



MIOSHA Fact Sheet

General Industry Safety & Health Division

Toxic vs. Sensitizing Reactions

What is a toxic reaction?

It is an adverse physical reaction that results from an exposure to a poisonous chemical. Examples of toxic reactions include burns from contact with acids; damage to the bone marrow and nervous system from exposure to lead; and cancer resulting from exposure to benzene.

What are the two main types of toxic reactions and when do they occur?

Toxic reactions can be localized or systemic. A localized reaction would be a burn on the skin due to direct contact with a corrosive chemical. A systemic reaction would be lead poisoning that results when lead is inhaled or ingested and transmitted throughout the body. This can result in damage to the blood, bone marrow, and/or the nervous systems. A chemical can have both a local and systemic effect by causing skin irritation and at the same time be damaging to a body organ or systems.

Both types of reactions can occur immediately (acute) or can be delayed (latent). Exposure to cadmium fumes may result in pulmonary edema 24 hours after inhalation exposure to cadmium. Skin contact with acids normally results in immediate pain and burns. However, skin contact with strong bases such as sodium hydroxide, may result in pain and burns several hours after exposure.

Do all toxic chemicals cause cancer?

No. Only a limited number of chemicals, compared to thousands of chemicals in use today, are known

to cause cancer. For a list of known carcinogens see the National Toxicology Program at: <http://ntp-server.niehs.nih.gov>.

What are the different forms of toxic chemicals?

Toxic chemicals can come in different forms such as solid, liquid, gases, vapors, dusts, fumes, fibers, and mists. Sometimes a chemical in a solid form may not be toxic, but may become toxic when it is converted into dust or fumes. For example stainless steel in solid metal form is not toxic. However, welding, cutting or grinding on this metal may release toxic fumes or dust.

What is a sensitizing reaction?

A sensitizing reaction is the result of a response from the body's immune system to the presence of a chemical or biologic agent. Unlike a toxic chemical, a sensitizing chemical or biologic agent does not cause harm unless there is a reaction from a person's immune system. One of the common immune system responses that result from a sensitizing or allergic reaction is known as "hay fever." Some chemicals may not be toxic, but can cause sensitizing reactions upon exposure. These are called sensitizers or allergens. Examples of sensitizing chemicals include: latex rubber, metals (i.e., nickel, chromium, beryllium, cobalt, etc.), formaldehyde, isocyanates, toluene, etc. Individuals who react to sensitizers are said to have a sensitivity to a particular allergen. Some chemicals can be toxic and can also be sensitizers.

When do sensitizing reactions occur?

Most sensitizing reactions happen soon after contact with an allergen or sensitizer. However, they can occur up to 24 hours later. While first-time exposure may only produce a mild reaction, repeated exposures may lead to more serious reactions. When an individual becomes sensitized to an allergen, the individual will exhibit symptoms at progressively lower concentrations. The severity of the symptoms can increase with each repeated exposure.

Substances that do not bother most people (such as venom from bee stings, certain foods, medications, pollens, and very low concentrations of certain chemicals) can trigger allergic reactions in some people. These reactions may be localized or systemic.

Can sensitizing reactions be as serious as toxic reactions?

Yes. Many allergic reactions are mild, while others can be severe and life-threatening. Sensitizing reactions occur more often in people with a family history of allergies. Anaphylaxis is a sudden and severe allergic reaction that occurs within minutes of exposure and causes severe breathing difficulties. Immediate medical attention is needed for this condition. It can get worse very fast and lead to death within minutes if treatment is not received.

How do you know if toxic or sensitizing chemicals are present in your workplace?

If toxic or sensitizing chemicals are in your work place, you must be provided with hazard communication training by your employer. Detailed information is provided in the material safety data sheets (MSDSs), container labels, and hazard warning signs, etc.

Are exposures to toxic and sensitizing chemicals covered by MIOSHA standards?

MIOSHA has established permissible exposure limits (PELs) to control employee exposures to hazardous chemicals in the workplace. Employers are required to protect employees from being exposed to toxic chemicals above all PELs. These PELs may not effectively protect employees from sensitizing chemicals, because sensitizing reactions may occur at very low or non-detectable concentrations. [Part 301. Air Contaminants](#) and numerous other substance-specific standards address these PELs.

What are employers expected to do when dealing with toxic or sensitizing chemicals in their workplaces?

Employers are expected to protect their employees from exposure to all hazardous chemicals including sensitizers. Employers have to identify the presence of hazardous chemicals in the workplace. Identification of these chemicals is the first step in assessing and evaluating chemical hazards. Elimination is the preferred method of controlling toxic or sensitizing chemicals in the workplace. Where elimination is not possible, engineering controls, training, and personal protective equipment should be implemented to reduce exposures.

Additional Information

Please visit the MIOSHA website at www.michigan.gov/mioshapublications where additional information may be available; or contact the Consultation, Education & Training Division at (517) 322-1809.

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