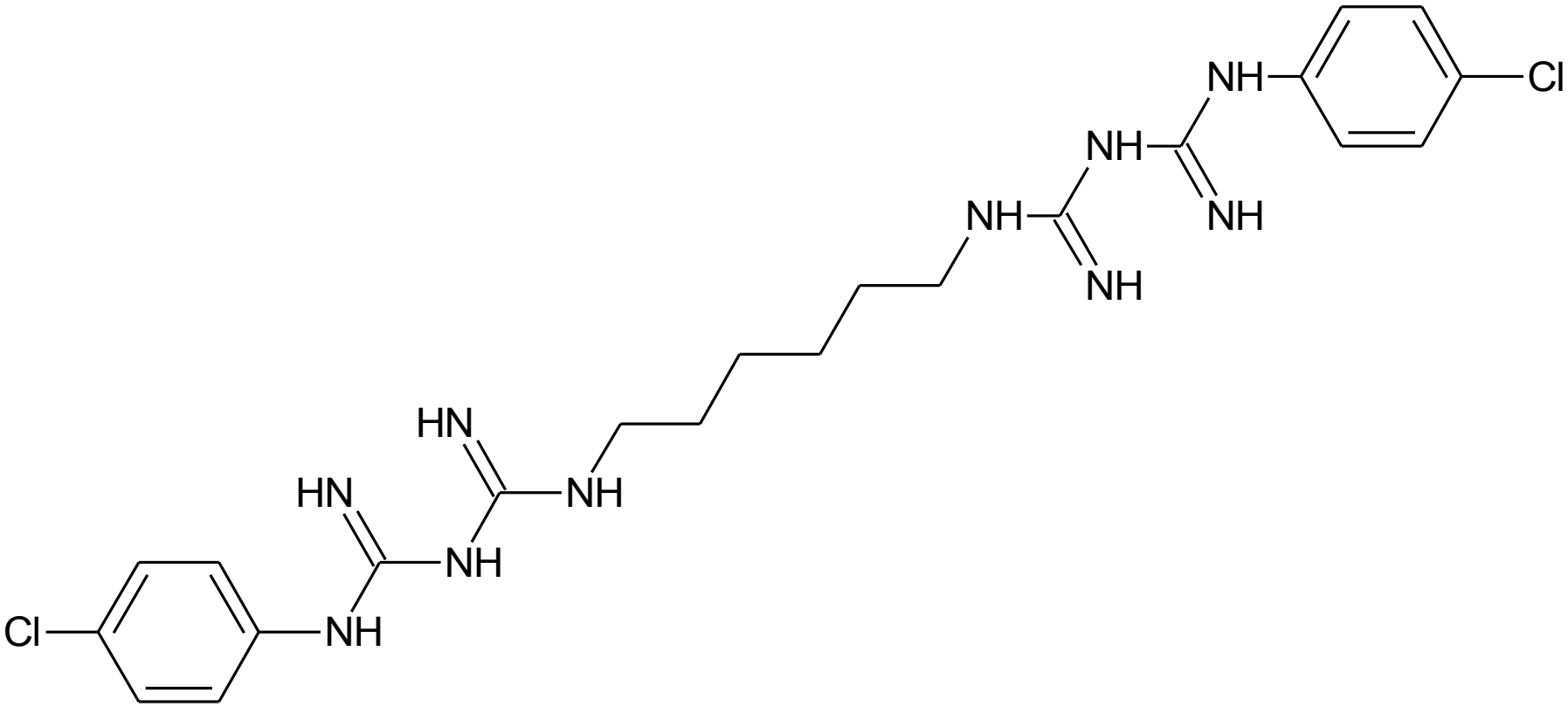
carbethopendecinium bromide
Carbethopendecinii bromidum ČL 2009



R = $-C_{12}H_{25}$ X = Br
benzododecinium bromide
Benzododecinium bromatum ČSL 4
Ajatin

R = C_8H_{17} - $C_{18}H_{37}$ X = Cl
benzalkonium chloride
Benzalkonii chloridi solutio PhEur

6. Biguanide derivatives



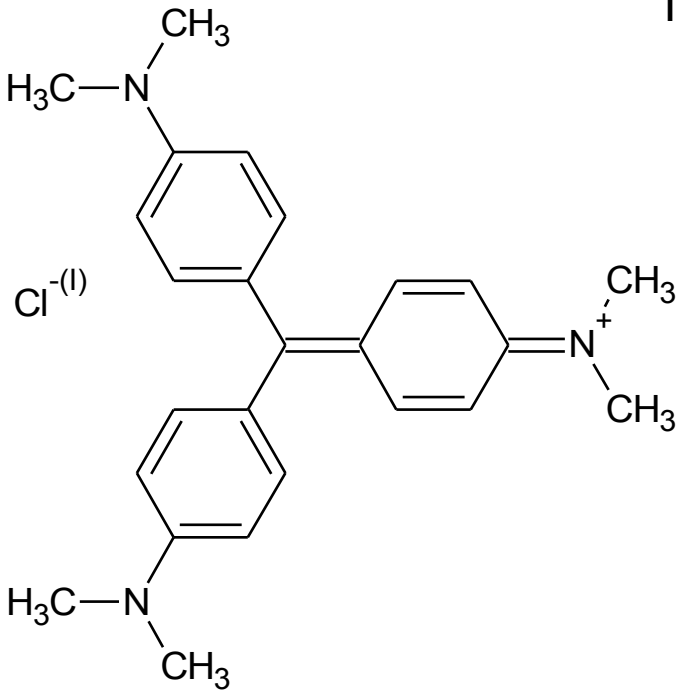
1,1'-Hexamethylenebis[5-(4-chlorophenyl)biguanide]

chlorhexidine

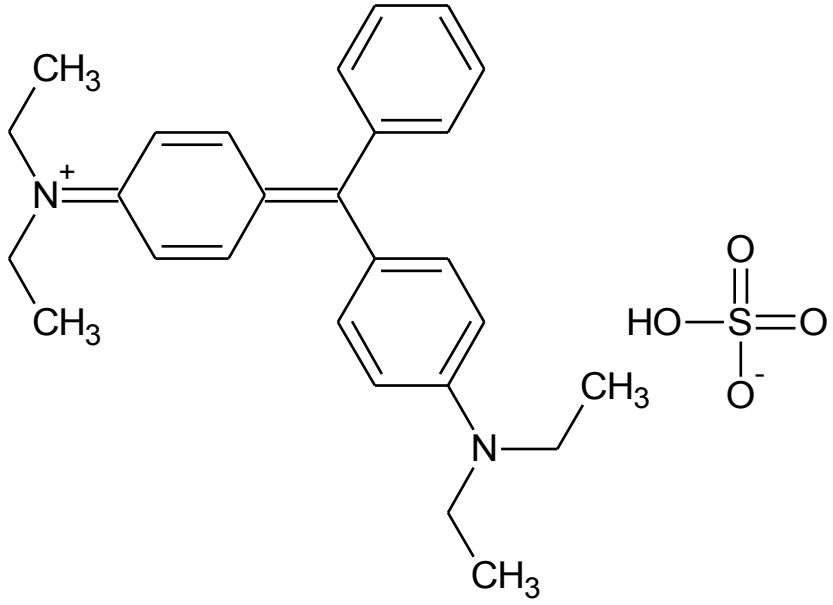
•antiseptic impregnation of adhesive plasters with a “pillow”, mouth waters

•mechanism of action: interaction with cell mebrane – blocks live-important processes there

7. Dyes
Triphenylmethane dyes

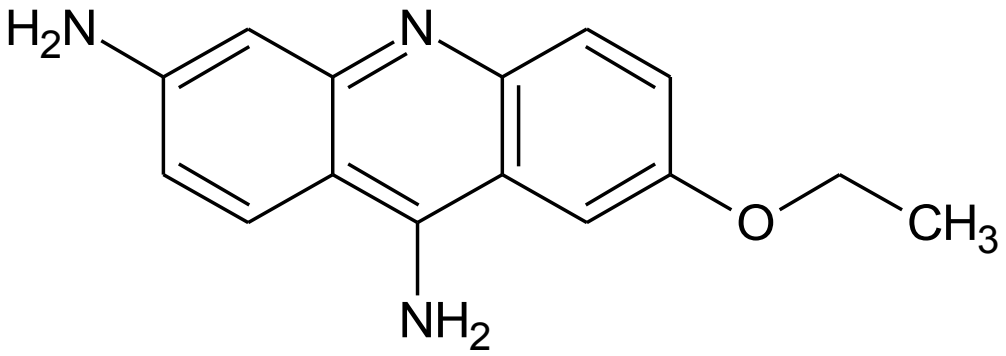


Methylrosaniline chloride
gentian violet
•antibacterial, antifungal, anthelmitic
•local treatment of throat or mouth inflammations by smearing with its solution on a cotton wool roll on a wooden stick
•skin lesions



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