

- b. Start the run
 - i. Do not leave the centrifuge until full operating speed has been reached and appears to be running safely without incident.
 - ii. Stop the centrifuge immediately if you notice any unusual noises or shaking and confirm the rotor is balanced.
 - iii. To prevent rotor failure,
 - 1. Do not exceed maximum speed and maximum mass limits for the rotor.
 - 2. You must reduce rotor speed if sample density calculations indicate maximum mass limits will be exceeded.
 - 3. Contact the manufacturer for guidance.
 - c. Sample Removal
 - i. Stop run: Ensure centrifuge comes to complete stop before opening cover.
 - ii. When centrifuging hazardous materials, wait at least 10 minutes after run to allow aerosols to settle before opening the centrifuge.
 - iii. Check for leaks and spills in samples, rotor, safety cups, buckets, and centrifuge well.
 - iv. In a fume hood or biosafety cabinet (depending on material) and wearing appropriate PPE, open sealable tubes, safety cups, rotors.
5. Centrifuge Maintenance
- a. Preventive Maintenance
 - i. Establish a preventive maintenance schedule:
 - 1. Include regular cleaning of the centrifuge interior to prevent corrosion, damage, and avoid costly repairs.
 - 2. Reference centrifuge operator's manual or contact manufacturer for additional guidance.
 - ii. Equipment repair and adjustments shall only be conducted by qualified service technicians.
 - b. Maintain log book:
 - i. For all high speed centrifuges and ultracentrifuges include run dates, durations, speeds, total rotor revolutions, and notes on rotor condition.
 - ii. Retire rotors after the manufacturer's recommended life span except where an annual stress test demonstrates the absence of structural flaws. Note: Rotor life span may be reduced or warranty voided if autoclaved so contact the manufacturer for additional guidance.
6. Centrifuge Disposal
- a. If biohazardous materials were used,
 - i. Clean and disinfect the centrifuge thoroughly.
 - ii. Deface the biohazard sticker and attach a note on the centrifuge describing the decontamination process conducted.
 - b. If radioactive materials were used
 - i. Appropriate radiation warning signs shall be placed on the centrifuge.
 - ii. Prior to removal of the centrifuge, the Radiation Safety Officer (RSO) shall conduct a survey to determine if removable contamination above limits for release is detected.

1. If contamination above these limits is detected, the unit shall, under the direction of the RSO, be cleaned and re-surveyed.
2. If continued cleaning fails to bring the contamination below release limits, the centrifuge shall be disposed of as radioactive waste.

APPENDIX C – BIOSAFETY CABINET TYPES AND SELECTION BY RISK ASSESSMENT

Biosafety Cabinet Types		
BSC Class	Airflow Pattern	Specific Uses
Type I	Air flows in at the front and is exhausted through a HEPA filter.	<ul style="list-style-type: none"> • Material in BSC is not protected, provides protection only to personnel and the environment. • Can be used with non-volatile toxic chemicals and radionuclides and when exhausted outdoors may be used with volatile chemicals.
Type II A1	70% of air is recirculated in the cabinet and 30% is exhausted through a HEPA filter either to the room or through a canopy to outside.	<ul style="list-style-type: none"> • Do not use volatile chemicals. With 70% recirculation, levels of volatile chemicals can reach unsafe levels. • Only minute amounts of non-volatile toxic chemicals and radionuclides may be used.
Type II A2	Similar to Type II, A1, but has 100 fpm intake air velocity and plenums are under negative pressure to the room; exhaust air can be ducted to the outside through a canopy unit.	<ul style="list-style-type: none"> • Suitable for use with non-volatile toxic chemicals and radionuclides. • Can be used with minute amounts of volatile chemicals if ducted to the outside through an exhaust canopy.
Type II B1	30% of air is recirculated and 70% is exhausted. Exhaust cabinet air must pass through a dedicated duct to the outside through a HEPA filter.	<ul style="list-style-type: none"> • Suitable for use with non-volatile toxic chemicals and radionuclides. • Can be used with minute amounts of volatile chemicals.
Type II B2	No air recirculation; total exhaust to the outside through a HEPA filter.	<ul style="list-style-type: none"> • Suitable for use with non-volatile toxic chemicals and radionuclides • Can be used with volatile chemicals in small amounts.

Selection of a Cabinet through Risk Assessment

Biological Risk Assessed	Protection Provided			BSC Class
	Personnel	Product	Environmental	
BSL-1, -2, -3	YES	NO	YES	I
BSL-1, -2, -3	YES	YES	YES	II (A, B1, B2, B3)
BSL-4	YES	YES	YES	III B1, B2

Primary Containment for Biohazards: Selection, Installation and Use of Biological Safety Cabinets, CDC/NIH, 2nd edition.

APPENDIX D – DECONTAMINATION AND SPILL RESPONSE

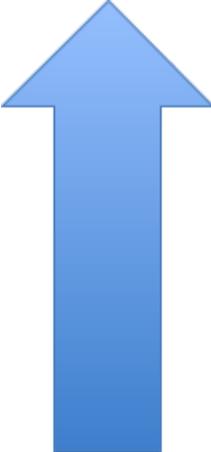
Decontamination is any process, which reduces biohazardous material (infectious agents, rDNA material, human material, biological toxins, etc) to an acceptable level below the level necessary to cause disease. Acceptable levels will depend on the biohazardous material in question, the type of work being conducted, and the method of decontamination.

In order to select the proper decontamination procedure one must consider many factors including; the biohazard's concentration and resistance to disinfectants, chemical compatibility with other materials present, surface being decontaminated, and hazards to humans and the environment associated with the disinfectant.

Note: All rDNA containing waste, including Biosafety Level 1 material, must be decontaminated prior to disposal or disposed as biohazard waste prior to being released from the laboratory.

The following two tables provide general information only. Phenolics and quats are available in many formulations with different properties. Follow the manufacturer's recommendations for use.

MICROBIAL RESISTANCE TO CHEMICAL DISINFECTANTS

MORE RESISTANT	MICROORGANISM	EXAMPLES	
	Prions	BSE,vCJD Scrapie	
	Bacterial Spores	Bacillus, Geobacillus, Clostridium sp.	
	Protozoan Oocytes	Cryptosporidium	
	Helminth Eggs	Ascaris, Enterobius	
	Mycobacteria	M. tuberculosis	
	Small non-enveloped viruses	Poliovirus, Parvoviruses, Papillomaviruses	
	Protozoan Cysts	Giardia, Acanthamoeba	
	Fungal Spores	Aspergillus, Penicillium	
	Gram-negative Bacteria	E. coli, Salmonella spp.	
	Vegetative Fungi & Algae	Candida, Chlamydomonas	
	Vegetative Helminths & Protozoa	Ascaris, Cryptosporidium, Giardia	
	Large Non-enveloped Viruses	Adenoviruses Rota viruses	
	Gram-positive Bacteria	Staphylococcus, Streptococcus, Enterococcus	
	LESS RESISTANT	Enveloped viruses	HIV, Hepatitis B, Herpes Simplex Virus

Material	Tips For Use	Advantages	Disadvantages
Chlorine Compounds	<ul style="list-style-type: none"> -Dilute household bleach 1:9(v/v) solution of household bleach (10% bleach solution), make fresh monthly -Store diluted solutions in a sealed container and protected from light. -For spill cleanup, and to wipe down work surfaces -FINAL concentration of 10% bleach used for liquid infectious waste -Fisher Scientific Fisherbrand Bleach Solution Dispenser. <p>It is a unique, Two-bottle design and fixed-ratio trigger sprayer automatically mixes concentrated bleach with tap water. Cat. No. 23-640-127</p>	<ul style="list-style-type: none"> -Relatively non-toxic -Low cost -Effective with detergents -Fast acting -Broad spectrum effectiveness 	<ul style="list-style-type: none"> -Inactivated by organic material such as blood, -Do not use at less than 1:9 (v/v) dilution -Strong oxidizer; corrosive -Irritates mucous membranes, eyes, skin -No residual activity on surfaces -Can damage clothing -Incompatible with quats -Produces toxic chlorine gas if mixed with acids or ammonia compounds -Can't be used to disinfect radioactive iodine.
Alcohols	<ul style="list-style-type: none"> -Dilute to 70% in water, (loses effectiveness at concentrations above 90%) -Use to clean instruments and wipe down interior of Biological Safety Cabinets -Use as topical antiseptic on intact skin 	<ul style="list-style-type: none"> -Non-corrosive -Effective with detergent 	<ul style="list-style-type: none"> -Can have reduced effectiveness in organic material, does not penetrate organic material -Flammable -No residual activity and limited effective exposure time due to high rate of evaporation
Phenolics	<ul style="list-style-type: none"> -Dilute according to manufacturer's instructions -Commonly used to clean walls, floors, etc -Useful in areas where organic matter cannot always be removed, such as animal areas 	<ul style="list-style-type: none"> -Good effectiveness in organic material -Effective with detergent -Has some residual Effectiveness 	<ul style="list-style-type: none"> -Toxicity varies with specific compound, can be absorbed through skin -Some formulations may have unpleasant odor -Corrosive -Skin irritant -Not effective against spores
QUATS – Quaternary Ammonium Compounds (cationic detergents)	<ul style="list-style-type: none"> -Dilute according to manufacturer's instructions -Surfaces must be rinsed free of anionic soap or detergents before use -Commonly used to clean walls, floors, etc. 	<ul style="list-style-type: none"> -Strong surface activity -Low toxicity -Non-corrosive -Effective over wide pH range 	<ul style="list-style-type: none"> -Easily inactivated by organic materials, anionic detergents, and salts of metals in water (hard water) -Skin irritant

APPENDIX E – BIOSAFETY LEVEL CONTAINMENT SIGNS

Visual Example

Only



BIOSAFETY LEVEL 1

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BIOSAFETY LEVEL 2

LIMITED ACCESS

PI Name:	Phone:	Biological Agents:
Alt Contact:	Phone:	
PPE (eye, torso, hand protection, respirator):		
Entry Requirements (vaccinations, medical surveillance):		
Exit Requirements:		
IN CASE OF EMERGENCY		
CALL 911 OR (574) 631-5555 from a cell phone.		
UNIVERSITY HEALTH SERVICE: (574) 631-7494	RISK MANAGEMENT & SAFETY (574) 631-8037	
WELLNESS CENTER: (574) 634-9355		

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BIOSAFETY LEVEL 3

LIMITED ACCESS

PI Name:	Phone:	Biological Agents:
Alt Contact:	Phone:	
PPE (eye, torso, hand protection, respirator):		
Entry Requirements (vaccinations, medical surveillance):		
Exit Requirements:		
IN CASE OF EMERGENCY		
CALL 911 OR (574) 631-5555 from a cell phone.		
UNIVERSITY HEALTH SERVICE: (574) 631-7494	RISK MANAGEMENT & SAFETY (574) 631-8037	
WELLNESS CENTER: (574) 634-9355		

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APPENDIX F – INFECTIOUS / BIOHAZARD SYMBOL AND LEGEND

