Will being exposed to a carcinogen result in cancer?

Some chemicals alter DNA, which can result in cancer if your body does not correct the damage.

Your risk for developing cancer increases with increased frequency of exposure.

Although you will not be able to prevent exposure to all carcinogens throughout your life, you can prevent many exposures that would otherwise occur in the workplace!
Reducing Risk

The Mayo Clinic provides the following seven tips to reduce your chance of getting cancer:

1. Don’t use tobacco;
2. Eat a healthy diet;
3. Maintain a healthy weight and be physically active;
4. Protect yourself from the sun;
5. Get immunized;
6. Avoid risky behaviors (e.g. don’t take drugs); and
7. Get regular medical care (this includes screenings)

At BYU we also Recommend

Preventing exposure to chemicals in labs and shops when possible. And, if not possible then minimizing your exposure!

How to Identify a Carcinogen

Look for IARC, NTP, and ACGIH carcinogen classifications on Safety Data Sheets (section 11).

Carcinogenicity:
IARC-GROUP 1 – Carcinogenic to humans.
EPA-GROUP A – Human or mammalian carcinogen.
NTP1 – Known to be carcinogenic in rats.
Carcinogenic by OSHA.
Carcinogenic by NIOSH.
ACGIH A1: Confirmed Human Carcinogen.

The following signal word and hazard statement will also be found on the Safety Data Sheet (SDS):

Signal Word: Danger
Hazard Statement: May be fatal if swallowed and enters airways. Causes skin irritation. May cause drowsiness or dizziness. May cause genetic defects. **May cause cancer.** Suspected of damaging fertility of the unborn child. Toxic to aquatic life with long lasting effects. Highly flammable liquid and vapor.
About IARC & NTP Classifications

IARC and NTP carcinogen classifications and their meaning:

**IARC**

- **Group 1** - Carcinogenic to humans
- **Group 2A** - Probably carcinogenic to humans
- **Group 2B** - Possibly carcinogenic to humans
- **Group 3** - Unclassifiable
- **Group 4** - Probably not carcinogenic

**NTP**

- Known to be carcinogenic
- Reasonably anticipated to be carcinogenic

**Key**

- OSHA refers to these substances as “select” carcinogens
- OSHA refers to these substances as “select” carcinogens if there is statistically significant tumor incidence in experimental animals.
ACGIH classifications and their meaning:

**ACGIH**

- **A1 - Confirmed human carcinogen**
- **A2 - Suspect 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**

OSHA refers to these as "select" carcinogens. And requires certain precautions to be taken when working with them.
Minimize Exposure

When using any chemical make sure you minimize your exposure, using exposure controls to keep exposure as low or non-existent as possible.

Individuals using “select” carcinogens are required by OSHA to develop written procedures for how they will handle the carcinogens safely while practicing strict hygiene.
Exposure Controls

Various control measures are available that can be used to minimize exposure. Some of these control measures are more preferred than others because they are more effective and require less human interaction. Always select and use the most preferred controls you can.

Hierarchy of Controls

Most Preferred
Engineering controls
(e.g. *Glove Box)

Administrative controls
(e.g. Work practices)

Least Preferred
Personal protective equipment
(e.g. Respirator)

You will more than likely be using a combination of controls.
Designated Areas

An Administrative Control—

If you are using a “select” carcinogen then you are required to establish a “designated area”.

The purpose of establishing a designated area is to help limit where contamination occurs, and to communicate where the designated area is in order to protect individuals in and outside the area.

Use signs like this to identify a designated area.

DESIGNATED AREA

- Explosive/Implosive Conditions
- Use of Select Carcinogens
- Reproductive Toxins
- Highly Toxic Chemicals

(Check those that apply)

Authorized Personnel Only

Substances: Formaldehyde

Note: this sign template is available after the “End” slide of this presentation

Only authorized individuals are allowed to enter “designated areas”
Additional Requirements

There are additional requirements when using any of the following “select” carcinogens:

- Inorganic Arsenic
- Benzene
- 1,3-Butadiene
- Cadmium
- Ethylene Oxide
- Formaldehyde
- Vinyl Chloride

Note: asbestos too.

Additional Requirements:

1. Exposure characterization (e.g. air monitoring) and identification of tasks where exposure is high;
2. Inclusion in the University respiratory protection program if exposures warrant such;
3. Medical surveillance when exposures reach a defined level;
4. Change rooms for individuals whose clothing may become contaminated;
5. A shower facility in the designated area for routine wash down of individuals who work with inorganic arsenic, lead, or cadmium if exposures reach an action level;
6. Recordkeeping (e.g. air monitoring and medical surveillance records).
OSHA’s 13 Carcinogens (also “select” carcinogens)

There are even stricter OSHA requirements for using any of the following “13 Carcinogens”:

1. 2-Acetylaminofluorene
2. 3,3’-Dichlorobenzidine (& its salts)
3. 4-Aminodiphenyl
4. 4-Dimethylaminoazo-benzene
5. 4-Nitrobiphenyl
6. Alpha-Naphthylamine
7. Benzidine
8. Beta-Naphthylamine
9. Beta-Propiolactone
10. Bis-Chloromethyl Ether
11. Ethyleneimine
12. Methyl-Chloromethyl Ether
13. N-Nitrosodimethylamine

Highly Recommended
Don’t use any of these chemicals!
In order for a lab to use one of the “13 Carcinogens” they would need to:

1. Use the substance in a completely isolated system. None of the substance is allowed to escape.
2. Adequate local exhaust ventilation must be used (e.g. lab) when opening the closed system to transfer the substance. Full body protection must be worn when performing the transfer. And, after the transfer, before leaving the designated area, all clothing must be removed and placed in a designated laundry collection container and individuals must decontaminate themselves by using designated washing facilities.
3. Spills or leaks must be addressed while wearing impervious full body protection;
4. Periodic reports are to be submitted to the OSHA office.
5. Medical surveillance must be performed.
Protecting Other Individuals

Remember it is important to protect everyone by being responsible with carcinogenic substances. Make sure to:

1. Establish a designated area, and communicate with those who may enter the area;

2. Dispose of contaminated waste in the proper manner. For questions regarding waste disposal please contact Environmental Management; and

3. Don’t allow contamination to extend beyond the designated area. You don’t want your vehicle, home, or clothing to carry a carcinogenic substance to those you care about.
-End-