



Hazardous Materials Management, Chemical Purchasing & Lab Safety

Industrial Hygienist
Perry Point VAMC
Robert Johnson



OVERVIEW

- Chemical Storage Guidelines:
 - Chemical Storage Compatibility
 - SDS Hazard Communication
 - Personal Protective Equipment
- Chemical Spill Procedures
- Emergency Eyewash and Shower Operation
- Green Purchasing of Chemicals
- Compressed Gases/Cryogenics



OVERVIEW

- General Safety
 - Electrical
 - Centrifuges
 - Noise
 - Ergonomics
 - Autoclaves
 - Biosafety cabinets
 - Animal Safety



Chemical Storage

- Refer to the “VA Baltimore Research Service – Chemical Storage Guidelines” and the SDS for each chemical.
- Label all containers in English with chemical name, date received, and associated hazards.
- Chemicals should not be stored on the floor. Protect containers from punctures and/or leaks. Use secondary containment.



Chemical Storage

- Do not store chemicals in fume hoods. This prevents proper ventilation.
- Chemicals being stored in research common rooms (111, 127, 121, 103, 104) must have room number and PI name written on the container.



Chemical Storage

- Incompatible materials **MUST ALWAYS BE STORED SEPARATELY:**
 - Flammables/Combustible (ignitable)
 - Methanol/Acetic Acid
 - Corrosives (Acids/bases)
 - Oxidizers
 - Poisons/Toxics
- **Oxidizing Acids:** Store separate from each other and all other chemicals including other acids



Hazard Communication

- New Global Harmonization System (GHS)
 - OSHA adopted to globally standardize hazard communication
- GHS effect on hazard communication Standard
 - MSDS now referred to as Safety Data Sheets (SDS)
 - SDS's must contain 16 major sections
 - New container labeling requirements

(M)SDS can be found on the following link

<http://vaww.ceosh.med.va.gov/ceosh/MSDS.shtml>.



GHS SDS Sections

1. Identification
2. Hazard(s) Identification
3. Composition/Ingredient Information
4. First-Aid Measures
5. Fire-Fighting Measures
6. Accidental Release Measures
7. Handling and Storage
8. Exposure Control/Personal Protection
9. Physical & Chemical Properties
10. Stability & Reactivity
11. Toxicological Information
12. Ecological Information
13. Disposal Considerations
14. Transport Information
15. Regulatory Information
16. Other Information



Hazard Communication

TRAINING

- How to read and interpret labels and (M)SDSs
- GHS Global Harmonization System
- How to access (M)SDS's on the CEOSH web site
- Hazards of chemicals in the work area
- Special procedures to protect users



Hazard Communication

- GHS Manufacturer Labeling
 - Symbols (hazard pictograms)
 - Signal Words (Warning or Danger)
 - Hazard Statements (describes level of Haz)
 - Precautionary Statements (how to protect)
 - Product Identifier (Ingredient Disclosure)
 - Supplier Identification
 - Supplemental Information



Hazard Communication

- Workplace Containers
 - OSHA has indicated that it will continue to give employers the flexibility to determine what types of workplace labels will be required. Employers have the ability to choose to label workplace containers either with the same label that the chemical manufacturer or importer used on shipped containers or with alternate labels that meet the requirements of the standard.



GHS Pictogram Examples

HCS Pictograms and Hazards		
<p>Health Hazard</p>  <ul style="list-style-type: none">■ Carcinogen■ Mutagenicity■ Reproductive Toxicity■ Respiratory Sensitizer■ Target Organ Toxicity■ Aspiration Toxicity	<p>Flame</p>  <ul style="list-style-type: none">■ Flammables■ Pyrophorics■ Self-Heating■ Emits Flammable Gas■ Self Reactives■ Organic Peroxides	<p>Exclamation Mark</p>  <ul style="list-style-type: none">■ Irritant (skin and eye)■ Skin Sensitizer■ Acute Toxicity■ Narcotic Effects■ Respiratory Tract Irritant■ Hazardous to Ozone Layer (Non-Mandatory)
<p>Gas Cylinder</p>  <ul style="list-style-type: none">■ Gases Under Pressure	<p>Corrosion</p>  <ul style="list-style-type: none">■ Skin Corrosion/Burns■ Eye Damage■ Corrosive to Metals	<p>Exploding Bomb</p>  <ul style="list-style-type: none">■ Explosives■ Self-Reactives■ Organic Peroxides
<p>Flame Over Circle</p>  <ul style="list-style-type: none">■ Oxidizers	<p>Environment (Non-Mandatory)</p>  <ul style="list-style-type: none">■ Aquatic Toxicity	<p>Skull and Crossbones</p>  <ul style="list-style-type: none">■ Acute Toxicity (fatal or toxic)

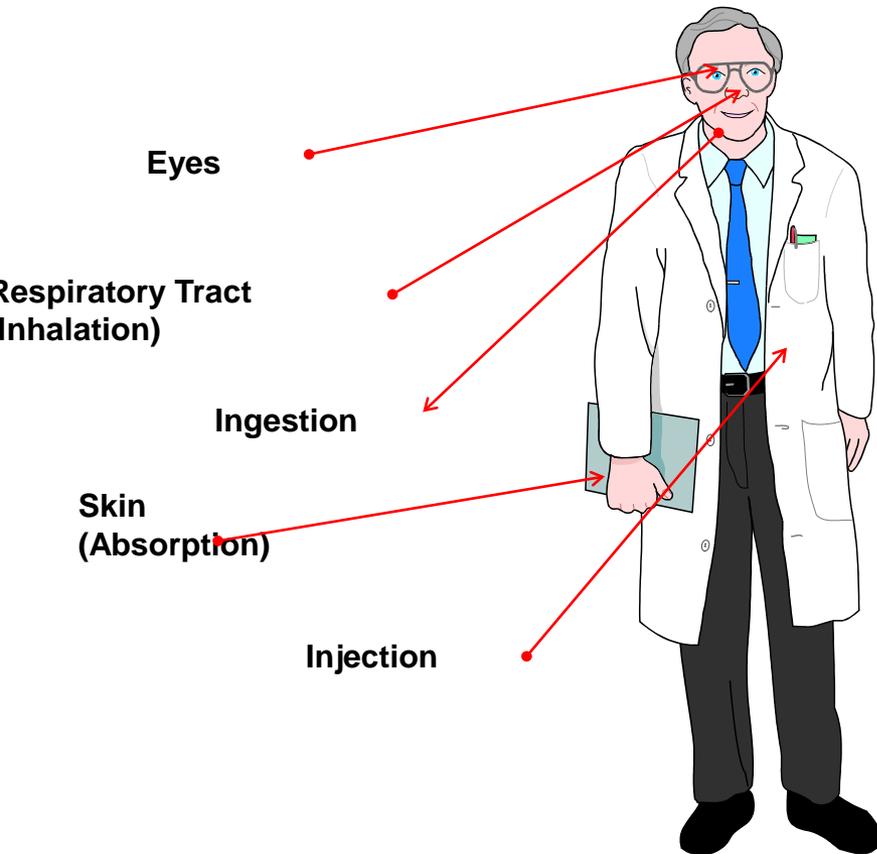


Personal Protective Equipment Order of Exposure Control

- Engineering Controls
- Administrative Controls
- Personal Protective Equipment



Personal Protective Equipment



- **USE THE PROPER PERSONAL PROTECTIVE EQUIPMENT (PPE) TO PREVENT EXPOSURE VIA THE VARIOUS ROUTES**



Class I: < 5 Gallons

- Contain & Stop spill
 - Prevent ignition or reaction with other chemicals
 - Use Universal Absorbent or chemical specific absorbent
 - Do not allow chemicals to go down the drain
- Contact Safety Department
 - John Barnes, ext. 4014 (Baltimore),
 - Robert Johnson, 330-6499 (Perry Point)
 - Emmanuel Mbong, ext. 4548, or 7020 engineering.
- Take steps to recover spilled product
 - Discard recovered product as Hazardous waste through the Safety Department
 - Do not discard as RMW or Solid Waste



Class II: > 5 Gallons

- Remove any injured staff
- Contact the Safety Department immediately.
 - Do not contact the Baltimore Fire Department
- If possible remove any sources of ignition or reaction.
- If possible prevent spill from spreading into drains.



Emergency Eyewash Operation





Emergency Eyewash Operation

- The operation of the eyewash unit will be checked by the user weekly, see **VAMHCS Policy 512-138/ENG-030 Inspection Testing of Emergency Eyewash 10/2012**
- **The eyewash will be engaged for 60 seconds or until water runs clear.**
- The water turbidity and flow rate will be observed. (Water should be clear and flowing at a rate that the two water streams converge).
- Access to the eyewash must not be obstructed.
- Findings will be recorded on the Eye Wash Log.



Emergency Shower Operation

Research Emergency Shower Locations

research services	3C-114
research services	3C-118
research services	3C-128
research services	3C-136
research services	3C-105
research services	3C-107
research services	3D-100
research services	3D-105
research services	BB-109
research services	BB-123
research services	BB-140





Emergency Shower Activation

- **Activate shower for a few seconds**
- **The shower is easily activated and remains on without the use of the operator's hands**
- **The flow of fluid is clear after flushing**
- **The fluid temperature is constant and tepid**
- **The shower delivers a steady, low-pressure, stream of fluid**
- **The flow continues until the mechanism is returned to its resting position**





Chemical Purchasing

- **Executive Order 13423**
- **Relevant Policies & SOPs**
 - VAMHCS Policy 512-138/ENG-001: Safety, Occupational Health and Fire Protection Program
 - VAMHCS Policy 512-138/ENG-017: Hazardous Materials & Wastes Management Plan
 - VAMHCS Policy 512-001/OPS-002: Hazardous Drug Safety & Health Plan



Chemical Purchasing

- When purchasing new chemicals
 - New Chemicals are those not listed on the VAMHCS Intranet, Quick Links SDS inventory list.
 - Keep a copy of the SDS in lab area.
 - Send a copy of the new SDS to the Safety Department
- Researchers working for VA and UM must notify the Chemical Hygiene officer when chemicals are brought over to the VA from UM.



HAZARDS

☑ THE TYPICAL COMPRESSED GAS CYLINDER:

- ✓ 175 Pounds.
- ✓ 2,000 to 2,640 psig (some to 6,000 psig).
- ✓ Wall Thickness of About 1/4 Inch.
- ✓ 57 Inches Tall.
- ✓ 9 Inches In Diameter.
- ✓ Easily Toppled.
- ✓ Easily Corroded.
- ✓ Devastatingly Hazardous.

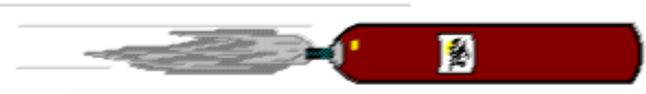




HAZARDS

WHEN THINGS GO WRONG:

- ✓ **Have Flown Over a Half Mile.**
- ✓ **Penetrated Brick Walls.**
- ✓ **Can Displace Oxygen in Extremely Large Areas.**
- ✓ **Can Oxygen-Enrich Extremely Large Areas.**
- ✓ **Can Spin and Ricochet Completely Out of Control.**
- ✓ **Can Immediately Freeze Exposed Skin.**
- ✓ **Can Explode With Tremendous Force.**
- ✓ **Can be Virtually Unstoppable**

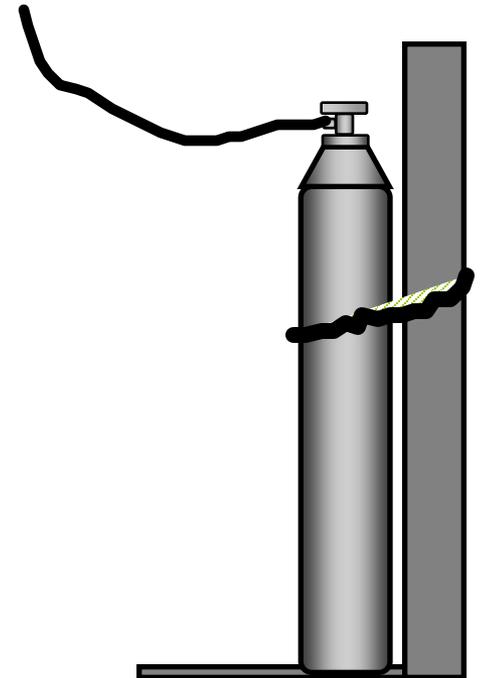




HAZARDS

☑ PRINCIPAL HAZARDS:

- ✓ Extremely High Pressure.
- ✓ Toxicity.
- ✓ Reactivity.
- ✓ Instability.
- ✓ Flammability.
- ✓ Extreme Low Temperature.
- ✓ Asphyxiation.
- ✓ Radioactivity.





USE

- ✓ **Gas cylinders must be secured at all times to prevent tipping.**
- ✓ **The valve spindle key should remain on the stem while the cylinder is in service.**
- ✓ **The threads on cylinder valves, regulators and other fittings should be examined to ensure they correspond and are undamaged.**
- ✓ **Cylinders should be placed with the valve accessible at all times.**
- ✓ **The main cylinder valve should be closed as soon as it is no longer necessary that it be open (i.e., it should never be left open when the equipment is unattended or not operating).**



STORAGE



☑ STORAGE REQUIREMENTS

- ✓ Do not store near elevators, walkways, building egresses, unprotected platform edges, or in locations where heavy moving objects may strike or fall on them.
- ✓ Must be secured above midpoint to prevent toppling.
- ✓ Store and use valve end up.
- ✓ Use Valve Cap When
Not in Use





STORAGE

☑ STORAGE REQUIREMENTS

- ✓ Containers must be stored upright.
- ✓ Use valve cap for unused cylinders.
- ✓ Must be secured to prevent toppling.
- ✓ Gases must be stored with like gases.
- ✓ Full and empty cylinders should be separated.
- ✓ The oldest material must be used first.
- ✓ Store only on stable surfaces.
- ✓ Some gases must always be shaded from sun or heat.





TRANSPORTATION

MOVEMENT OF COMPRESSED GAS CYLINDERS:

- ✓ **Never handle roughly.**
- ✓ **Never use magnetic lifting devices.**
- ✓ **Never lift by valves or cylinder caps.**
- ✓ **Never roll, drag, or slide the cylinder.**
- ✓ **Always use a hand-truck, fork truck etc.**
- ✓ **Cradles, ropes, chains, or slings are prohibited from use unless lugs or lifting attachments are provided by the manufacturer.**





SPECIFIC TYPES OF GASES

THE BIG THREE:

- ✓ **Oxidizers**: Must not be used in contact with oils, greases or other hydrocarbons.
- ✓ **Flammables**: Must not be exposed to flames, sparks or arcs including static electricity, hot surfaces or oxidizers. Store 20 Ft. away from oxygen/oxidizers, separated by a minimum 30 minute fire wall.
- ✓ **NonFlammables**: Must not be allowed to displace air in confined work spaces so that there is insufficient oxygen for breathing.





SPECIFIC TYPES OF GASES

☑ OXYGEN (INCLUDING OXIDIZING GASES):

- ✓ Oxygen and oxidizers can be deadly.
- ✓ Cleanliness is absolutely essential!!!
- ✓ Keep oil, grease, and other hydrocarbons away!
- ✓ Separate from combustible materials.
- ✓ Oxygen can “fuel enrich” permeable materials.
- ✓ Oxygen enriched materials burn tremendously.





SPECIFIC TYPES OF GASES

☑ INERT GASES:

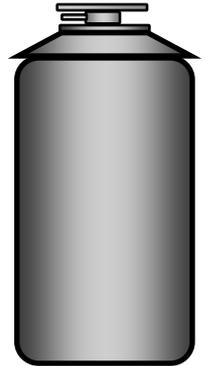
- ✓ **Can displace oxygen leading to asphyxiation.**
- ✓ **SCBA or airline systems must be used.**
- ✓ **Oxygen content below 19 percent is dangerous.**
- ✓ **Common highly inert gases include:**
 - Argon 1:847
 - Helium 1:757
 - Nitrogen 1:696
 - Carbon Dioxide
 - Neon 1:1438
 - Xenon



SPECIFIC TYPES OF GASES

☑ CRYOGENIC LIQUEFIED GASES:

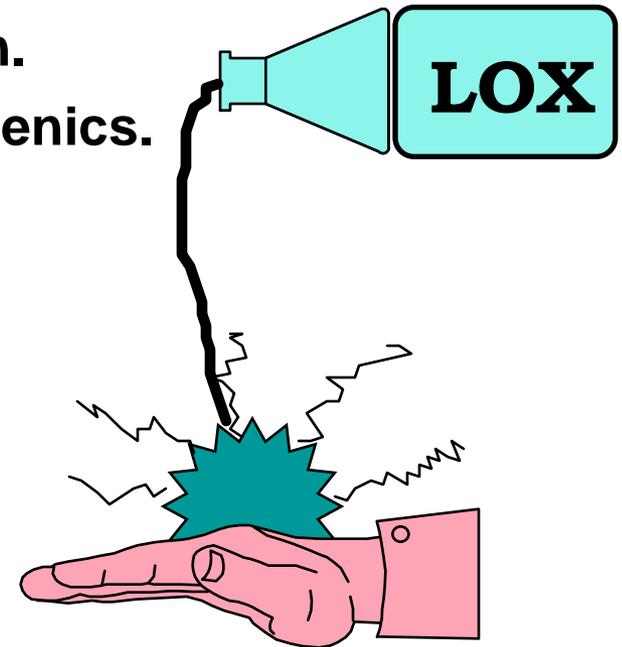
- ✓ **In liquid form at relatively low pressures.**
- ✓ **Extremely low temperatures.**
- ✓ **Usually below - 238F (- 150C).**
- ✓ **Handled in heavily insulated containers.**
- ✓ **Insulated containers minimize evaporation.**
- ✓ **Proper operation of venting systems is essential.**
- ✓ **High expansion rate on vaporization.**
- ✓ **Can cause extreme bodily damage on contact.**
- ✓ **Personal protective equipment must be utilized.**





SPECIFIC TYPES OF GASES

- ☑ **CRYOGENIC LIQUEFIED GASES:**
 - ✓ **Avoid skin and eye contact.**
 - ✓ **Use appropriate cryogenic gloves, sleeves and aprons.**
 - ✓ **Always use appropriate eye protection.**
 - ✓ **Use only hardware designed for cryogenics.**
 - ✓ **Pain is not immediate.**
 - ✓ **Tissue solidifies over time.**
 - ✓ **Blood circulation is arrested.**
 - ✓ **Serious skin burns may result.**
 - ✓ **Blood clots are highly probable.**
 - ✓ **Skin highly vulnerable to infection.**
 - ✓ **Flush with tepid water.**





SPECIFIC TYPES OF GASES

- CRYOGENIC LIQUEFIED GASES:

Oxygen
Rate of Expansion

1ft³
- 238

875 ft³
+65F



GENERAL SAFETY

SAFETY CONSIDERATIONS

- ✓ *Don't be afraid to ask people to wait!*
- ✓ Know the safe procedures **BEFORE** starting work.
- ✓ Read & understand all equipment manuals before equipment use.
- ✓ Don appropriate PPE prior to work.
- ✓ Know emergency procedures.
- ✓ Practice personal hygiene – do not eat, drink or apply cosmetics in the laboratory
- ✓ Only closed toe shoes are to be worn in the laboratory or animal facilities
- ✓ Wear your lab coat



Laboratory Safety – Electrical Hazards

- Do not use faulty electrical equipment or equipment with damaged cords. Inspect equipment prior to use.
- Protect cords from damage during use
- Do not use extension cords as a substitute for permanent wiring.
- Make sure Ground Fault Circuit Interrupters (GFCI's) are used near sinks. Periodically test GFCI's.
- Do not plug or unplug energized equipment with wet hands.
- In the event of electrocution, **DO NOT TOUCH VICTIM**. Know the location of switches and electrical panels to de-energize circuits first.
- Electrical panels should always be immediately accessible and never be blocked



Laboratory Safety – Centrifuges

- Majority of centrifuge accidents are due to user error.
- Inspect tubes or containers for cracks prior to use.
- Use only matched sets of tubes and assure balance of rotor.
- Use safety cups to prevent spills and aerosol generation.
- Do not overfill containers.
- Make sure that the centrifuge is operating properly before leaving the area.
- Do not open lid until centrifuge completely stops.
- Report spills or injury to supervisor immediately.



Laboratory Safety – Noise

- Noise levels in laboratories are usually below the threshold level that damages hearing.
- However, you should always be on the “look out” for noise emitted from equipment and procedures that may damage your hearing.
- A good indication of a hazardous noise level is one that causes you to shout to communicate.
- Exposure to high levels of noise can cause:
 - Hearing Loss
 - Startle reaction & Injury
 - Stress & Anxiety
 - High blood pressure
 - Gastrointestinal problems & chronic fatigue



Laboratory Safety – Ergonomics

- **Be aware of muscle tension while performing tasks to avoid ergonomic-related risk factors.**
 - Keep shoulders relaxed & elbows close to sides.
 - Maintain neutral wrist and arm positions.
 - Avoid twisting , turning and reaching movements.
 - Keep objects close to you and adjust chair to height of work surface.
 - Use properly fitted gloves.



Laboratory Safety – Ergonomics

- **Microscopes**

- Keep shoulders relaxed & elbows close to sides.
- Maintain chair/microscope height at a position to keep head upright. Avoid bending at the neck.
- Avoid leaning on hard edges.
- Spread microscope work throughout the day. Take short breaks or share work with others if possible.
- Relax eyes and focus on distant objects every 15 min.
- Stand and stretch every 30-60 min.



Laboratory Safety – Ergonomics

- **Pipetting**

- Use lightweight, properly sized pipetter for your hand.
- Use latch mode or electronic pipettors for repetitive work.
- Elevate chair to avoid reaching up to pipette.
- Use minimal pressure while pipetting.
- Hold with a relaxed grip.
- Avoid twisting or turning at the wrists.
- Alternate hands if possible.
- Use properly fitted gloves.



Laboratory Safety – Autoclaves

- Recognize the potential for burns and cuts and use appropriate PPE.
 - Ensure doors are closed and locked before starting cycle.
 - Allow items to cool before removing from autoclave/sterilizer.
 - Avoid handling sharp ends of instruments.
 - Use forceps or tools to remove sharp instruments from baskets and autoclaves.



Laboratory Safety – Biosafety Cabinets (BSC)

- Confirm that hood certification is current.
- Move arms in and out of cabinet slowly to limit disruption of air curtain.
- Wear appropriate personal protective equipment.
- Avoid use of large equipment or extra materials in hood.
- Collect materials for disposal inside the hood to avoid removing your hands from the hood too often.
- Use aseptic techniques to reduce splatter or aerosol generation.
- Decontaminate infectious agent contact areas immediately. Do not wait until the end of shift.
- Decontaminate materials before removing from hood.
- Completely decontaminate the BSC at the end of shift.



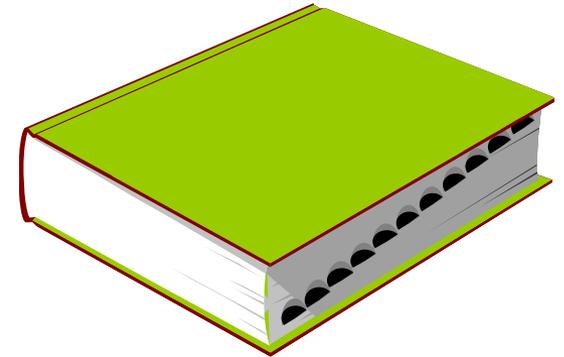
Laboratory Safety – Animal Handling

- Procedures performed only by trained personnel
- Persons working with animals or their unfixed tissues must read - VA Occupational Health & Safety Program/Plan for Those with Laboratory Animal Contact, have initial physical examination or waive participation, and fill out the related animal allergy questionnaire.
- Keep doors closed in rooms holding research animals.
- Latex, nitrile, or natural rubber gloves are to be worn to handle live animals or their unfixed tissues.
- Restrict operations that generate aerosols to biological safety cabinets.
- Clean up spills immediately.



FOR MORE INFORMATION

- www.OSHA.gov
- *Guide to Safe Handling of Compressed Gases*, Matheson
- *Handbook of Compressed Gases*, Compressed Gas Association
- *Gas Data Book*, Matheson





Contact Information

- VA Safety Department:

BT Industrial Hygienist

John Barnes

John.A.Barnes@va.gov

(410) 605-7000 ext. 4014

PP Industrial Hygienist

Robert Johnson

Robert.F.Johnson@va.gov

(410) 642-2411 ext. 6499

from BT 330-6499

- Chemical Hygiene Officer:

Grazyna Zaidel

Grazyna.Zaidel@va.gov

RM 3C-110

(410) 605-7000 ext. 6518