University of Manitoba
Basic Lab Safety
and WHMIS
Presentation Overview

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Responsibilities for Safety at the University of Manitoba
Responsibilities for Safety

- Manitoba’s Provincial Workplace Safety and Health (WS&H) Act is based on the concept of an **Internal Responsibility System**

  **Everyone** at the workplace: the employer (including supervisors), workers, students, contractors and self employed persons all share a responsibility for the health and safety of all persons at the workplace.
Responsibilities for Safety

The WS&H Act provides the following Four Basic Rights:

*Right to know* about hazards (WHMIS)
*Right to refuse* dangerous work
*Right to protection from discrimination* re: safety and health matters
*Right to participate* in safety activities (through safety committees).
Responsibilities for Safety - Principal Investigator/Professors/Supervisors

- By U of M POLICY 512 Health and Safety Policy, some safety responsibilities of the employer are delegated down to Departments and Principal Investigators (PIs) / Professors / Supervisors.

- At the U of M, the Department or PI / Professor / Supervisor is responsible to provide you with:
  - a safe work environment,
  - adequate safety equipment
  - safety training.
Responsibilities for Safety – Employees and Students

This training session is provided on behalf of your PIs and department at the U of M.

- You are expected to follow your departmental and PI’s established safety protocol.
- You are expected to use such reasonable care so as to protect your own safety and the safety of others.
- All safety concerns must be brought to the attention of the PIs/Professors or designated responsible individual.

YOU HAVE THE RIGHT TO REFUSE TO DO ANY WORK THAT YOU CONSIDER TO BE UNSAFE.

Concerns can also be addressed through your departmental safety committee representative.
EHSO is responsible for the development and administration of environmental health and safety programs at the University of Manitoba.

- EHSO provides information, consultation, expertise, training, advice and authorization.

EHSO Website: U of M homepage - UM info – Search “safety office”
U of M Environmental Health & Safety Office (EHSO) Programs

- Accident Investigation
- Asbestos Management
- Audiometric Testing
- Biological Safety
- Chemical Safety
- Confined Space Entry
- Construction Safety
- Emergency Planning & Response
- Fire & Life Safety
- General Safety
- Hazardous Waste Management

- Indoor Air Quality
- Occupational Health
- Office Safety & Ergonomics
- Personal Safety
- Radiation Safety
- Safety Committees
- Traffic Safety
- Transportation of Dangerous Goods
- Workers Compensation
EHSO Location & Staff

Bannatyne Campus: T248/249 Old Basic Science
Fort Garry Campus: 191 Frank Kennedy Centre
Main Office Phone: 474-6633

Grant McCaughey Director ................................................................. 474-9290
Pauline Fortier – Occupational Health Coordinator ...................... 474-6438
Pearl Novotny – Administrative Assistant ...................................... 474-6633
Prabhat Goswami – Biological / Chem Safety Coordinator .......... 474-8791
Richard Chaput – Asbestos Program Technologist ......................... 474-7970
Evelyn Froese – Assistant Bio/Chem Safety Coordinator ................. 789-3477
Paul Houle – Hazardous Waste Mgmt. Coordinator ....................... 474-6316
Joey Bellino – Assistant Hazardous Waste Mgmt. Coordinator ....... 474-6970
Leona Page – Radiation Safety Coordinator ..................................... 789-3613
Eva Sailerova – Assistant Radiation Safety Coordinator ............... 789-3359
Terry Neufeld – Office Assistant ............................................................. 474-9031
Personal Safety
Emergency Contacts
Accident/Incident Reporting
Working Alone Policy
Fire Safety
Personal Safety: Code Blue Station

- Provide 24/7 instant voice connection to Security Services
- Officer will automatically be sent and arrive in under 2 minutes
- Strategically placed at both campuses
Personal Safety:
Other safety resources

- **Safewalk Program:** Call 474-9341
  For students, faculty, and staff at both campuses, a student patrol with specially marked security vests or a uniformed Security Services Officer will provide a safe walk to your car or other building at night.

- **Red Emergency Buttons:** are available in certain buildings and tunnels. Pushing the red button will alert Security Services that an emergency exists at that location.
Emergency Contacts
On Campus

eg. medical emergency, fire, assault, violence, traffic accident

- Dial **555** (not 911) from any
- 474-, 789-, 975- telephone exchange
- Dial #555 from any AT&T MTS cell phone
- Dial 474-9341 from all other phones
- All 555 calls go directly to Security Services who will send the appropriate response and also accompany outside emergency vehicles to the correct location
Accident/Incident Reporting

- Legislation requires that all accidents, incidents and near misses shall be investigated and a report completed.
- Incidents include the following:
  - personal injury
  - occupational illness
  - fire/explosion
  - property and equipment damage
  - environmental damage
  - near miss incidents (those incidents that could have resulted in any of the above losses)
Accident/Incident Reporting

If you are Injured:

Staff and Students:
- Report the incident to your supervisor immediately: verbally or using the green ‘Notice of Injury’ Form available on EHSO web-site.
- If the injury requires a visit to the doctor or chiropractor, seek medical attention immediately.
- Make sure to tell your supervisor of the visit.

Additionally for staff only:
- Complete the ‘Employees Report for Worker’s Compensation’ (also available on web-site). It can be faxed directly to WCB.
- Your supervisor must complete an ‘Employer’s Report’ and fax it within 24 hrs to the EHSO if you consulted a health care professional with respect to your accident.
Accident/Incident Reporting Procedures

- EHSO Web Site Forms and Instructions
  http://www.umanitoba.ca/campus/health_and_safety/occhealth/index.shtml

Accidents and incidents are to be investigated in order to meet legislative requirements, identify the cause and relationships involved in the occurrence of accidents and incidents and to recommend changes to equipment, procedures and any other matters that will ensure the health and safety of academic, support staff, students and visitors to the campus.

Accident/Injury Reporting Procedures (Adobe pdf)
Employee's Green Card Notice of Injury Form (Adobe pdf)
Accident/Incident (A/I) Report (Adobe pdf)
Accident/Incident (A/I) Report (Office 97)
Accident/Incident (A/I) Report (Sample) (Adobe pdf)
CCOHS Accident Investigation Guide (Adobe pdf)
Accident/Incident Reporting
Serious injury or accident

- When a serious accident occurs at a workplace, the employer **must** notify Manitoba Labour-Workplace Safety and Health Division as quickly as possible.
- During regular hours: Contact EHSO at 474-6633.
- If after hours: Call Security at 555.

- **Serious accidents include:**
  - a collapse or structural failure of a building, tower, crane, hoist or excavation,
  - a death or serious injury,
  - uncontrolled spill of a hazardous material
  - Explosion, fire or flooding.
Accident/Incident Reporting

Serious injury or accident

Serious injuries are defined as:

- Amputation
- Loss of sight
- Internal haemorrhage
- Third degree burns
- Unconsciousness resulting from concussion, electrical contact, asphyxiation
- Poisoning
- Cuts requiring hospitalization or time off work
- Any injury resulting in paralysis
- Any other injury likely to endanger life or cause permanent disability
Fire Safety

- Get to know the alarm bell scenarios in your building.
- When you hear a fire alarm you should turn off all flames and gas sources and prepare to exit the building via the stairway.
- If you need assistance proceed to nearest stairway and await the FIRE WARDEN

Chief Fire Warden is: Harminder Dhanjal 474-6027

Contact for specific departmental information and training
Fire Alarm Manual Pull Station

Fire Emergency Procedures

Emergency Red Button
WHMIS: Three key elements

- **Education**
- **Labels**
- **Material Safety Data Sheets (MSDS)**
WHMIS Controlled Products

**Definition:**
Any substance or material which meets any of the criteria for inclusion in one or more of the **six WHMIS Hazard Classes** as defined in the Federal “Controlled Product Regulation” is termed a **Controlled Product**

Under WHMIS, there is no comprehensive list of controlled products but only a list of hazard criteria.
Controlled Products:
Hazard Classes & Symbols

Class A: Compressed Gases

RISKS:

- Physical hazard (120kg)
- Explosive hazard (if heated, dropped or impacted)
- Content hazard (could be flammable, poisonous)
Controlled Products: Hazard Classes & Symbols

Class A: Compressed Gases

PRECAUTIONS:

- Secure cylinder
- Avoid heat & ignition sources
- Transport & handle carefully
Controlled Products: Hazard Classes & Symbols

Class A: Compressed Gases

Store in cool, ventilated area

STORAGE & TRANSPORT
Controlled Products: Hazard Classes & Symbols

Class A: Compressed Gases

Examples:
$\text{CO}_2$ tanks,
$\text{N}_2$ tanks,
Acetylene tanks.
Class B: Flammable & Combustible

Six subdivisions:
1. flammable gas
2. flammable liquid
3. combustible liquid
4. flammable solid
5. flammable aerosol
6. reactive flammable material
Controlled Products: Hazard Classes & Symbols

Class B: Flammable & Combustible

RISKS:
- Fire hazard - will burn if ignited
- Could ignite spontaneously (under adverse conditions)
- Could ignite upon mixing with water or other chemicals
- Many are poisonous
Controlled Products:
Hazard Classes & Symbols

Class B: Flammable & Combustible

PRECAUTIONS:

- Avoid contact with flames or other ignition sources
- Avoid heat
- Cap tightly for storage
- Avoid inhalation and skin contact
Controlled Products:
Hazard Classes & Symbols

Class B: Flammable & Combustible

STORAGE & TRANSPORT

- Store in flammable storage cabinets (or intrinsically safe refrigerators if cold storage is required)
- Transport separate from oxidizing materials
- Transport securely to prevent accidental spillage
Class B: Flammable & Combustible

Examples:
1. Flammable Gases - hydrogen, methane, propane
2. Flammable Liquids [flash pt <37.8C] - gasoline, acetone, ether, ethanol
3. Combustible Liquids [flash pt >37.8C] - kerosene, diesel fuel
4. Flammable Solids – magnesium metal, aluminum dust
5. Flammable Aerosols - aerosol containers
6. Reactive Flammable Materials – phosphorus, sodium metal
Controlled Products:
Hazard Classes & Symbols

Class C : Oxidizing Material

**RISKS:**
- Increase fire and explosion hazard of combustibles
- Potentially explosive when mixed with combustibles or organics
- Most are corrosive & poisonous
Controlled Products: Hazard Classes & Symbols

Class C: Oxidizing Material

PRECAUTIONS:

- Wear protective clothing & avoid personal contact (esp. eyes)
- Store away from combustibles & organics & avoid heating
- Store in non-corroding containers, no cork or rubber stoppers
Controlled Products: Hazard Classes & Symbols

Class C: Oxidizing Material

STORAGE & TRANSPORT

- Store away from combustibles & organics
- Store in non-corrosive containers
- Transport separate from flammables
- Transport securely to prevent accidental spillage
Controlled Products: Hazard Classes & Symbols

Class C: Oxidizing Material

Examples:
Any oxygen source including: $O_2$ gas, peroxides, nitr-ates/ites, chlor-ates/ites, hypochlorites (bleach), perchlorates, dichromates, permanganates, persulfates
**Controlled Products: Hazard Classes & Symbols**

**Class D: TOXIC**

- **Acute** *(Immediate)*
- **Chronic** *(Delayed)*
- **Biohazard**
Controlled Products: Hazard Classes & Symbols

Class D: TOXIC - Acute

RISKS

- Harmful or lethal at small amounts (<50mg / kg body wt → 50% lethal)
- May be toxic not only if ingested, but also if inhaled or absorbed through eyes or skin
- Many acute toxic compounds act as carcinogens at lower levels
Class D: TOXIC - Chronic

RISKS

Systemic damage with low level repeated exposure

Damage could include:

- Permanent illness or death
- Birth defects in pregnant women
- Activation of cancer formation
- Sensitization to allergies
Controlled Products: Hazard Classes & Symbols

Class D: TOXIC - Biohazard

RISKS

Systemic damage with accidental or prolonged exposure

Damage could include:

- Acquiring disease and infections
- Activation of cancer formation
- Sensitization to allergies
Controlled Products: Hazard Classes & Symbols

Class D: TOXIC

PRECAUTIONS:

- Wear protective clothing including, lab coat, correct gloves, eye protection, and mask
- Avoid all personal exposure including skin contact, inhalation, ingestion or injection
- Clean even minor spills carefully to avoid creation of dust or vapor
- If appropriate, work in a fume hood
Controlled Products: Hazard Classes & Symbols

**Class D: TOXIC**

**STORAGE & TRANSPORT**

- Store tightly capped in appropriate location
- Assume exterior is contaminated, ALWAYS handle with gloves
- Transport securely to prevent accidental spillage
Controlled Products:
Hazard Classes & Symbols

Class D: TOXIC - Acute

Examples:
- All halogens (Br, Cl, F, I)
- Cyanides & Nitriles (HCN)
- Heavy metals like Arsenic, Cadmium
- Heavy metal salts like Nickel Acetate
- Carbon Monoxide, Nitrogen dioxide
Controlled Products: Hazard Classes & Symbols

Class D: TOXIC - Chronic

Examples:
- Heavy metals like Mercury & Lead
- Solvents like Formaldehyde, Benzene, Carbon Tetrachloride
- Reagents like Acrylamide, Ethidium Bromide
- Numerous carcinogens, mutagens and teratogens
Controlled Products: Hazard Classes & Symbols

Class D: TOXIC - Biohazard

Includes all Risk Group 2 - 4 organisms
(Those organisms that can cause disease in humans-
consult Health Canada’s “Laboratory Biosafety
Guidelines”)
Currently, all Plant Science research groups
are listed as Risk Group 1

Examples:
- Human blood, tissue & body fluids
- Animal blood, tissue & body fluids
- Tissue culture cell lines
- Experimental bacterial, viral & yeast cultures
Controlled Products: Hazard Classes & Symbols

**Class E : Corrosive**

**RISKS:**

- Will burn human tissues including skin, eyes, mouth, throat & lungs
- Will corrode many lab related materials particularly metals
- Fumes may be environmentally damaging
Controlled Products: Hazard Classes & Symbols

**Class E: Corrosive**

**PRECAUTIONS:**

- Wear appropriate protective clothing
- If possible work in fume hood
- Avoid personal contact
- Avoid inhaling vapors
- Cleanup spills immediately
- Store in appropriate container—metal cans, glass bottles: corks & rubber stoppers may NOT be appropriate
Controlled Products: Hazard Classes & Symbols

Class E: Corrosive

**STORAGE & TRANSPORT**

- Store away from combustibles & organics
- Store in non-corrosive containers
- Transport separate from flammables
- Transport securely to prevent accidental spillage
Class E: Corrosive

Examples:
- Most oxidizing agents
- Strong acids & bases
- Gases like Ammonia, Hydrogen Chloride
Controlled Products: Hazard Classes & Symbols

Class F: Dangerously Reactive

RISKS:

- Can react **violently** under certain conditions including:
  - contact with other chemicals or water
  - if heated or shaken
  - if allowed to polymerize

- Can release poisonous vapors when mixed with other chemicals
Controlled Products: Hazard Classes & Symbols

**Class F : Dangerously Reactive**

**PRECAUTIONS:**

- Determine unstable conditions (MSDS) & **AVOID** these conditions
- Wear protective clothing especially eye protection
- Open slowly & carefully
- Use in fume hood
- Store tightly capped in chemical storage cabinet or fume hood
Controlled Products: Hazard Classes & Symbols

**Class F: Dangerously Reactive**

- Store away from potential “trigger” chemicals
- Store in chemical storage cabinet or fume hood
- Transport securely to prevent accidental dropping, spillage & radical temperature changes
Controlled Products:
Hazard Classes & Symbols

Class F: Dangerously Reactive

Examples:
-Picric acid: unstable when dry (desiccated)
-Ether: unstable degradation products
-Perchloric acid: highly unstable when dehydrated
-1,3-butadine: vigorous polymerization
-Alkali cyanides: releases cyanide gas when mixed with acids
Liquid Nitrogen

RISKS:
- Risk of frost-bite
- Risk of samples exploding
- Risk of asphyxiation

PRECAUTIONS:
- Avoid skin contact
- Wear insulated gloves & eye protection
- Use in well ventilated room only
Controlled Products: Hazard Classes & Symbols

Canadian vs US Symbols

Explosive  Highly Flammable or Extremely Flammable  Oxidizing  Toxic or Very Toxic  Harmful or Irritant  Biohazard  Corrosive  Dangerous for the Environment
Controlled Products Storage

- All containers must be labeled and tightly capped
- Maximum container size in labs is 4L
- **Store by compatibility, NOT alphabetically**
- Avoid exposure to heat and direct sunlight
- FLAMMABLES in flammable storage cabinets (often yellow)
- ACIDS in corrosive resistant acid cabinet, **EXCEPT chromic, nitric & perchloric acids [exceptions should be stored separately]**
- BASES separately
- ORGANIC SOLVENTS separately
- Review Controlled Product Standard on EHSO web-site for more compatibility charts
### WHMIS Education: Dangerous Storage Combinations

<table>
<thead>
<tr>
<th>Oxidizers <em>with</em> Flammables</th>
<th>Acids (conc.) <em>with</em> Bases (conc.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkali metals - like Ca, K, Na <em>with</em> water, CO$_2$, CO, CCl$_4$</td>
<td>Anhydrous Ammonia <em>with</em> halogens, Hg, HF, CaClO$_4$</td>
</tr>
<tr>
<td>Acetic Acid <em>with</em> chromic, nitric or perchloric acid, peroxides, permanganates, OH cmpds</td>
<td>Chromic Acid <em>with</em> acetic acid, alcohol, naphthalene, glycerine, and other flammable liquids</td>
</tr>
<tr>
<td>Acetone <em>with</em> concentrated sulphuric or nitric acids</td>
<td>H$_2$O$_2$ <em>with</em> flammables, Cu, Cr, Fe or respective salts</td>
</tr>
</tbody>
</table>
### WHMIS Education: Dangerous Storage Combinations

<table>
<thead>
<tr>
<th>Hypochlorites <em>with</em> acids</th>
<th>Hydrogen Sulphide <em>with</em> Nitric Acid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorine <em>with</em> ammonia, acetylene, butadiene, benzene, petroleum derivatives, sodium carbides</td>
<td>Chlorates ( \text{ClO}_3^- ) <em>with</em> ammonium salts, acids, metal powders, sulphur, carbon</td>
</tr>
<tr>
<td>Cyanides (Alkaline) <em>with</em> acids</td>
<td>Potassium chlorate <em>with</em> acids</td>
</tr>
</tbody>
</table>
WHMIS: Three key elements

- Education
- **Labels**
- Material Safety Data Sheets (MSDS)
**WHMIS Labels: Type of labels**

<table>
<thead>
<tr>
<th>Supplier Labels:</th>
<th>Workplace Labels:</th>
</tr>
</thead>
<tbody>
<tr>
<td>1- <strong>Product Name</strong></td>
<td><strong>Product Name</strong></td>
</tr>
<tr>
<td>2- <strong>Supplier Name</strong></td>
<td><strong>MSDS Reference</strong></td>
</tr>
<tr>
<td>3- <strong>WHMIS Symbol (s)</strong></td>
<td><strong>Risk Phrase (s)</strong></td>
</tr>
<tr>
<td>4- <strong>MSDS Reference</strong></td>
<td></td>
</tr>
<tr>
<td>5- <strong>Precautions</strong></td>
<td></td>
</tr>
<tr>
<td>6- <strong>First Aid Measures</strong></td>
<td></td>
</tr>
<tr>
<td>7- <strong>Risk Phrase (s)</strong></td>
<td></td>
</tr>
</tbody>
</table>

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WHMIS Labels: Supplier label

- Product Identifier
- Supplier Identifier
- Hazard symbol(s)
- Risk phrase(s)
- Precautionary measures
- First aid measures
- Reference to the MSDS
WHMIS Labels: Workplace Labels

Must be present on:
1) products decanted or transferred from an original container
2) product where original label is lost or becomes illegible
3) products produced and used at the workplace.

Methanol
Flammable, poisonous, harmful vapor
Keep away from heat, sparks, flames
Avoid contact with eyes and skin

See MATERIAL SAFETY DATA SHEET
WHMIS: Three key elements

- Education
- Labels
- **Material Safety Data Sheets (MSDS)**
WHMIS MSDS: Material Safety Data Sheet

- Detailed information about the controlled product
- Must be provided by the supplier
- **It is against the law to use a chemical in the workplace without the presence of an MSDS**
- Must be no more than three years old from the date produced or revised
MSDS Example

AMMONIUM NITRATE

MSDS Number: A6048 * * * * * Effective Date: 07/21/04 * * * * * Supercedes: 11/02/01

1. **Product Identification**
   Synonyms: Nitric acid, ammonium salt
   CAS No.: 6484-52-2
   Molecular Weight: 80.04
   Chemical Formula: NH4NO3
   Product Codes: J.T. Baker: 0729, 0731  Mallinckrodt: 3436

2. **Composition/Information on Ingredients**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS No</th>
<th>Percent</th>
<th>Hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium Nitrate</td>
<td>6484-52-2</td>
<td>99 - 100%</td>
<td>Yes</td>
</tr>
</tbody>
</table>

3. **Hazards Identification**

   **Emergency Overview**

   DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSION. MAY BE HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

   SAF-T-DATA (tm) Ratings (Provided here for your convenience)

   Health Rating: 2 - Moderate
   Flammability Rating: 1 - Slight
   Reactivity Rating: 3 - Severe (Oxidizer)
   Contact Rating: 2 - Moderate
   Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES
   Storage Color Code: Yellow (Reactive)
4. **Potential Health Effects**
----------------------------------

**Inhalation:** May cause irritation to the respiratory tract; symptoms may include coughing, sore throat, and shortness of breath. At high temperatures, exposure to toxic nitrogen oxides decomposition products can quickly cause acute respirator problems. Inhalation of large amounts causes systemic acidosis and abnormal hemoglobin.

**Ingestion:** Large oral doses of nitrates may cause dizziness, abdominal pain, vomiting, bloody diarrhea, weakness, convulsions, and collapse. Harmful if swallowed. May cause methemoglobinemia resulting in cyanosis.

**Skin Contact:** Causes irritation to skin. Symptoms include redness, itching, and pain.

**Eye Contact:** Causes irritation, redness, and pain.

**Chronic Exposure:** Small repeated oral doses of nitrates may cause weakness, depression, headache, and mental impairment.

**Aggravation of Pre-existing Conditions:** No information found.

**First Aid Measures**

**Inhalation:** Remove to fresh air. Get medical attention for any breathing difficulty.

**Ingestion:** If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

**Skin Contact:** Remove any contaminated clothing. Wash skin with soap and water for at least 15 minutes. Get medical attention if irritation develops or persists.

**Eye Contact:** Wash thoroughly with running water. Get medical advice if irritation develops.

5. **Fire Fighting Measures**

**Fire:** Not combustible, but substance is a strong oxidizer and its heat of reaction with reducing agents or combustibles may cause ignition. May support combustion in an existing fire.

**Explosion:** Contact with oxidizable substances may cause extremely violent combustion.

**Sealed containers may rupture when heated. Sensitive to mechanical impact.**

**Fire Extinguishing Media:** Use flooding amounts of water in early stages of fire involving ammonium nitrate.

**Use any means suitable for extinguishing surrounding fire.**

**Special Information:** In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full face piece operated in the pressure demand or other positive pressure mode.
6. **Accidental Release Measures**

Remove sources of heat and ignition. Collected waste may be transferred to a closed, preferably metal, container and sent to a RCRA approved waste disposal facility. Alternatively, sweep spill into noncombustible container and dissolve in large amount of water. Add soda ash. Mix and neutralize with 6M-HCl. Neutralized sludge may be sent to an approved waste disposal facility.

7. **Handling and Storage**

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Store in a dry location separate from combustible, organic or other readily oxidizable materials. Avoid storage on wood floors. Remove and dispose of any spilled dichromates; do not return to original containers.
Do not store above 54C (130F) preferably below 30C (86F). Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

8. **Exposure Controls/Personal Protection**

Airborne Exposure Limits: None established.
Ventilation System: A system of local and/or general exhaust is recommended to keep employee exposures as low as possible.
Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, Industrial Ventilation, A Manual of Recommended Practices, most recent edition, for details.
Personal Respirators (NIOSH Approved): For conditions of use where exposure to dust or mist is apparent and engineering controls are not feasible, a particulate respirator (NIOSH type N95 or better filters) may be worn.
If oil particles (e.g. lubricants, cutting fluids, glycerine, etc.) are present, use a NIOSH type R or P filter. For emergencies or instances where the exposure levels are not known, use a full-face positive-pressure, air-supplied respirator.
**WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.
Skin Protection: Wear protective gloves and clean body-covering clothing.
Eye Protection: Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.
9. Physical and Chemical Properties

Appearance: Colorless crystals.
Odor: Odorless.
Solubility: 118g/100g water @ 0C (32F).
Specific Gravity: 1.73 @ 23C (77F)
pH: 5.4
% Volatiles by volume @ 21C (70F): 0
Boiling Point: 210C (410F) Decomposes.
Melting Point: 170C (338F)
Vapor Density (Air=1): No information found.
Vapor Pressure (mm Hg): No information found.
Evaporation Rate (BuAc=1): No information found.

10. Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage. Hygroscopic.
Hazardous Decomposition Products: Emits nitrous oxides when heated to decomposition.
Liberates ammonia in reaction with strong alkalis.
Hazardous Polymerization: Will not occur.
Incompatibilities: Aluminum, antimony, chromium, copper, iron, lead, magnesium, manganese, nickel, zinc, brass, oil, charcoal, organic material, acetic acid, ammonium chloride, bismuth, cadmium, chlorides, cobalt, phosphorus, potassium and ammonium sulfate, sodium, sodium hypochlorite, sodium perchlorate, sodium-potassium alloy, and sulfur.

11. Toxicological Information

Oral rat LD50: 2217 mg/kg.

\Cancer Lists\----------------------------------------
---NTP Carcinogen---

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Known</th>
<th>Anticipated</th>
<th>IARC Category</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonium Nitrate (6484-52-2)</td>
<td>No</td>
<td>No</td>
<td>None</td>
</tr>
</tbody>
</table>
12. **Ecological Information**

Environmental Fate: When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is not expected to evaporate significantly. When released into water, this material is expected to readily biodegrade.

Environmental Toxicity: No information found.

13. **Disposal Considerations**

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. **Other Information**

NFPA Ratings: Health: 0 Flammability: 0 Reactivity: 3 Other: Oxidizer

Label Hazard Warning: DANGER! STRONG OXIDIZER. CONTACT WITH OTHER MATERIAL MAY CAUSE FIRE OR EXPLOSION. MAY BE HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT.

Label Precautions: Keep from contact with clothing and other combustible materials.
Do not store near combustible materials. Store in a tightly closed container.
Avoid breathing dust. Avoid contact with eyes, skin and clothing.
Remove and wash contaminated clothing promptly. Use only with adequate ventilation.
Wash thoroughly after handling. Store preferably below 30C

Label First Aid: If inhaled, remove to fresh air. Get medical attention for any breathing difficulty. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. In all cases, get medical attention.

Product Use: Laboratory Reagent.
Manitoba Workplace Health Hazard Regulation (companion regulation to WHMIS) requires that a chemical inventory be maintained of all Controlled Products in the Workplace.
Radiation Safety Program

Radiation sources

- Radioactive Materials
  - Radioactive chemicals
  - Small sealed sources of radioactive material
  - Machines and equipment containing large sealed sources of radioactive material.

- Radiation Emitted Devices

- LASERs

Federal Legislation mandates procedures, permits and training for users of radioactive material - contact EHSO for more information
Radiation Safety Program: Program Elements

- **Controlled inventory and permit system** – all users must have appropriate training before beginning work with radioactive materials; contact EHSO Radiation Safety Coordinator for more information

- **Radiation Safety Manual**

- **Training**

- **Internal Inspections**

- **CNSC Inspections**
Radiation Safety Program:

Door Signs –

(for Physical Plant trades and caretakers)

CAUTION:
may enter and
Perform duties

DO NOT ENTER:
if required to enter –
consult EHSO or follow procedure
All radiochemicals in use at the U of M are used in trace amounts or are shielded in equipment.

Decrease your exposure by:

1. Not removing Shielding
2. Limiting the time you spend in these areas
3. Maximize the distance
4. Practice good personal hygiene
5. Get training
Biological Safety Program
What is a biohazard?

- Cultured animal cells and the potentially infectious agents which these cells may contain
- Primate body fluids and other potentially infectious clinical specimens
- Tissue or microbial cultures, and materials contaminated by such cultures, stocks or specimens of micro-organisms
- Containers or materials saturated with blood products
- Parasites
- Allergens
- Tissue from experimental animals including animal dander
- Plant viruses, bacteria, fungi
- Toxins (bacterial or plant)
- Vaccines
- Human anatomical waste (body parts or organs)
- Animal anatomical waste (carcasses, body parts, organs)
General Lab Safety

Safety Equipment
General Lab Safety

Upon entering a laboratory, memorize the location of the nearest:

- Fire Extinguisher
- Fire Alarm Pull Station
- Emergency Exits
- Fire Blankets
- Eyewash Station
- Emergency Showers
- First Aid and Spill Kits
- Telephone
Potential Laboratory Hazards

- **Chemicals:**
  All six WHMIS classes

- **Biohazards:**
  Cells, animals, biological / patient samples, viruses, bacteria

- **Allergens:**
  Chemical, animal, latex

- **Radioactive Reagents:**

- **Physical / Equipment:** -electrical, sharps, hi/low temperature and pressure

- **Mixed hazards:** eg radioactive and biological
Routes of Entry of Hazardous Agents into Body

- **Inhalation**: includes vapors, dust, mists, gases, biological agents
  - Protection: fume hood, masks, respirator or BSC as appropriate
- **Absorption** – e.g. skin, mucous membranes (eyes, nose, mouth):
  - Chemical burns, splashes, vapours, or indirect contact from hands
  - Protection: lab coat, correct gloves & hand washing, work in fume hood, appropriate footwear.
- **Ingestion**: from contaminated hands or by incidentally contaminated utensils/cups/water bottles
  - Protection: absolutely **NO** eating / **drinking** in the lab, no applying of makeup
- **Inoculation**: from accidental needle stick injury or broken glass/sharps
  - Protection: limit use of sharps or handle with forceps
Routes of Entry of Hazardous Agents into Body

- Wear appropriate footwear when working with controlled products. Do NOT wear open footwear such as sandals.
Personal Protective Equipment: Lab coats

- **Must** be worn when working with controlled products
- **Should** be worn at all times when in the lab
- **Do NOT** wear lab coats in the following areas:
  1) All Offices, Bathrooms, Elevators, Public Hallways
  2) Coffee/ lunch rooms, departmental libraries
  3) Student Carrel Area outside of the lab
  4) Other non-lab areas of the building
Personal Protective Equipment: Lab coats

- Lab coats protect your clothes and your skin in the event of a reagent spill. They also help you avoid bringing contaminated clothing into your home.
Personal Protective Equipment: Choosing a Glove

- Choose a glove that is appropriate for the task/chemical.
- Consult MSDS for any glove specifications
- Consult Supplier glove charts or check directly with manufacturer if unsure
- Check for pin holes in gloves before putting them on
- Change disposable gloves often
## Personal Protective Equipment:

### Gloves must be worn when:

<table>
<thead>
<tr>
<th>Activity</th>
<th>Gloves Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>For tissue culture</td>
<td>4-6 mil latex or nitrile disposable glove</td>
</tr>
<tr>
<td>Handling toxic chemicals</td>
<td>Nitrile, neoprene or combo as appropriate for chemical, check MSDS.</td>
</tr>
<tr>
<td>Handling corrosive chemicals or solvents</td>
<td>Reusable, chemically resistant, thick gloves, usually greater than 10 mil –nitrile, neoprene or combo-depending on contact time and concentration of chemical, check MSDS. There is one brand of disposable 8mil nitrile gloves that offers dexterity and some chemical resistance. Contact EHSO for more info.</td>
</tr>
<tr>
<td>Working with RNA</td>
<td>4-6mil latex or nitrile disposable gloves</td>
</tr>
<tr>
<td>Removing items from the –80°C freezer or liquid nitrogen</td>
<td>Thermal Resistant Gloves</td>
</tr>
<tr>
<td>Handling hot solutions or items</td>
<td>Thermal Resistant Gloves</td>
</tr>
</tbody>
</table>
Personal Protective Equipment: Gloves -composition

- **Latex:** a natural rubber
  resists water, acids, alkalis, salts, ketones
- **Nitrile:** a synthetic rubber
  better chemical protection, superior puncture and abrasion protection, better electrostatic dissipation
- **Neoprene:** a synthetic rubber
  superior chemical protection, good for handling acids, caustics, alcohols, solvents
- **Combination gloves:**
  latex & nitrile
  neoprene & latex
  latex & nitrile & neoprene
- **Heat & Cold resistant gloves:**
Glove Options

Disposable Nitrile Gloves

Reversible Chemically Resistant Gloves

Disposable Latex Gloves

Heat and Cold Resistant Gloves

Reusable Nitrile Gloves
Eyes are much more sensitive to chemical & physical damage than our skin and may not heal as well. Eye protection should be worn at all time in the lab areas but it must be worn when:

- doing radioactive work
- handling caustic or dangerously reactive chemicals
- working with UV light (UVA&B filtering face shield)
- when cleaning chemical spills (non-vented goggles)

Consult with your supervisor to ensure that the available eye protection is appropriate for the task.
Eye and Face Protection Options

- **Basic safety glasses**
- **Chemical and Vapour Resistant Safety Goggles** (no direct vent openings)
- **Impact-Only Resistant Safety Goggles** (Has direct vent holes - Are not chemical splash and vapour resistant)
- **Face Shield**
Masks protect only from particles/dust or aqueous mists that do NOT emit harmful vapors.

Where the use of a fume hood is not feasible, a full or half face respirator may be appropriate and required for work with hazardous vapours.

- Respirators come with a variety of cartridges for work with biological and/or chemical material.
- Use of a respirator requires that the user be fit tested by the EHSO.

Consult with your supervisor to determine appropriate use of masks/respirators for your work.
Respiratory Protection Examples

- Dust Mask
- Half and Full Face Respirator - Must be Fit-Tested
- PAPR – Powered Air Purifying Respirator
- N95 – Require Fit-Testing
Required Safety Equipment

Every lab **MUST** have the following available:

1. Lab coats

2. Gloves (latex or latex-like & nitrile), chemically resistant as appropriate and thermal resistant

3. Eye protection (individual safety glasses, goggles and face shield as appropriate)

4. Respiratory protection (dust masks, respirator)

5. Working space in the fume hood

Fume hoods should NOT be a chemical or equipment storage area. If your hood lacks space to comfortably decant a 4L bottle of solvent into a beaker then it **REQUIRES CLEANING** (discuss with Principal Investigator/Supervisor)
Safety Equipment:
Eye wash and showers:

- Safety shower
- Hand wash
- Eye wash

- Fire
  - Extinguishers
  - Smoke alarms
  - Sprinklers
Safety Equipment: Eye wash and Showers

- Emergency eye wash and safety showers are located throughout the Department of Plant Science. Locate the eye wash and shower closest to you.
Safety Equipment:  Fume Hoods

Protection offered:
Personal..........................YES
Sample............................NO
Environmental....................NO

Use with:
Poisonous, corrosive, odorous, flammable chemicals if appropriate.

U of M Air flow standards require a face velocity of 90-120 Ifpm at a sash height of 11”.

Work with sash at height indicated on sticker
Work with material at least 6” behind face of sash
Do not block rear baffles
Do not use to dispose of solvents by evaporation
Clean Bench

Provides Horizontal or Vertical *Laminar*, *HEPA filtered Flow over workspace*

Protection offered:
- Personal: NO
- Sample: YES
- Environmental: NO

Uses include media preparation and plant culture.
General Lab Safety

U of M Waste Disposal Procedures:
Waste Disposal Procedures
General Guidelines

- Segregate **Biological** from **Chemical** from **Radioactive** waste at source
- Develop procedures for waste **before** starting work
- Generation of mixed waste (e.g. radioactive and biological) may need special procedures and approval

Questions should be directed to Hazardous Waste Coordinator, Paul Houle, at UM EHSO 474-6316
Waste Disposal Procedures: Types of Waste

- **Glass/Sharps** –
  includes broken glass, rigid plastic tips, pasteur pipettes, microscope slides (generally anything that can puncture the skin)

- **Chemical** –
  solid & liquid

- **Biohazardous/Biomedical material** -
  solid, liquid, sharps including all needles, syringes, razor and scalpel blades,

- **Radioactive material** -
  solid, liquid

- **Old lab equipment**
  e.g. centrifuges, incubators, refrigerators, freezers etc.
Waste Disposal Procedures: Glass Waste

NO chemical, biological or radioactive contaminants

- Prepare a box lined with a heavy dark garbage bag.
- Alternatively, use a purchased glass/sharps disposal container.
- Once full
  a) seal garbage bag
  b) seal box with tape
  c) mark as BROKEN GLASS and dispose with caretaker.
- Deface any inappropriate label before discarding.
Chemical Waste Disposal: General Rules

- Any generated waste must be labeled while being collected or stored in lab
- **ALL chemicals MUST be disposed via UM EHSO**:
  - **NO** evaporation of *organics* in the fume hood
- Sink Disposal is **LIMITED** to:
  1. buffer or detergent or mild acid / base solutions (<1%)  
  2. <10% v/v methanol or ethanol solutions 
  3. bleach containing solutions (<5% hypochloric acid) followed by copious amounts of water
Chemical Waste Disposal: General Rules cont’d

- Chemicals or organics CANNOT be diluted with water for the purpose of disposal

- Empty bottles from TOXIC chemicals (acute & chronic) MUST be disposed via UM EHSO

- Any questions regarding chemical waste disposal should be directed to Paul Houle at UM EHSO 474-6316

- Some potential explosives have a finite shelf life and must be disposed of before the expiry date. E.g. ether. Complete list is available in the U of M ‘Controlled Product Standard Part B’ available on EHSO web-site.
Chemical Waste Disposal
20L Ethanol or Methanol Drums

- Decant the solvent drum completely. DO NOT pour contents down the sink. DO NOT rinse.
- Leave drum open in fume hood to allow residual solvent to evaporate.
- Once dry, **deface all signs and symbols** on the surface of the container.
- Discard container as regular waste with caretakers
- Non-methanol or ethanol drums must **NOT** be air dried and **MUST** be discarded as chemical waste via U of M EHSO
Chemical Waste Disposal Procedures
solid & liquid

- Complete the chemical waste disposal form available on EHSO Hazardous Waste Program Web-site
http://www.umanitoba.ca/campus/health_and_Safety/haz-waste
Radioactive Waste Disposal – Dry and Liquid

- Collect each isotope separately.
- Collect dry and liquid waste separately.
- Collect in approved container.
- Complete a yellow Radioactive Waste Tag
- All radioactive waste is disposed via U of M EHSO. Info available on EHSO web-site
General Lab Safety

Dealing with Non-Hazardous & Hazardous Chemical Spills
General Lab Safety: Spill Cleanup General Guidelines

- Spills should never be cleaned up by untrained staff
- Caretakers are not allowed to clean up any lab spills
- The best time to learn about and practice cleaning up a spill is before it happens.
General Lab Safety: Spills

Basic lab spill kit

- EVERY lab that contains controlled products should have a basic spill kit. Suggested spill clean-up material include:
  - 1) waste pails
  - 2) absorbent pads / material
  - 3) disposable and reusable chemically resistant gloves
  - 4) face shield & goggles
  - 5) caution signs/tape
  - 6) autoclavable or disposable broom & dustpan
  - 7) appropriate respirator may also be required

Kit location and use should be known by ALL lab members.
General Lab Safety: Spills
Basic lab spill kit example
General Lab Safety: Spills

Basic spill types

- Glassware Breakage
- Non-hazardous Liquid or Solid Chemical
- Hazardous Liquid or Solid Chemical
- Biohazardous Material
- Radioactive Material
General Lab Safety: Spill Cleanup

- **Glassware Breakage**
  - Remain calm, tell other lab members and ask for help

- **Non-hazardous Liquids & Solids**
  - *FIRST*, deal with personal or co-worker injuries or potential injuries (for example, remove all contaminated clothing and wash contaminated skin)

- **Hazardous Liquids & Solids**
  - *SECOND*, if liquid is involved, obtain your lab spill kit and contain the spill with absorbent materials

- **Biohazardous material**
  - *THIRD*, tape off the area to avoid people from entering the spill zone

- **Radioactive material**
  - *FOURTH*, access the cleanup procedure-
General Lab Safety: Spill Cleanup
Glassware Breakage

- Glassware Breakage
- Non-hazardous Solids & Liquids
- Hazardous Solids & Liquids
- Biohazardous material
- Radioactive material

Sweep up broken glass and discard as glassware waste

Broken Glass
General Lab Safety: Spill Cleanup
Non-hazardous Liquids & Solids

- Glassware Breakage

- Non-hazardous Solids & Liquids
  - Wear a lab coat and spill kit gloves and dust mask (if necessary).
  - Sweep up solid chemical and broken glass and discard in waste pail. Once done, cap and arrange for disposal via UofM EHSO.
  - For liquids, absorb liquid with spill kit absorbent or paper towels depending on volume. Rinse and dry area.

- Hazardous Solids & Liquids

- Biohazardous material

- Radioactive material

  - Clean and replace all cleanup equipment.
General Lab Safety: Spill Cleanup
Hazardous Chemical Spills

- Glassware Breakage
- Non-hazardous Solids & Liquids
- Hazardous Solids & Liquids
- Biohazardous material
- Radioactive material

First and foremost:
You will **NOT** attempt to clean up the spill:

A) **IF** you are unaware of the composition of the spill.

B) **IF** the spill involves more than one chemical.

C) **IF** it is beyond your capabilities

If possible to do safely, contain the spill using the special absorbent pad from the spill kit and then call UM EHSO for assistance.

File Incident Report
General Lab Safety: Spill Cleanup

Hazardous Chemical Solid

- Glassware Breakage
- Non-hazardous Solids & Liquids
- Hazardous Solids & Liquids
- Biohazardous material
- Radioactive material

Wear a lab coat, spill kit gloves and dust mask or respirator (if volatile).

Sweep up solid chemical and broken glass and discard in waste pail. Once done, cap and arrange for disposal via UofM EHSO.

If non-reactive with water, rinse spill area using clean water.

Clean and/or replace all cleanup equipment.

File Incident Report
General Lab Safety: Spill Cleanup
Hazardous Chemical Liquid

- **Glassware Breakage**
  - Wear a lab coat, spill kit gloves and respirator (if volatile).

- **Non-hazardous Solids & Liquids**
  - Absorb all liquid with absorbent material in spill kit. Discard in waste pail. Sweep up any broken glass and discard in waste pail.
  - Once done, cap and arrange for disposal via UofM EHSO. Store in fume hood if necessary.
  - Rinse spill area with clean water. Repeat if necessary.

- **Hazardous Solids & Liquids**
  - Clean and/or replace all cleanup equipment.

- **Biohazardous material**

- **Radioactive material**

File Incident Report
General Lab Safety: Spill Cleanup

Biohazardous Material

- **Glassware Breakage**
- **Non-hazardous Solids & Liquids**
- **Hazardous Solids & Liquids**
- **Biohazardous material**
- **Radioactive material**

Wear a lab coat, splash protection (glasses and face shield) for face and heavy latex gloves or double glove.

Absorb all liquid with absorbent material in spill kit. Discard into double autoclave bag for autoclaving.

Sweep up or use forceps to pick up any broken glass. Discard in biological sharps waste container.

Disinfect area with bleach or appropriate disinfectant; use the required contact time.

Rinse area. Repeat if necessary.

Autoclave or disinfect and replace all cleanup equipment.

File Incident Report
General Lab Safety: Spill Cleanup

Radioactive Material

- Glassware Breakage
- Non-hazardous Solids & Liquids
- Hazardous Solids & Liquids
- Biohazardous material
- **Radioactive material**

**MINIMIZE CONTAMINATED AREA, MINIMIZE AMOUNT OF WASTE**
**DO NOT SPREAD ACCIDENTALLY**

Wear a lab coat and latex gloves.

Absorb spill with **minimal** absorbent material.

Clean area with damp towel from outside in, monitoring success of cleanup.

Discard all soiled materials as radioactive waste (yellow tags)

All large spills MUST be reported to EHSO’s Eva Sailerova or Leona Page

File Incident Report & CNSC Report
General Lab Safety: Spill Cleanup

Getting U of M EHSO Help

If the spill is:

1) larger than you can handle
2) involves unknown, reactive or highly toxic and volatile hazardous chemicals

If possible, apply absorbent material, clear and secure the area and call:

UM Environmental Health and Safety
474-6633 (9AM-5PM)
474-9341 (non-working hrs)
PLANT SCIENCE SAFETY QUIZ

- What does WHMIS stand for?

- The three elements of WHMIS are:

  a) Supplier information, Product labels and Emergency Information
  b) MSDS, Transportation Documentation and Emergency Information
  c) Product Labels, MSDS and Worker Education
PLANT SCIENCE SAFETY QUIZ

- Identify these WHMIS Hazard Symbols:
PLANT SCIENCE SAFETY QUIZ

- A controlled product may fall under more than one hazard class and therefore the supplier label for that product will have more than one hazard symbol on it.
  a) True b) False

- For a controlled product, the greater the evaporation rate, the more quickly it will create a vapour hazard.
  a) True b) False

- Oxidizers and Flammable materials are incompatible and should not be stored together.
  a) True b) False
PLANT SCIENCE SAFETY QUIZ

- The \( \text{LC}_{50} \) and the \( \text{LD}_{50} \) of a material gives an indication of how toxic the material is.
  a) True       b) False

- Would a Flammable liquid or a Combustible liquid have a lower flashpoint?

- An MSDS should be consulted:
  a) Only by Safety Experts    b) Before you use a controlled product
  c) Only in an emergency      d) Occasionally to review hazards
  e) b and d                   f) a and b
PLANT SCIENCE SAFETY QUIZ

- Corrosive materials are only hazardous to humans.
  a) True  
  b) False

- All Chemical waste must be disposed of through the U of M EHSO
  a) True  
  b) False

- Wearing a double layer of latex gloves offers the same protection as a single layer of nitrile glove.
  a) True  
  b) False