Occupational Cancer Canada



What is a carcinogen?

A carcinogen is a substance, mixture or agent that can cause cancer or it increases the risk of developing cancer. Known carcinogens include viruses (e.g., Hepatitis B), hormones (e.g., estrogens), chemicals (e.g., benzene), naturally occurring minerals (e.g., asbestos), alcohol, and solar radiation (e.g., ultraviolet radiation).

What is occupational cancer?

Occupational cancer is cancer that is caused wholly or partly by exposure to a carcinogen at work.

How common is occupational cancer?

Research shows that the amount of cancer related to occupational exposure varies with the type of cancer. The most common types of occupational cancer are lung cancer, bladder cancer and mesothelioma.

Type of Cancer	Related to Occupational Exposure Estimated % (USA)
Lung	6.3-13%
Bladder	3-19%
Mesothelioma	85-90% (men); 23-90% (women*)
Leukemia	0.8-2.8%

Laryngeal	**1-20% (men)**
Skin Cancer (non-melanoma)	**1.5-6% (men)**
Sinonasal and nasopharyngeal	**31-43% (men)**
Kidney	**0-2.3%**
Liver	**0.4-1.1 (vinyl chloride only; men)**

* In general, the overall attributable risk for mesothelioma in women is 23%. However, if the woman has had “take-home” exposure to asbestos, the risk may be around 90%. “Take-home” exposure results from asbestos being carried home on contaminated work clothing or other items.

Data From: Dying for work: the magnitude of US mortality from selected causes of death associated with occupation. K. Steenland, et al. American Journal of Occupational Medicine. Vol. 43 (2003). p. 461-482

How do we know if an agent can cause cancer?

Scientists identify cancer-causing agents using information from:

- studies that look at the relationship between an exposure and the risk of developing cancer in human populations
- experiments that examine the relationship between an exposure and the risk of developing cancer in laboratory animals
- tests that examine the ability of an agent to cause mutations (genetic changes) in cells, and
- knowledge of chemical structures and the way in which chemicals interact with the body

Scientists generally use information or evidence from all of these sources when determining if an agent can cause cancer.

Are there lists of substances or agents that can cause occupational cancer?

Identifying carcinogens is complicated. Fortunately, there are several organizations that evaluate the available information according to specific criteria.

The most authoritative lists of carcinogens are published by the:

- International Agency for Research on Cancer (IARC), an agency of the World Health Organization
- American Conference of Governmental Industrial Hygienists (ACGIH), an

independent US organization
- US National Toxicology Program (NTP), a US interagency program

IARC

IARC classifies each agent or exposure into one of five groups according to the strength of scientific evidence for carcinogenicity, as follows:

- Group 1 – Carcinogenic to humans
- Group 2A – Probably carcinogenic to humans
- Group 2B – Possibly carcinogenic to humans
- Group 3 – Not classifiable as to its carcinogenicity to humans
- Group 4 – Probably not carcinogenic to humans

A list is available at the IARC Monographs web site.

ACGIH

ACGIH assigns chemicals or agents to one of the following 5 categories:

- A1 – Confirmed human carcinogen
- A2 – Suspected human carcinogen
- A3 – Confirmed animal carcinogen with unknown relevance to humans
- A4 – Not classifiable as a human carcinogen
- A5 – Not suspected as a human carcinogen

Carcinogens identified by ACGIH are listed in ACGIH's TLVs® and BEIs® booklet that is published annually. See the ACGIH web site for more information.

NTP

Every two years, NTP publishes a list of agents that they have evaluated and assigned to one of two categories:

- Known to be Human Carcinogens
- Reasonably Anticipated to be Human Carcinogens

Their 14th Report on Carcinogens is available online.

What are examples of occupational exposures that have been associated with cancer?

Examples of occupations and occupational groups that have been associated with occupational cancer are listed in the following table Occupations or Occupational Groups Associated with Carcinogen Exposure.

Is exposure to a specific carcinogen associated with a certain type of cancer?

In many cases, certain types of cancer are associated with specific carcinogens.

Are workplace exposures to carcinogenic agents regulated?

Many Canadian jurisdictions do regulate workplace exposures to carcinogens (e.g., asbestos). The specific substances regulated and regulatory requirements

vary by jurisdiction. Regulations typically specify maximum exposure limits. In some cases, the regulations may require routine monitoring of the workplace, medical surveillance of workers, specific record keeping, etc.

Does WHMIS apply to carcinogens?

In Canada, the Workplace Hazardous Materials Information System (WHMIS) is a nation-wide system that ensures people have the information they need to work safely with hazardous products (including carcinogens) in the workplace. In 2015, Canada aligned WHMIS with the Globally Harmonized System of Classification and Labelling of Chemicals (GHS). The original system is identified as WHMIS 1988. Updates which implement GHS will be referred to as WHMIS 2015.

The WHMIS 2015 legislation is currently in force. “In force” means that suppliers may begin to use and follow the new requirements for labels and safety data sheets (SDSs) for hazardous products sold, distributed, or imported into Canada. However, there is a transition period with various stages. At the beginning of the transition period, the supplier must fully comply with either the repealed Controlled Products Regulations (WHMIS 1988) or the Hazardous Products Regulations (WHMIS 2015) for a specific controlled or hazardous product. See the OSH Answers document on WHMIS 2015 – General for additional information.

WHMIS 1988

When following WHMIS 1988 requirements, agents on the following lists are classified as carcinogens:

- IARC Group 1 (Carcinogenic to humans)
- IARC Group 2A (Probably carcinogenic to humans)
- IARC Group 2B (Possibly carcinogenic to humans)
- ACGIH A1 (Confirmed human carcinogen)
- ACGIH A2 (Suspected human carcinogen)

When a product that is a mixture has not been tested to determine its health hazards, WHMIS 1988 states that if the product contains an ingredient that is classified as a carcinogen and that ingredient is found in the controlled product at a concentration greater or equal to (>) 0.1%, the product must also be classified as a carcinogen.

Products classified for carcinogenicity are included in the WHMIS 1988 category D2: Class D – Poisonous and Infectious materials – Division 2: Materials Causing Other Toxic Effects. The symbol used for this hazard class is the stylized “T”.

Symbol for poisonous and infectious materials



WHMIS 2015

When following WHMIS 2015 requirements, the Carcinogenicity hazard class has two categories – Category 1 and Category 2. Category 1 has two subcategories – Category 1A and Category 1B.

A hazardous product that is a substance is assigned to the Carcinogenicity hazard class and category based on evaluation of the available scientific evidence according to detailed criteria published in the Hazardous Products Regulations. A hazardous product that is a Category 1 (1A or 1B) may cause cancer. A hazardous product that is a Category 2 is suspected of causing cancer.

A hazardous product that is a mixture may be assigned the Carcinogenicity hazard class based on the following:

- Carcinogenicity – Category 1: it contains at least one ingredient at a concentration greater or equal to (>) 0.1% that is classified in Carcinogenicity – Category 1A or in Carcinogenicity – Category 1B,
- Carcinogenicity – Category 2: it contains at least one ingredient at a concentration greater or equal to (>) 0.1% that is classified in the category Carcinogenicity – Category 2

Note: Other approaches to classifying mixtures for carcinogenicity may apply. Consult the Hazardous Products Regulations for additional information.

If a hazardous product is classified for Carcinogenicity, the following standardized label elements apply:

	Category 1	**Category 2**
Pictogram		
Signal Word	**Danger**	**Warning**
Hazard Statement	**May cause cancer***	**Suspected of causing cancer***

Precautionary Statements	**Obtain special instructions before use.** **Do not handle until all safety precautions have been read and understood.** **Wear protective gloves/protective clothing/eye protection/face protection.** **IF exposed or concerned: Get medical advice/attention.** **Store locked up.** **Dispose of contents/container to …**

*State route of exposure if it is conclusively proven that no other routes of exposure cause the cancer.

Note: The supplier may adapt the precautionary statements as allowed by the HPR.

Is it possible to work safely with a carcinogen?

Both WHMIS 1988 and WHMIS 2015 require that people who work with hazardous products have education and training about the potential hazards of the products and how to work with them safely. Information on the hazard classification and how to work safely with that product is included on the Material Safety Data Sheets/Safety Data Sheets (MSDSs/SDSs).

There are many ways to control the hazards of any substance or agent.

A hazard control program consists of all steps necessary to protect workers from exposure, and the procedures required to monitor worker exposure and their health.

Knowing which control method is best can be a complicated process. It often involves doing a risk assessment to evaluate and prioritize the hazards and risks.

The following general advice can help you work safely with a carcinogen:

- Consult the MSDS/SDS for information about the hazards and necessary precautions for the specific carcinogenic product you are using.
- Understand all of the hazards associated with the product, including additional health concerns (e.g., serious short-term health effects or irritation), reactivity and flammability.
- Know how to use the product safely to protect yourself and co-workers.
- Ensure engineering controls (e.g., ventilation) are operating. Closed handling systems may be necessary to prevent the release of the product (dust, mist, vapour, gas) into the workplace.
- Use the smallest quantity possible.
- Follow safe work practices specified by your employer.
- Wear the appropriate personal protective equipment specified for the job. This equipment may include respiratory protection and chemical protective clothing, such as an apron and gloves, made from materials that protect against the chemicals being handled.
- Report ventilation failures, leaks, or spills to your supervisor immediately.
- Understand and practice emergency procedures so that you know what to do in

case of a spill or other emergency.

Why is reducing exposure important?

Reducing exposure will reduce your risk of developing cancer from exposure to a carcinogen.

Typically, there are 3 important routes of exposure in a workplace setting – inhalation (breathing in), skin contact and ingestion (swallowing). In addition, there are several factors that can influence how likely a product is to cause a specific effect (e.g., cancer), for example:

- Route of entry into the body (e.g., some carcinogens will only cause cancer if inhaled, but not by skin contact).
- Amount or dose entering the body (in general, a higher exposure increases risk).
- Potency of the carcinogen (some carcinogens cause cancer if there is exposure to even a very small amount, while others may require intense exposure over many years).
- Individual susceptibility (e.g., some people may be more susceptible to developing cancer due to their genetic make-up).
- Personal habits (e.g., smoking acts synergistically with many carcinogens. This action means that if you smoke, your risk of developing cancer following a workplace exposure to a carcinogen is MUCH higher).

When considering if a person may have been exposed to a chemical, or if measures are being taken to reduce exposures currently in the workplace, there are many questions that should be asked. Some include:

- Inhalation (breathing in)
    - Is the work environment dirty?
    - Is respiratory protection worn (respirators)?
    - Is the hazardous agent used in an “open” or “closed” system?
- Skin contact/absorption
    - Is there skin contact?
    - Is personal protective equipment worn (e.g., gloves, aprons)?
    - Is work clothing laundered properly?
    - Are proper hand washing facilities available?
- Ingestion (swallowing)
    - Is eating or smoking allowed in the work area?
    - Is food stored in the work area?

Another important factor is how long and how much a person was exposed to the agent. Duration (how long) of exposure to some agents may be infrequent or only in very small amounts, while others may be used daily or in very large amounts. The number of weeks or years on the job may provide an estimate of the degree of exposure. In general, the higher the exposure (duration and/or amount), the higher the risk of developing a health effect, including cancer.

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