



ENVIRONMENTAL HEALTH & SAFETY

The University of Alabama at Birmingham

Biohazard Equipment Disinfection/Decontamination

Disinfection: Disinfection is a procedure that reduces the level of microbial contamination by eliminating nearly all recognized pathogenic microorganisms, but not necessarily all microbial forms (e.g., bacterial spores) on inanimate objects. Disinfection does not ensure an “overkill” and therefore lacks the margin of safety achieved by sterilization procedures. Disinfectants and their application should be carefully considered, as their effectiveness is significantly altered by a number of factors. These include:

- the disinfectant used
- nature and number of contaminating microorganisms (especially the presence of bacterial spores)
- the amount of organic matter present (e.g., soil, feces, and blood)
- type and condition of instruments, devices, and materials to be disinfected
- temperature
- contact time with disinfectant

Table 1. Disinfectant Efficacy for Various Infectious Agent Categories

Liquid Disinfectants [†]	Requirements for Disinfection			Inactivation Efficacy			
	Effective Dilution Range	Contact Time (minutes)		Vegetative Bacteria	Lipo virus	Nonlipid Viruses	Bacterial Spores
		Enveloped Viruses	Broad Spectrum				
Quaternary Ammonium	0.1 – 2.0%	10	Not Effective	+	+		
Chlorine	500 ppm*	10	30	+	+	+	+
Ethanol	70 – 85%	10	Not Effective	+	+	variable, virus dependent	
Formaldehyde	0.2 – 8.0%	10	30	+	+	+	+
Glutaraldehyde	2%	10	30	+	+	+	+
Iodophor	25 – 1600 ppm	10	30	+	+	+	+
Isopropanol	70 – 85%	10	Not Effective	+	+	variable, virus dependent	
Phenolic	1.0 – 5.0%	10	Not Effective	+	+	variable, virus dependent	

*Commercially available chlorine bleach is 5.25% chlorine (52,200 ppm). A dilution of 1 to 100 will yield a 525 ppm solution, which is suitable for disinfecting purposes.

[†]See product-specific SDS for safety information and read instructions carefully before use.



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	Ethylene Oxide	Para-formaldehyde (gas)	Quaternary Ammonium Cmpds	Phenolic Cmpds	Chlorine Cmpds	Iodophor Cmpds	Alcohol (ethyl or isopropyl)	Formaldehyde (liquid)	Glutaraldehyde
Use Conditions									
Concentration of active ingredient	400-800 mg/l	0.3g/ft ³	0.1-2%	0.2-3%	0.01-5%	0.47%	70-85%	4-8%	2%
Temperature, °C	35-60	>23							
Relative humidity, %	30-60	>60							
Contact time, minutes	105-240	60-180	10-30	10-30	10-30	10-30	10-30	10-30	10-600
Effective Against *									
Vegetative bacteria	+	+	+	+	+	+	+	+	+
Bacterial spores	+	+			∇			∇	+
Lipo viruses	+	+	+	+	+	+	+	+	+
Hydrophilic viruses	+	+		∇	+	∇	∇	+	+
Tubercle bacilli	+	+		+	+	+	+	+	+
HIV	+	+	+	+	+	+	+	+	+
HBV	+	+		∇	+	∇	∇	+	+
Applications *									
Contaminated liquid discard				+				∇	
Contaminated glassware	∇		+	+	+	+		∇	+
Contaminated instruments	∇			+	+			∇	+
Equipment total decon	∇	+							
<p>* (+) very positive response; (∇) less positive response; blank, a negative response or not applicable. See product-specific SDS for safety information and read instructions carefully before use.</p> <p>Adapted from <i>Laboratory Safety, Principles and Practices</i>, D. Fleming, J. Richardson, J. Tulis, D. Vesley; American Society for Microbiology, 1995: 226-227.</p>									



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Table 2. Decontaminants for Infectious Waste Management Table 3. Other Important Disinfectant Properties

Disinfectants		Important Characteristics										
Type	Category	Shelf Life	Corrosive	Flammable	Residue	Inactivated by Organic Matter	Compatible for Optics*	Compatible for Electronics	Skin Irritant	Eye Irritant	Respiratory Irritant	Toxic
Liquid	Quaternary ammonium compounds	+				+	+		+	+		+
	Phenolic compounds	+	+		+				+	+		+
	Chlorine		+		+	+			+	+	+	+
	Iodophor	+	+		+	+			+	+		+
	Alcohol, ethyl	+		+						+		+
	Alcohol, isopropyl	+		+						+		+
	Formaldehyde	+			+				+	+		+
Gas	Glutaraldehyde	+			+		+		+	+		+
	Ethylene Oxide	N/A		~			+	+	+	+	+	+
	Paraformaldehyde	N/A		~	+		+	+	+	+	+	+
	Chlorine Dioxide	N/A						+		+	+	+
	Vaporized H ₂ O ₂	N/A						+		+	+	+

See product-specific SDS for safety information and read instructions carefully before use.

~ Under specific conditions—see product SDS.

* Special considerations (compatible for optics): Usually compatible, but consider interferences from residues and effects on associated materials such as mounting.