



# Hazardous Materials Control

## Learning Objectives:

- To learn what types of hazardous materials are in use in the Institute
- To become familiar with the requirements of WHMIS
- To recognize WHMIS labels, symbols and pictograms
- To become familiar with the contents of Safety Data Sheets
- To learn good working practices recommended when handling hazardous materials



# Hazardous Materials Control

Hazardous materials in use in the Heart Institute include the following .....

- Radioactive Materials
- Lasers
- Biohazardous Infectious Materials
- Chemicals





# Radioactive Materials

## What is Radiation?

- Radiation comes from atoms that are in the process of changing
- Produce ionizing radiation – which is harmful because it has sufficient energy to penetrate cells where it can create changes that may cause biological damage
- Radiation occurs in the environment – called natural background radiation
  - We are all exposed everyday
  - Sources may be cosmic or terrestrial, man made (smoke detectors and exit signs), or natural, such as bananas or tobacco
  - Radon is a significant terrestrial source that may be present in certain regions of the country
- In the Heart Institute the main sources of radiation are:
  - Radioisotopes (used in research)
  - Radiation emitting machines such as the cyclotron
  - X-ray Machines



# ALARA

- **Radiation Safety is based on the ALARA Principle – As Low As Reasonably Achievable**
  - 1.Reduce your time spent with radioactive materials
  - 2.Increase your distance from the source ...
  - 3.Use appropriate shielding when handling ...
  - 4.Prevent the spread of contamination by monitoring frequently ...



# Radiation Warning Signs

## Nuclear Substances

The trefoil is an internationally recognized warning sign to indicate the presence of radioactive materials.





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# Radiation Warning Sign

- This is the internationally recognized sign for an X-ray Emitting Device





# Radioactive Materials

- Legislative Oversight for radioactive materials include:
  - Canadian Nuclear Safety Act / Commission for radioisotopes
  - Health Canada (X-ray Safety)
  - Ministry of Labour (X-ray Safety)
  - Healing Arts radiation Protection Act (X-ray Safety)
- The Heart Institute and OHIRC comes under the umbrella of the Ottawa Hospital's Consolidated License so must comply with TOH Radiation Protection Manual
- More detailed training by Radiation and Laser Safety Department is required for those who handle or use radioactive materials



# LASER Use in the Heart Institute

- LASER is an acronym that stands for Light Amplification by Stimulated Emission of Radiation
- Laser light is monochromatic (single colour) and collimated (focused in a narrow beam) – these properties enable lasers to produce very powerful beams of light
- Laser light is a form of non-ionization radiation ie contains less energy than radioactive materials and cannot remove electrons from atoms – can be a hazard nevertheless
- In the Heart Institute lasers are in use in the Cardiac Operating Room and in research laboratories (primarily enclosed)
- there are 2 types of hazards associated with laser use – beam hazards and non-beam hazards





# LASERS - Hazards

Beam Hazards	Non-Beam Hazards
Eye damage – corneal and / or retinal burn Can cause cataracts	Electrical – high voltage / electrical shocks Chemical – use of compressed gases, chemicals in dye lasers Fire – high radiant power can cause fires
Skin damage – burns, red skin, accelerated aging and pigmentation	LGAC – Laser generated air contaminants – Laser “plumes”. Can contain carcinogens, mutagens, irritants and fine dust which can be inhaled by operators



# LASER Safety

## Laser Warning Signs



## Training

- All staff who will be required to work directly with a Laser or in a Laser controlled area must attend appropriate training from the Laser Safety Officer at the Ottawa Hospital



# Biohazardous Infectious Materials

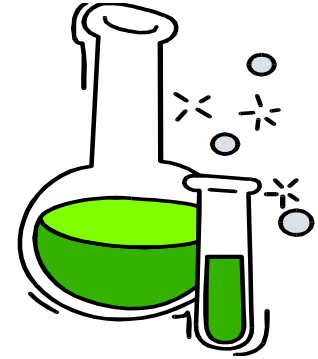
- Biohazardous Infectious materials are living organisms such as viruses and bacteria or the product of a living organism such as a biotoxin
- Workers could be exposed to biohazardous infectious materials from exposure to human blood, bodily fluids or tissue in patient care areas or to viruses and bacteria used in research laboratories.
- Legislative oversight is from the Public Health Agency of Canada ... they have issued the Canadian Biosafety Standards
- There are also requirements under the Occupational Health and Safety Act and WHMIS
- Specific Biosafety training is required for users in Research





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# WHMIS



## Workplace Hazardous Materials Information System

**WHMIS = The right to Know (about hazardous materials that are used on the job)**





# WHMIS Updated

- In 2015 Canadian WHMIS changed to align with the Globally Harmonized System (GHS) for classifying chemical hazards and communicating health and safety information
- Why? ... currently many different countries have different classification and labeling systems which can be confusing and difficult to comply with .. The UN developed the GHS which standardizes classification and labeling and facilitates communication
- GHS identifies 3 major hazard groups for chemicals:
  - Physical
  - Health
  - Environmental ..... Canada has not adopted this hazard group
- The essential elements of WHMIS remain the same – hazard symbols have been replaced with pictograms, MSDSs are now called SDSs and controlled products are now called hazardous products



## Staying the same ....

- **Information Delivery System**
  - System of Labels
  - Use of Safety Data Sheets (SDS)
  - Worker training programs
- **Application to all Canadian workplaces**
- **Supplier responsibilities**
  - Classify their hazardous products
  - Label appropriately
  - Prepare and provide safety data sheets to customers



# Roles and Responsibilities Under WHMIS

## •Employer responsibilities

- Identify all hazardous materials in the workplace
- Obtain and post all applicable SDSs
- Ensure workplace labels are applied where required
- Provide training to employees

## •Worker rights and responsibilities

- Right: to know all about the hazardous materials being used on the job
- Responsible to attend training and apply the knowledge when working with hazardous materials
- Report any non-compliance items such as missing labels or SDSs to the supervisor













# WHMIS

- Applies two major hazard groups – physical and health
- Each hazard group includes hazard classes that have specific hazardous properties such as ...
  - Physical – flammability, reactivity or corrosivity etc
  - Health – acute toxicity, eye irritation, respiratory sensitization etc
- Pictograms are used to show the user what type of hazard is present for the particular hazardous product .... At a glance the user can see, for example, if the product is flammable, toxic etc
- Most have a red square on point border with the symbol inside the border .....





# WHMIS 2015 Pictograms

	<b>Exploding bomb</b> (for explosion or reactivity hazards)		<b>Flame</b> (for fire hazards)		<b>Flame over circle</b> (for oxidizing hazards)
	<b>Gas cylinder</b> (for gases under pressure)		<b>Corrosion</b> (for corrosive damage to metals, as well as skin, eyes)		<b>Skull and Crossbones</b> (can cause death or toxicity with short exposure to small amounts)
	<b>Health hazard</b> (may cause or suspected of causing serious health effects)		<b>Exclamation mark</b> (may cause less serious health effects or damage the ozone layer*)		<b>Environment*</b> (may cause damage to the aquatic environment)
	<b>Biohazardous Infectious Materials</b> (for organisms or toxins that can cause diseases in people or animals)				

\* The GHS system also defines an Environmental hazards group. This group (and its classes) was not adopted in WHMIS 2015. However, you may see the environmental classes listed on labels and Safety Data Sheets (SDSs). Including information about environmental hazards is allowed by WHMIS 2015.



# Exemptions from WHMIS

- Explosives
- Pesticides
- Radioactive Material
- Manufactured goods
- Tobacco products
- Consumer goods
- Cosmetics, food and drugs
- Wood products



# WHMIS Labels ...

- A source of information on a controlled product
- The first element of WHMIS information that directs users to the second element – SDSs
- Two types
  - Supplier
    - Applied by the supplier before the product enters the workplace
  - Workplace
    - Applied in the workplace by the user (when product is decanted or when supplier label is missing or damaged)



# WHMIS Supplier Labels

- **WHMIS supplier labels must have the following information:**

- Product identifier
- Initial supplier identifier
- Pictogram
- Signal word
- Hazard statement
- Precautionary statement(s)
- Supplemental label information

- **No specific border required**

- **Labels must be in English and French – one bilingual label or one English and one French**



# Signal Word

- WHMIS 2015 introduced the concept of a signal word
- A signal word is a word used to alert a user of a potential hazard of the material and to indicate the severity of the hazard
- There are 2:
  - **Danger** is used for high-risk hazards
  - **Warning** is used for less severe hazards
- Signal words must be shown on the supplier label and the “Hazards Identification” section of the SDS



# Hazard Statement

- ..... **A brief standardized sentence that describes the most significant hazards of the product**
- **Examples are:**
  - Extremely flammable gas
  - Fatal if inhaled
  - May cause cancer



# Precautionary Statement

- **Provide advice on how to safely store or handle the product to minimize exposure .. Like hazard statements they are also standardized statements**
- **Examples are:**
  - Keep container tightly closed
  - protect from sunlight
  - Wear protective gloves ... etc



# Workplace Labels

- must contain 3 categories of information as follows:
  - Product name
  - Safe handling precautions/precautionary statements – may include pictograms
  - Reference to the safety data sheet if available
- There is no requirement for borders
- Employers are responsible to apply workplace labels ... so in the laboratory for example the principal investigator must ensure they are used when appropriate:
  - A hazardous product is transferred to another container
  - A supplier label becomes lost or illegible





# Safety Data Sheet

- Summary documents that provide information about the hazards of a product and advice about safety precautions (so essentially the same as an MSDS)
- Every product that is classified as a hazardous product under WHMIS must have an SDS
- 16 Sections are legislated
- No listed expiry date ... when the supplier becomes aware of new information the SDS must be updated



# SDS Information

Section	Content
Identification	Product identifier (name)\ any other means of identification Recommended use / restrictions on use Canadian Supplier Emergency telephone number
Hazard identification	Hazard classification Label elements – symbol, hazard statement(s), precautionary statement(s) Other hazards not indicated by classification
Composition/Ingredient Information	Chemical name Common name and synonyms CAS number or any unique identifier Chemical name of impurities or additives if any concentration



## SDS Information ....

First aid measures	First aid measures by route of exposure – skin, inhalation, eye contact or ingestion Most important symptoms and effects Immediate medical attention and special treatment if necessary
Fire Fighting measures	Suitable / unsuitable extinguishing media Specific hazards arising from the hazardous product Special PPE and precautions for fire-fighters
Accidental Release measures	Personal precautions, PPE and emergency procedures Materials and methods for containment and clean up
Handling and storage	Precautions for safe handling Conditions for safe storage (including incompatible materials)
Exposure Controls / personal protection	Occupational exposure guidelines / limits Appropriate engineering controls Individual protection measures such as PPE



# SDS Information ....

Physical and chemical properties	Properties such as appearance, odour threshold, pH, boiling point, melting point, flash point, flammable limits, etc
Stability and reactivity	Reactive or not, incompatible products, hazardous decomposition products, conditions to avoid etc
Toxicological information	Description of the various toxic health effects and the data used to identify those effects such as: Routes of exposure Symptoms Delayed and immediate effects, chronic and acute effects
Ecological Information	Hazards to the environment, does it bio-accumulate etc. Under WHMIS 2015 this section must be listed but information does not have to be provided



## SDS Information ....

Disposal considerations	Information on safe handling for disposal and methods of disposal, including any contaminated packaging Under WHMIS 2015 this section must be listed but information does not have to be provided
Transport Information	Any information related to the safe transportation in accordance with Transportation of Dangerous Goods regulations: UN number, proper shipping name, packing group, special precautions etc Under WHMIS 2015 this section must be listed but information does not have to be provided
Regulatory Information	Safety, health and environmental regulations specific to the product Under WHMIS 2015 this section must be listed but information does not have to be provided
Other Information	Date of the latest revision of the SDS – There is no expiry date on an SDS. The law requires SDSs to be updated whenever there is significant new data.



# Working Safely with Hazardous Products

- Read the SDS.... Know the hazard(s)
- Use / Wear appropriate personal protective equipment
- Keep containers closed when not in use
- Use, store or handle in a well ventilated area or in the fume hood
- Keep only the smallest amounts possible in the work area
- Label all hazardous materials
- Practice good housekeeping (decontaminate surfaces frequently)
- Practice good personal cleanliness – frequent hand washing
- Segregate hazard classes in storage
- Report all accidents, spills and exposures to the supervisor





# Working Safely .....

- Behave appropriately in the workplace – no horseplay, practical jokes or distracting behaviour
- Tie back long hair and confine loose clothing or jewelry
- Never eat (even chewing gum), drink, apply cosmetics or handle contact lenses in an area where hazardous materials are used or decanted – housekeeping room or lab
- Clean up spills immediately
- **Compressed Gases**
  - Store in a cool, dry well ventilated space in a securely fastened upright position
  - Leave protective valve cap in place when not in use
  - Always transport using an appropriate cart / hand truck
  - Label empty containers “EMPTY” and segregate
- **Flammable and Combustible Material**
  - Eliminate ignition sources
  - Store separately from oxidizing materials in approved flammable storage cabinets
  - Minimize the amount in storage



# Working Safely....

## •Oxidizing Materials

- Eliminate ignition sources
- Store separately from flammable materials

## •Corrosives

- Use appropriate personal protective equipment –goggles not glasses
- Add acid to water not the reverse
- Store in corrosives or acid cabinet
- Do not store acids and bases together or under sinks

## •Reactives

- Date container when first opened
- Plan your experiments / know the specific hazards or reactive properties of the chemical you are working with
- Wear safety glasses with side shields or goggles
- Do not handle containers where crystals have formed around the cap or lid





# Remember to take the WHMIS Quiz ...

- <https://www.classmarker.com/online-test/start/?quiz=dbh5305063e2c256>
- **Password: healthandsafety**