



Comprehensive Cancer Program Division of Prevention

"To protect and improve the health of all Ohioans"

Exposure to Toxic Chemicals and Cancer

How are we exposed to chemicals in our environment?

We come in contact with many different chemicals every day that generally do not cause health problems. But any chemical can become toxic if a person comes into contact with large enough doses. For example: aspirin will cure a headache, but too much aspirin becomes toxic and can cause serious health problems. Contact with toxic chemicals does not always cause adverse (negative) health effects. Whether you get sick as a result of a chemical exposure depends on:

- How toxic the chemicals are;
 - How much you were exposed to (dose);
 - How long you were exposed (duration);
 - How often you were exposed (frequency);
 - Your general health, age and lifestyle.
- Young children, the elderly and people with chronic (ongoing) health problems are more at risk to health problems following exposures to chemicals.

What is a completed exposure pathway?

Chemicals must have a way to get into a person's body in order to cause health problems. Environmental scientists work to show the five links between a chemical source and the people who are exposed to a chemical. In order for a person to get sick from contact with chemicals, a "Completed Exposure Pathway" must be present.

The five links that make a completed exposure pathway include:

- (1) Source (where the chemical came from);
- (2) Environmental Transport (the way the chemical moves from the source to the public. This can take place through the soil, air, underground drinking water or surface water);
- (3) Point of Exposure (where contact with the chemical is made. This could be where chemical contamination occurred or off-site if the contamination has moved);
- (4) Route of Exposure (how people came into physical contact with the chemical. This could occur by drinking, eating, breathing or touching the chemical);
- (5) People Who Might be Exposed (those who are most likely to come into physical contact with a chemical).

Documenting a completed exposure pathway:

Documenting a completed exposure pathway can link a chemical exposure with a health problem such as cancer. But it is difficult to study communities living near chemical contamination sites and link their health problems with exposure to a chemical. A few of the difficulties include:

- Not knowing the exact level of a person's exposure to a cancer-causing chemical. This is especially true if the exposure to chemicals occurred years ago and there is no information to prove the exposure;
- Chemical contamination sites often contain more than one chemical. This makes it difficult to link a health problem to a single exposure or chemical;
- Scientists who study communities will also look at other factors before linking a disease to an exposure from a site. Cancer often takes a long time to develop and getting information on the type of past behaviors that increase the risk of getting cancer (such as tobacco use, alcohol consumption and diet) are often difficult or sometimes impossible to collect.

Do toxic chemicals cause cancer?

Yes, some chemicals are known to be carcinogenic (cause cancer). But it is important to know that less than 5% of all cancers are believed to be due to factors in the environment such as environmental pollution (2%), industrial products (1%) or food additives (1%).

Toxic chemicals are cancer risk factors. A risk factor is anything that could increase a person's chance of getting a disease. Cancer risk factors, such as tobacco use, drinking a lot of alcohol, having a poor diet, lack of physical activity and unprotected exposure to the sun, can be changed. Other cancer risk factors such as a person's age, sex and family medical history (genetics) cannot be changed.

The Ohio Department of Health works closely with the Agency for Toxic Substance and Disease Registry (ATSDR), the U.S. EPA and Ohio EPA, local health departments and concerned communities to investigate and prevent harmful exposures and disease related to toxic substance in the environment.

IMPORTANT FACTS: Cigarette smoke contains 43 known cancer-causing chemicals. In 2003, the U.S. EPA Superfund program prepared a list of the 275 chemicals found at chemical contamination sites throughout the nation. Six of the top 10 chemicals found at chemical contamination sites are also found in cigarette smoke.



A List of Known¹ and Possible² Human Carcinogenic (cancer-causing) Agents by Organ

Organ	Known Human Carcinogen	Possible Human Carcinogen
Bladder	* Arsenic * Benzidine	* Cadmium * Tobacco smoke
Blood Diseases (leukemia, lymphoma)	* Benzene * Ionizing Radiation	* Tetrachloroethylene (PERC or PCE) * Trichloroethylene (TCE) * Vinyl chloride
Brain		* Vinyl chloride
Colon	* Arsenic	
Kidney	* Arsenic * Coke oven emissions	* Tetrachloroethylene (PERC or PCE) * Chloroform * Trichloroethylene (TCE)
Liver	* Alcoholic drinks * Vinyl chloride	* Chlordane * Chloroform * Dieldrin * Polychlorinated Biphenyls (PCBs) * Trichloroethylene (TCE)
Lung	* Arsenic * Asbestos * Beryllium * Cadmium * Chromium (Hexavalent) * Coke oven emissions * Tobacco smoking * Uranium - Radon	* Benzo(a)pyrene * Polycyclic aromatic hydrocarbons (PAHs) * Vinyl chloride
Mouth, Pharynx, Larynx, Esophagus	* Alcoholic drinks * Chewing tobacco (mouth only) * Tobacco smoke	
Skin	* Arsenic * Overexposure to the sun	* Benzo(a)pyrene * Polycyclic aromatic hydrocarbons (PAHs) * Tetrachloroethylene (PERC or PCE)

¹ The category “known human carcinogen” requires evidence from human studies.

² The category “possible human carcinogen” gathers evidence mainly from animal studies. There may be limited human studies or there may be no human or animal study evidence to support carcinogenicity; but the agent, substance or mixture belongs to a well-defined class of substances that are known to be carcinogenic.

Note: Due to limited space, the above table is not a complete listing of all the known and possible human carcinogens. The top 20 chemicals listed in this table can be found in the 2003 U.S. EPA Superfund, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) listing of chemicals found at chemical contamination sites placed on the National Priorities List (NPL).

- ❖ To see a full listing of known and possible carcinogens, you can review the National Toxicology Program, Report on Carcinogens, Eleventh Edition or visit online (see below reference).
- ❖ To see a full listing of the chemicals found at National Priorities List (NPL) sites, you can review the 2003 CERCLA Priority List of Hazardous Substances report or visit online (see below reference).

References:

- ❖ American Cancer Society, 2004.
- ❖ Ohio Department of Health, Comprehensive Cancer Program, 2004.
- ❖ Agency for Toxic Substances and Disease Registry, 2003 CERCLA Priority List of Hazardous Substances (2005 electronic at www.atsdr.cdc.gov/cercla/).
- ❖ Report on Carcinogens, Eleventh Edition; U.S. Department of Health and Human Services, Public Health Service, National Toxicology Program, 2005 (2005 electronic at <http://ntp.niehs.nih.gov/ntp/roc/toc11.html>).

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