**Acutely Toxic Chemicals Guidance**

The following information is intended to provide general guidance on how to safely work with a specific class of chemical or hazard. This information is generic in nature. It addresses the use and handling of substances by hazard class only.

A list of acutely toxic chemicals is attached at the end of this document.

The purchase or possession of Select Agent toxins requires registration with the Centers for Disease Control and Prevention (CDC) or the United States Department of Agriculture (USDA). More information on the possession and use of Select Agents can be obtained by contacting EHS at 856-256-5105 or [EHS@Rowan.edu](mailto:EHS@Rowan.edu). A list of Select Agents is attached at the end of this document.

**Securing of gas cylinders**

Not applicable

**Decontamination**

* **Personnel:** Wash hands and arms with soap and water immediately after handling acutely toxic chemicals.
* **Area:** Decontamination procedures vary depending on the material being handled. The toxicity of some materials can be neutralized with other reagents. All surfaces should be wiped with the appropriate cleaning agent following dispensing or handling. Waste materials generated should be treated as a hazardous waste.
* **Equipment:** Decontaminate vacuum pumps or other contaminated equipment (glassware) before removing them from the designated area.

**Designated area**

The room sign for the laboratory must contain a Designated Areas Within identifier.

All locations within the laboratory where acutely toxic chemicals are handled should be demarcated with designated area caution tape) and/or posted with designated area caution signs. This includes all fume hoods and bench tops where the acutely toxic chemicals are handled.

Where feasible acutely toxic chemicals should be manipulated over plastic-backed disposable paper work surfaces. These disposable work surfaces minimize work area contamination and simplify clean up.

**Emergency procedure**

Emergency procedures which address response actions to fires, explosions, spills, injury to staff, should be developed by each laboratory. The procedures should address as a minimum the following:

* **Who to contact:** (Public Safety, Principal investigator/course director of the laboratory including evening phone number and Office of Environmental Health and Safety).
* The location of all safety equipment (showers, eye wash, fire extinguishers, etc.).
* The method used to alert personnel in nearby areas of potential hazards.
* Special first aid treatment required by the type of acutely toxic material(s) handled in the laboratory.

**Fume hood**

Manipulation of acutely toxic chemicals should be carried out in a fume hood. If the use of a fume hood proves impractical, refer to the section on special ventilation.

All areas where acutely toxic chemicals are stored or manipulated must be labeled as a designated area.

**Glove (dry) box**

Certain acutely toxic chemicals must be handled in a glove box rather than a fume hood. The Principal Investigator/course director will determine if this is required.

The Office of Environmental Health and Safety is available to provide guidance if required.

**Hazard assessment**

Hazard assessment should focus on proper use and handling procedures, the education of employees concerning the health risk posed by acutely toxic materials, and on the demarcation of designated areas.

**Personal Protective Equipment**

Lab coats, closed toed shoes, and long sleeved clothing should be worn when handling acutely toxic chemicals. Additional protective clothing should be worn if the possibility of skin contact is likely.

The Office of Environmental Health and Safety is available to provide guidance.

**Eye protection**

Eye protection in the form of safety glasses must be worn at all times when handling acutely toxic chemicals. Ordinary (street) prescription glasses do not provide adequate protection. (Contrary to popular opinion these glasses cannot pass the rigorous test for industrial safety glasses.) Adequate safety glasses must meet the requirements of the Practice for Occupational and Educational Eye and Face Protection (ANSI/ISEA Z87.1-2010) and must be equipped with side shields. Safety glasses with side shields do not provide adequate protection from splashes; therefore, when the potential for splash hazard exists other eye protection and/or face protection must be worn.

**Gloves**

Gloves should be worn when handling acutely toxic chemicals. Disposable nitrile gloves provide adequate protection against accidental hand contact with small quantities of most laboratory chemicals. However, the handling of some acutely toxic chemicals will require chemical resistant gloves.

The Principal Investigator/course director is responsible to the select the appropriate chemical resistant glove when direct or prolonged contact with hazardous chemicals is anticipated.

The Office of Environmental Health and Safety is available to provide guidance.

**Safety shielding**

Safety shielding is required any time there is a risk of explosion, splash hazard or a highly exothermic reaction. All manipulations of acutely toxic chemicals which pose this risk should occur in a fume hood with the sash in the lowest feasible position. Portable shields, which provide protection to all laboratory occupants, are acceptable.

The Principal Investigator/course director is responsible to the select the appropriate shielding.

The Office of Environmental Health and Safety is available to provide guidance.

**Eyewash**

Where the eyes or body of any person may be exposed to acutely toxic chemicals, suitable facilities for quick drenching or flushing of the eyes and body shall be provided within the work area for immediate emergency use. Bottle type eyewash stations are not acceptable.

**Safety shower**

A safety or drench shower should be available in a nearby location where the acutely toxic chemicals are used.

**Signs and labels**

* **Doorways:** The room sign must contain a Designated Area Within identifier where carcinogens, reproductive hazards, and/or acutely toxic chemicals are stored or used.
* **Containers:** All acutely toxic chemicals must be clearly labeled with the correct chemical name and CAS #. Handwritten labels are acceptable; chemical formulas and structural formulas are not acceptable. Chemical containers must be dated upon receipt as well as when opened.

**Special storage**

Acutely toxic chemicals must be stored in a designated area.

**Special ventilation**

Manipulation of acutely toxic chemicals outside of a fume hood may require special ventilation controls in order to minimize exposure to the material. Fume hoods provide the best protection against exposure to acutely toxic chemicals in the laboratory and are the preferred ventilation control device. Where possible handle acutely toxic chemicals in a fume hood. If the use of a fume hood proves impractical, attempt to work in a glove box or in an isolated area on the laboratory bench top while wearing the appropriate PPE.

If available, consider using a ***ducted*** Biological Safety Cabinet. The ***ducted*** biological safety cabinet is designed to remove the acutely toxic chemicals before the air is discharged into the environment. Acutely toxic chemicals that are volatile must not be used in a biological safety cabinet unless the cabinet is vented to the outdoors. A Biological Safety Cabinet that exhausts into the laboratory is not suitable for this work.

If your research does not permit the handing of acutely toxic chemicals in a fume hood, ***ducted*** biological safety cabinet, or glove box, you must contact the Office of Environmental Health and Safety.

All areas where acutely toxic chemicals are stored or manipulated must be labeled as a designated area.

**Spill response**

Anticipate spills by having the appropriate clean up equipment on hand. It is recommended to purchase a spill kit for your laboratory for this purpose. The appropriate clean up supplies can be determined by consulting the Safety Data Sheet. This should occur prior to the use of any acutely toxic chemical.

In the event of a spill alert personnel in the area that a spill has occurred. Do not attempt to handle a large spill of acutely toxic chemicals. Vacate the laboratory immediately and call for assistance.

* Public Safety 856-256-4911. This is a 24 hour service.
* Office of Environmental Health & Safety, 856-256-5105 or [EHS@Rowan.edu](mailto:EHS@Rowan.edu)

Remain on the scene, but at a safe distance, to receive and direct safety personnel when they arrive.

**Vacuum protection**

Evacuated glassware can implode and eject flying glass, and splattered chemicals. Vacuum work involving acutely toxic chemicals must be conducted in a fume hood, glove box or isolated in an acceptable manner.

Mechanical vacuum pumps must be protected using cold traps and, where appropriate, filtered to prevent particulate release. The exhaust for the pumps must be vented into an exhaust hood.

**Waste disposal**

All materials contaminated with acutely toxic chemicals should be disposed of as a hazardous waste. Wherever possible, attempt to design research in a manner that reduces the quantity of waste generated.

Questions regarding waste pick up should be directed to the Office of Environmental Health and Safety at 856-256-5105 or [EHS@Rowan.edu](mailto:EHS@Rowan.edu). This office can also assist you in minimizing waste generation.

A list of Acutely Toxic Chemicals and Select Agents is provided on the following pages, as a guide. The list is not inclusive. Other chemicals and hazardous agents may be periodically added to the list.

## Acutely Toxic Chemicals

This list is provided as a guide and is not all inclusive. Review Safety Data Sheet

|  |  |  |
| --- | --- | --- |
| Acrolein | Acrylyl chloride | 2-Aminopyridine |
| Benzyl chloride | Bromine | Chlorine dioxide |
| Chlorine trifluoride | Chlorpicrin | Cyanogen chloride |
| Cyanuric fluoride | Decaborane | Dichloro acetylene |
| Dimethyl disulfide | Dimethylsulfate | Dimethylsulfide |
| Ethylene chlorohydrin | Ethylene fluorohydrin | Hexamethylene diisocyanate |
| Hexamethyl phosphoramide | Iodine | Iron pentacarbonyl |
| Isopropyl formate | Methacryloyl chloride | Methacryloxyethyl isocyanate |
| Methyl acrylonitrile | Methyl chloroformate | Methylene biphenyl isocyanate |
| Methyl fluoroacetate | Methyl fluorosulfate | Methyl hydrazine |
| Methyl Mercury (and other organicforms) | Methyltrichlorosilane | Methyl vinyl ketone |
| Nickel carbonyl | Nitrogen tetroxide | Nitrogen trioxide |
| Organo Tin compounds | Osmium tetroxide | Oxygen difluoride |
| Ozone | Pentaborane | Perchloromethyl mercaptan |
| Phosphorus oxychloride | Phosphous trichloride | Sarin |
| Sulfur monochloride | Sulfur pentafluoride | Sulfuryl chloride |
| Tellurium hexafluoride | Tetramethyl succinonitrile | Tetranitromethane |
| Thionyl chloride | Toluene-2,4-diisocyanate | Trichloro (chlormethyl) silane |

LIST OF SELECT AGENTS

The following biological agents and toxins have been determined to have the potential to pose a severe threat to both human and animal health, to plant health, or to animal and plant products. An attenuated strain of a select agent or an inactive form of a select toxin may be excluded from the requirements of the Select Agent Regulations. Here is a list of [excluded agents and toxins](https://www.selectagents.gov/SelectAgentsandToxinsExclusions.html).

|  |  |
| --- | --- |
| HHS and USDA Select Agents and Toxins 7CFR Part 331, 9 CFR Part 121, and 42 CFR Part 73 | |
| **HHS SELECT AGENTS AND TOXINS** Abrin Bacillus cereus Biovar anthracis\* Botulinum neurotoxins\*  Botulinum neurotoxin producing species  of Clostridium\*  Conotoxins (Short, paralytic alpha conotoxins  containing the following amino acid sequence X1CCX2PACGX3X4X5X6CX7)1  Coxiella burnetii  Crimean-Congo haemorrhagic fever virus  Diacetoxyscirpenol Eastern Equine Encephalitis virus3  Ebola virus\* Francisella tularensis\* Lassa fever virus Lujo virus  Marburg virus\* Monkeypox virus3 Reconstructed replication competent forms of the  1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments (Reconstructed 1918 Influenza virus)  Ricin Rickettsia prowazekii  SARS-associated coronavirus (SARS-CoV) Saxitoxin  South American Haemorrhagic Fever viruses:  Chapare  Guanarito  Junin  Machupo  Sabia  Staphylococcal enterotoxins A,B,C,D,E subtypes  T-2 toxin Tetrodotoxin Tick-borne encephalitis complex (flavi) viruses:  Far Eastern subtype  Siberian subtype  Kyasanur Forest disease virus  Omsk hemorrhagic fever virus  Variola major virus (Smallpox virus)\* Variola minor virus (Alastrim)\* Yersinia pestis\* | **OVERLAP SELECT AGENTS AND TOXINS** Bacillus anthracis\* Bacillus anthracis Pasteur strain  Brucella abortus Brucella melitensis Brucella suis Burkholderia mallei\* Burkholderia pseudomallei\* Hendra virus  Nipah virus  Rift Valley fever virus  Venezuelan equine encephalitis virus3  **USDA SELECT AGENTS AND TOXINS**  African horse sickness virus  African swine fever virus  Avian influenza virus3 Classical swine fever virus Foot-and-mouth disease virus\*  Goat pox virus  Lumpy skin disease virus  Mycoplasma capricolum3 Mycoplasma mycoides3 Newcastle disease virus2,3 Peste des petits ruminants virus  Rinderpest virus\* Sheep pox virus Swine vesicular disease virus  **USDA PLANT PROTECTION AND QUARANTINE (PPQ) SELECT AGENTS AND TOXINS** Peronosclerospora philippinensis   (Peronosclerospora sacchari)  Phoma glycinicola (formerly Pyrenochaeta glycines) Ralstonia solanacearum Rathayibacter toxicus Sclerophthora rayssiae Synchytrium endobioticum Xanthomonas oryzae |

\*Denotes Tier 1 Agent

1 C = Cysteine residues are all present as disulfides, with the 1st and 3rd Cysteine, and the 2nd and 4th Cysteine forming specific disulfide bridges; The consensus sequence includes known toxins α-MI and α-GI (shown above) as well as α-GIA, Ac1.1a, α-CnIA, α-CnIB; X1 = any amino acid(s) or Des-X; X2 = Asparagine or Histidine; P = Proline;  A = Alanine;  G = Glycine; X3 = Arginine or Lysine;  X4 = Asparagine, Histidine, Lysine, Arginine, Tyrosine, Phenylalanine or Tryptophan; X5 = Tyrosine, Phenylalanine, or Tryptophan;  X6 = Serine, Threonine, Glutamate, Aspartate, Glutamine, or Asparagine;  X7 = Any amino acid(s) or Des X and; “Des X” = “an amino acid does not have to be present at this position.”  For example, if a peptide sequence were XCCHPA then the related peptide CCHPA would be designated as Des-X.

2 A virulent Newcastle disease virus (avian paramyxovirus serotype 1) has an intracerebral pathogenicity index in day-old chicks (Gallus gallus) of 0.7 or greater or has an amino acid sequence at the fusion (F) protein cleavage site that is consistent with virulent strains of Newcastle disease virus.  A failure to detect a cleavage site that is consistent with virulent strains does not confirm the absence of a virulent virus.

3 Select agents that meet any of the following criteria are excluded from the requirements of this part: Any low pathogenic strains of avian influenza virus, South American genotype of eastern equine encephalitis virus , west African clade of Monkeypox viruses, any strain of Newcastle disease virus which does not meet the criteria for virulent Newcastle disease virus, all subspecies Mycoplasma capricolum except subspecies capripneumoniae (contagious caprine pleuropneumonia), all subspecies Mycoplasma mycoides except subspecies mycoides small colony (Mmm SC) (contagious bovine pleuropneumonia), and any subtypes of Venezuelan equine encephalitis virus except for Subtypes IAB or IC, provided that the individual or entity can verify that the agent is within the exclusion category.