Chemical methods for controlling microorganisms

Effectiveness
Toxicity
Stability
Odor
Solubility

1. Phenol and Phenolics

- cresols, xylenols, and ortho-phenylphenol
- as disinfectants in laboratories and hospitals
- act by denaturing proteins and disrupting cell membrane
- kill most bacteria, most fungi, and some viruses,
- but are usually ineffective against endospores

2. Alcohols

- ethanol and isopropanol (70 to 80%)
- disinfectants and antiseptics
- act by denaturing proteins and dissolving membrane lipids
- bactericidal and fungicidal but not sporicidal
- lipid-containing viruses are also destroyed.

3. Halogens

- iodine, chlorine, bromine, fluorine

Iodine, as iodine tincture, 2% or more iodine in a water ethanol solution of potassium iodide or as iodophors, complexed with solubilizing agent or surfactants.

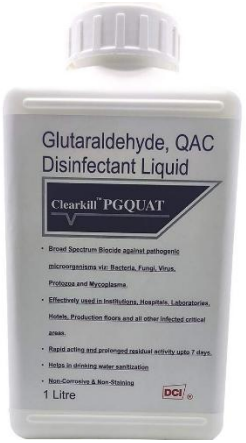
- At higher concentrations, it may even kill some spores.
- Antiseptic, skin degerming and disinfecting in hospitals and laboratories
- by oxidizing cell constituents and iodinating cell proteins.

Chlorine is used as disinfectant for municipal water supplies and swimming pools

- as chlorine gas, sodium hypochlorite, or calcium hypochlorite, all of which yield hypochlorous acid (HClO) and then atomic oxygen, denature microbial enzymes

4. Aldehydes

- formaldehyde and glutaraldehyde
- combine with nucleic acids and proteins and inactivate them, by crosslinking and alkylating molecules
- sporicidal and as chemical sterilant in hospital and laboratory



5. Heavy metals

- silver, copper, mercury, arsenic, zinc etc as germicides
- combine with proteins and inactivate them
- precipitate cell proteins
- 1% silver nitrate ----ophthalmic gonorrhea
- Silver sulfadiazine ---- on burns
- Copper sulfate --------algicide in lakes and swimming pools

6. Sterilizing Gases

Ethylene oxide (4-12 h exposure)

- microbicidal and sporicidal
- kills by combining with cell proteins
- heat-sensitive items such as disposable plastic petri dishes and syringes, heart-lung machine components
- high penetrating power and denatures microbial proteins.