

Cancer

Occupational Cancer

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What is a carcinogen?

A carcinogen is a substance, mixture or agent that can cause cancer or increase the risk of developing cancer. Known carcinogens include viruses (e.g., Hepatitis B, Kaposi sarcoma-associated herpes virus, etc.), hormones (e.g., estrogens), chemicals (e.g., benzene, diesel exhaust, alcohol), naturally occurring minerals (e.g., asbestos), bacteria (e.g., *Helicobacter pylori*), ionizing radiation (e.g., X-rays) and solar radiation (e.g., ultraviolet radiation).

Carcinogens may also include work organization factors, such as shift and night work.

What is occupational cancer?

Occupational cancer is the term given to cancers that are caused wholly or partly by exposure to a carcinogen or situation at work. Generally speaking, this exposure would occur over a long period of time (e.g., more than 10 years).

How common is occupational cancer?

Research shows that the amount of cancer related to occupational exposure varies with the type of cancer. Common types of occupational cancer are lung cancer, bladder cancer, and mesothelioma. The [Occupational Cancer Research Centre](#) produces reports on the burden of occupational cancers.

How do we know if an agent or situation may 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 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.

Do all exposures to a carcinogen result in occupational cancer?

No. Whether or not exposure to a carcinogen will result in cancer depends on many factors, including:

- Route of exposure
- Concentration of the carcinogen
- Dose (toxicity) of the carcinogen
- Frequency (how often the worker was exposed)
- Duration (how long the worker was exposed)
- Exposure to other agents at the same time (including smoking, medical treatments, etc.)
- Individual characteristics (e.g., age, genetic ancestry, etc.)

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 or amount), the higher the risk of developing a health effect, including cancer.

For more information, please see the following OSH Answers documents:

- [How Workplace Chemicals Enter the Body](#)
 - [What Makes Chemicals Poisonous](#)
 - [What is an LD₅₀ and LC₅₀?](#)
 - [Occupational Hygiene - Occupational Disease](#)
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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 following:

- 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

International Agency for Research on Cancer (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](#) website.

American Conference of Governmental Industrial Hygienists (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, which is published annually. See the [ACGIH website](#) for more information.

US National Toxicology Program (NTP)

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 [most recent 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. Our OSH Answers document [Cancer Sites Associated with Occupational Exposures](#) has a list of examples.

Are workplace exposures to carcinogenic agents regulated?

Canadian jurisdictions regulate workplace exposures to carcinogens. The specific substances regulated and regulatory requirements vary by jurisdiction. Regulations typically specify maximum occupational exposure limits. In some cases, the regulations may require routine monitoring of the workplace, medical surveillance of workers, specific record keeping, etc.

Check with your local [department or ministry responsible for occupational health and safety](#) for more information.

How does WHMIS apply to carcinogens?

In Canada, the Workplace Hazardous Materials Information System (WHMIS) is a nationwide system that ensures people have the information they need to work safely with hazardous products (including carcinogens) in the workplace.

See the OSH Answers document on [WHMIS – General](#) for general information.

WHMIS requirements are defined in the Hazardous Products Act and regulations. The carcinogenicity hazard class has two categories - Category 1 and Category 2. Category 1 has two subcategories - Category 1A and Category 1B.

“Substances” or “mixtures of substances” are determined to be carcinogenic hazardous products when the available scientific data shows the substance or mixture meets the criteria for Category 1, 1A, 1B or Category 2. If there is sufficient scientific data to differentiate between Subcategory 1A or 1B, then these subcategories are assigned instead of Category 1.

Note: Consult the Hazardous Products Act and regulations for additional information.

When a hazardous product is classified as a carcinogen, the following 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 cancer.

Note: The supplier may adapt the precautionary statements as allowed by the Hazardous Products Regulations.

Is it possible to work safely with a carcinogen?

Yes. There are many ways to control the hazards and risks of working with a possible carcinogen.

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 challenging process. It often involves doing a risk assessment to evaluate and prioritize the hazards and risks.

For more information, please see the following documents in OSH Answers:

- [Hazard and Risk - Risk Assessment](#)
- [Hazard and Risk - Hazard Control](#)
- [Hazard and Risk - Hierarchy of Controls](#)

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

- Eliminate exposures to and the use of carcinogens from the workplace, where possible.
- Eliminate unnecessary tasks involving exposure to a carcinogen.
- Substitute a carcinogen with a less hazardous product when possible.
- Make sure engineering controls (e.g., ventilation) are operating properly. Closed handling systems may be necessary to prevent the release of the product (dust, mist, vapour, gas) into the workplace.
- Enclose the process to reduce exposure.
- Use alternative methods that reduce exposure where possible, such as using the product in a solid form (versus a liquid, which evaporates faster).
- Limit time exposed to carcinogens by using job rotation, allowing only limited access to the area, or reducing the number of workers.
- Develop and implement safe work instructions. Consult the Safety Data Sheet (SDS) or technical literature for information about the hazards and necessary precautions for the specific carcinogenic product being used.
- Determine the amount of airborne exposure and compare it to the occupational exposure limit.
- Make sure containers are closed and clearly labelled.
- 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.
- Understand and practice emergency procedures so that you know what to do in case of a spill or other emergency.
- Provide education and training programs.
- Know how to use the product safely to protect yourself and co-workers.
- Use the smallest quantity possible.
- Follow safe work practices specified by your employer.
- Follow good personal hygiene practices when recommended, such as washing skin regularly, storing work clothing separately from personal items, washing work clothing, and washing hands before eating, drinking or smoking.
- Report ventilation failures, leaks, or spills to your supervisor immediately.

- Report health concerns to your supervisor, health and safety committee or representative, or employer.
- Wear the appropriate personal protective equipment specified for the job. This equipment may include respiratory protection and chemical protective clothing, such as goggles, glasses, face shields, aprons and gloves, made from materials that protect against the chemicals being handled. Not all materials will protect from all chemicals.

If personal protective clothing is used, it should be used as part of a [personal protective equipment program](#) that outlines responsibilities, selection, use, maintenance, limitations, etc...

Where can I get more information?

There are many organizations that can provide assistance for people with cancer. These are just a few* that specifically mention occupational cancers.

- [CAREX Canada](#)
- [Protect Yourself](#). Canadian Cancer Society
- [Occupational Cancer](#). National Institute for Occupational Safety and Health (NIOSH), USA
- [Carcinogens](#) (Safety and Health Topics). Occupational Safety and Health Administration (OSHA), USA

(*We have mentioned these organizations as a means of providing a potentially useful referral. You should contact the organization(s) directly for more information about their services. Please note that mention of these organizations does not represent a recommendation or endorsement by CCOHS of these organizations over others of which you may be aware.)

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