GuideSheet

Common Disinfectants for the Laboratory

The table below depicts commonly used disinfectants in biomedical laboratories and summarizes the mode of action, hazards, benefits, and disadvantages of each.

Class of Disinfectants	Mode of Action	Advantages	Disadvantages	Hazards
Alcohols Examples • Ethyl alcohol (ethanol) • Isopropyl alcohol (isopropanol)	Damages cell membranes, denatures essential microbial proteins, and interferes with metabolism resulting in cell lysis. Mixtures of alcohols and water are more microbiocidally active than pure (absolute) alcohol, but microbiocidal activity decreases significantly if alcohol content falls below 50%.	• Does not leave any residue • Inexpensive	• Reduced activity against non-enveloped viruses • Evaporates before required contact time (requires prolonged contact time to be effective) • Not effective against spores • May harden rubber • Can dissolve certain glues	Flammable 
Chlorine Compounds Examples • Household bleach (Chlorox) • Clidox-S	Available free chlorine acts as organic and fat solvent degrading fatty acids, transforming them into fatty acid salts and glycerol. They reduce the surface tension of the remaining solution and increase membrane permeability. Chlorine compounds affect surface antigen in enveloped viruses and DNA as well as structural alterations in non-enveloped viruses. Stability of available free chlorine depends on chlorine concentration, pH, presence of organic matter, and light.	• Inexpensive • Effective against enveloped and non-enveloped viruses • Wide bactericidal spectrum	• Must be made fresh to maintain available free chlorine at microbiocidally active levels • Corrodes metals • Activity significantly reduced by proteins (e.g. from serum) • Less bactericidal in more basic environment (elevated/ increased/higher pH) • Extended contact time required for tuberculocidal activity	May be incompatible with other disinfectants or chemicals > may cause development of chlorine vapor. 

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Quaternary Ammonium Compounds (Quats) Examples • Lysol • Quatricide • Vindicator+	Affects proteins.	• Mainly effective against gram positive bacteria • Best as addition to water baths and incubators (no halide or phenolic residue)	Not effective against spores.	Nontoxic, if handled and used according to the manufacturer's directions.
Phenolics Examples • Hil-Phene • Carbolic Soap	Causes proteolysis.	Active against vegetative bacteria and enveloped viruses.	Not effective against spores.	• Able to penetrate skin and latex gloves • Irritant 
Iodophors Example • Wescodyne	Penetrates cell wall of microorganism and disrupts protein and nucleic acid structure and synthesis.	• Broad range activity including enveloped viruses, bacteria, fungi • Quick acting antimicrobial • Not affected by hard water	• Variable activity against non-enveloped viruses, *Mycobacterium tuberculosis,* and spores • Corrodes metals and stains surfaces	• Skin and eye irritant • Corrosive • Toxic 
Accelerated Hydrogen Peroxide Examples • Accel Wipes • Oxivir®Tb • Sporocide Plus™	Hydrogen peroxide generates free hydroxyl radicals, which attack membrane lipids, essential cell components, and cause DNA strand breakage.	Effective against enveloped and non-enveloped viruses, gram positive, gram negative bacteria and fungi, and bacterial spores (*Clostridium difficile*).	Contact times for tuberculocidal activity may vary and need to be verified on SDS or product label information.	Safe to handle when following manufacturer's directions.
Peroxygen Compounds Example • Virkon S	Oxidation of proteins and other components of cell protoplasm leads to inhibition of enzyme systems and loss of cell wall integrity.	Effective against enveloped and non-enveloped viruses, gram positive, gram negative bacteria and fungi, and bacterial spores (*Bacillus subtilis*).	Mixed reports on activity against *Mycobacterium tuberculosis*.	Powder form is skin, eye, and inhalation irritant, corrosive, and toxic (solution containing Virkon S at a concentration of 1-2% only poses minimal hazards). 

References

Biosafety in Microbiological and Biomedical Laboratories. Centers for Disease Control and Prevention/National Insitutues of Health, 5th Ed. U.S. Department of Health and Human Services. Washington, DC: 2009

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McDonnell, G. Antisepsis, Disinfection, and Sterilization: Types, Action and Resistance. Washington, DC: ASM Press, 2007 New Hampshire Department of Education.

EPA Registered Hard Surface Disinfectants Comparison Chart

U.S. Department of Health, Education, and Welfare. NIH Laboratory Safety Monograph: A Supplement to the NIH Guidelines for Recombinant DNA Research. National Institutes of Health, 1978.