

CHEMICAL HAZARDS



Most workplaces use or store chemicals of one kind or another. Chemicals can cause a number of health effects if not properly controlled.

How Do Chemicals Get Into the Body?

In order to cause health problems, chemicals must enter your body. There are three main “routes of exposure,” or ways a chemical can get into your body.

- **Breathing (Inhalation):** Breathing in chemical gases, mists, or dusts that are in the air.
- **Skin or Eye Contact:** Getting chemicals on the skin, or in the eyes. They can damage the skin, or be absorbed through the skin into the bloodstream.
- **Swallowing (Ingestion):** This can happen when chemicals have spilled or settled onto food, beverages, cigarettes, beards, or hands. Once chemicals have entered your body, some can move into your bloodstream and reach internal “target” organs, such as the lungs, liver, kidneys, or nervous system.



What Forms Do Chemicals Take?

Chemical substances can take a variety of forms. They can be in the form of solids, liquids, dusts, vapors, gases, fibers, mists and fumes. The form a substance is in has a lot to do with how it gets into your body and what harm it can cause. A chemical can also change forms. For example, liquid solvents can evaporate and give off vapors that you can inhale. Sometimes chemicals are in a form that can't be seen or smelled, so they can't be detected.

Detecting some forms of chemicals can be difficult. Solids and liquids are easier to recognize since they can be seen. Dusts and mists may or may not be visible, depending upon their size and concentration. Fumes, vapors, and gases are usually invisible.



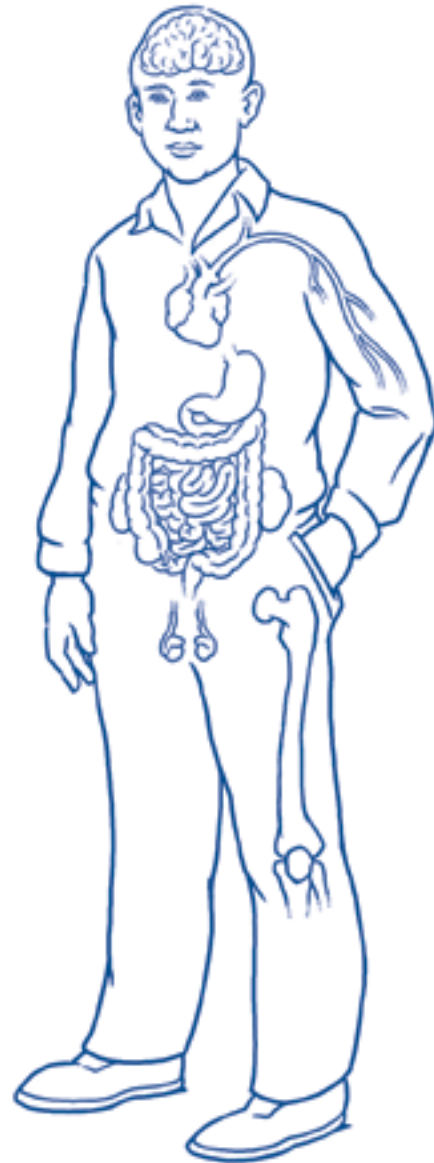
What Health Effects Can Chemicals Cause?

The effects of a toxic chemical on your body may be either acute or chronic.

Acute (short-term) effects show up immediately or soon after exposure to the chemical. They may be minor, like nose or throat irritation, or they could be serious, like eye damage or passing out from chemical vapors. What all these effects have in common is that they happen right away.

Chronic (long-term) effects may take years to show up. They are usually caused by regular exposure to a harmful substance over a long period of time. These effects are usually permanent.

Some chemicals cause both acute and chronic effects. For example, breathing solvent vapors might make you dizzy right away (an acute effect). But breathing the same vapors all the time for many years might eventually cause liver damage (a chronic effect).





What Symptoms May be Caused by Chemicals at Work?

	SYMPTOMS	COMMON CAUSES
Head	Dizziness, headache	Solvents, paint, ozone, smoke (including tobacco)
Eyes	Red, watery, irritated, grainy feeling	Smoke, gases, various dusts, vapors from paint and cleaners
Nose & Throat	Sneezing, coughing, sore throat	Smoke, ozone, solvents, various dusts, vapors and fumes from paint and cleaners
Chest and Lungs	Wheezing, coughing, shortness of breath, lung cancer	Metal fumes, various dusts, smoke, solvents, vapors from paint and cleaners
Stomach	Nausea, vomiting, stomach ache, diarrhea	Some metal fumes, solvents, paint vapors, long-term lead exposure
Skin	Redness, dryness, rash, itching, skin cancer	Solvents, chromium, nickel, detergents and cleaners, paint on skin
Nervous System	Nervousness, irritability, sleeplessness, tremors, loss of balance or coordination	Long-term solvent exposure, long-term lead exposure
Reproductive System	For men: low sperm count, damage to sperm For women: irregularities in menstruation, miscarriage, damage to egg or fetus	Lead, toluene, some other solvents, ethylene oxide gas



What Factors Affect Your Risk?

<p>1. How toxic the chemical is.</p>	<p>The more toxic the chemical, the more likely it will cause health problems, even in small amounts. Asbestos and cyanide are considered highly toxic because a very small quantity can cause health effects.</p>
<p>2. How the chemical gets into the person's body (route of exposure).</p>	<p>The way a chemical enters your body affects your risk. Some chemicals, like the pesticide parathion, are very toxic whether they get into the body through the skin, by breathing, or by swallowing. On the other hand, asbestos is only harmful when inhaled or swallowed. A house may have asbestos insulation, but unless the asbestos is disturbed and becomes a dust in the air, it can't be breathed in, so it won't cause harm.</p>
<p>3. The amount of the chemical that you are exposed to (dose).</p>	<p>For some chemicals, the higher the amount, the greater the damage. For example, acetone is an industrial solvent that is also found in nail polish remover. It is more dangerous to the worker who uses large amounts than to the person who uses a little nail polish remover.</p>
<p>4. How long you are exposed to the chemical (duration).</p>	<p>The longer the exposure, the greater the danger. For example, someone may work with a chemical for half an hour per day, while another person is exposed for eight hours a day. Also, someone may be exposed for one month, while another person may have 20 years of exposure.</p>
<p>5. Reaction and interaction with other chemicals.</p>	<p>Some chemicals in combination can create a different chemical that is more hazardous than the original ones (reaction). For example, ammonia and bleach used together can produce a highly toxic chemical. Some chemicals, in combination, can increase the likelihood of harm. For example, workers who have been exposed to asbestos increase their likelihood of getting lung cancer if they smoke cigarettes.</p>
<p>6. Individual differences (like heredity, body size, age, smoking, drinking, allergies, sensitivities, or previous exposures to other toxic chemicals).</p>	<p>Chemicals can be more harmful to some people than to others. Lead is much more harmful to small children than adults because it affects their developing brain and nervous system. If two people work with asbestos and one of them smokes, the smoker is more likely to develop asbestos-related lung cancer than the non-smoker.</p>



Controlling Chemical Hazards

Once chemical hazards are identified, various methods can be used to protect workers from them. These are called *hazard controls*. Not all controls are equally effective. There is a “hierarchy” of possible solutions. The most effective solutions, at the top of the pyramid, are those that actually remove the hazard. Further down are solutions that only reduce or limit the worker’s exposure.

Often a combination of methods is needed to get the best protection.



Remove the Hazard

The best way to protect workers from hazards is to remove the hazards from the workplace altogether, or at least keep them away from workers. These methods are often called **engineering controls**. They directly address the hazard and do not depend on workers’ actions to be effective. Workers don’t have to wear special protective gear or take special precautions, because the hazard is gone.

Engineering controls include these methods:

- **Redesign** the process. For example:
 - Replace gasoline motors with electric motors to eliminate exhaust fumes.
 - Use wet methods when grinding, sanding, or using other tools to reduce dust levels.



Remove the Hazard (continued from previous page)

- **Substitute safer products for hazardous ones.** For example, use chemicals that are less toxic or dangerous, such as some water-based cleaners.
- **Isolate the process, or isolate the worker from the process.** For example, use glove boxes when working with dangerous substances like radioactive material.
- **Install ventilation systems.** These remove chemicals from the air that workers breathe. The best systems remove vapors and fumes close to the source (local exhaust ventilation).

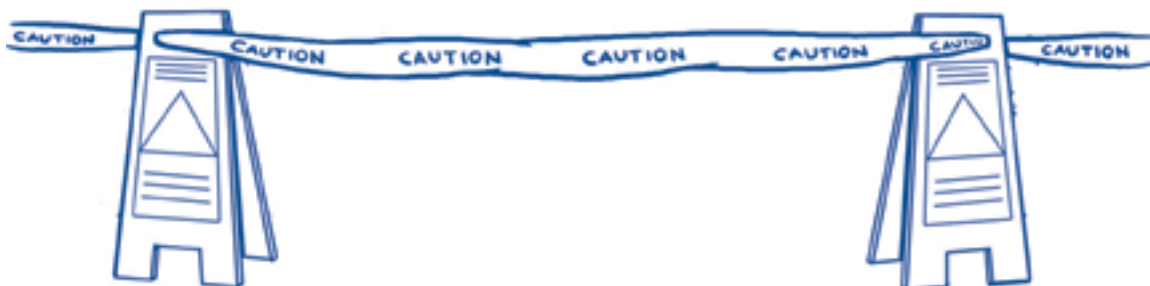


Improve Work Policies and Procedures

When the hazard cannot be eliminated altogether, another option is to set rules that will limit workers' exposure to the danger. These measures are often called **administrative controls**.

Administrative controls include:

- **Rotate workers** between a hazardous task and a non-hazardous task so that the length of exposure is reduced.
- **Increase the number of breaks** to reduce the time of exposure.
- **Restrict access** to the work area.
- **Improve personal hygiene facilities and practices.** Provide a way for workers to wash their hands and faces before eating and drinking. Prohibit eating in work areas. Set up facilities for showering after the shift, and leaving contaminated clothes at the workplace.
- **Provide worker training programs.** Increase workers' ability to recognize and evaluate chemical hazards, and to take action to protect themselves.





Provide Personal Protective Equipment

A third method of reducing hazards is to use **personal protective equipment (PPE)**. PPE is worn on the body and protects you from exposure to chemicals. It includes gloves, goggles, respirators, and coveralls. Wear PPE when other methods of hazard control aren't possible or don't give enough protection.

For PPE to be effective, workers must be given the correct PPE and trained in its use, care, and storage. PPE is usually considered less protective than the other methods because:

- It doesn't get rid of the hazard itself. It can reduce the **amount** of exposure by placing a barrier between the hazard and the worker.
- Workers may not want to wear it because it can be uncomfortable and hot, and may make it hard to communicate.
- It has to fit properly to work. In many cases, it must be cleaned and inspected often.
- It has to be the right type for the particular hazard, such as the right respirator cartridge or glove for the chemical being used.
- Workers must know and remember how to use it properly.
- Some PPE creates its own hazards, such as heat, heavy weight, reduced visibility and reduced hearing, restricted movement, and discomfort.
- PPE depends entirely on human action to be effective.

Use a Combination of Methods

Sometimes you may need a combination of methods to control a chemical hazard. While engineering controls may be the most effective method, you also need to have training programs and good workplace policies to supplement them. There may also be situations where PPE is essential. It's important to consider as many solutions as possible before settling on a strategy for controlling chemical hazards.





Chemical Labels

Under the “Right to Know” laws, (such as California’s Hazard Communication standard), labels from suppliers are only required to contain the following information*:

- Product identity, specifically the chemical name.
- Hazard warnings, including what type of hazard (for example, fire or lung damage).
- Name and address of the manufacturer.

Some labels may include additional information and include words like “caution” or “harmful if breathed.”

*Note: This requirement is changing in 2014 and more information will be required on chemical labels.

ACETONE

DANGER!

**EXTREMELY FLAMABLE.
HARMFUL IF SWALLOWED OR INHALED.
CAUSES IRRITATION.**

Keep away from heat, sparks, flame. Avoid contact with eyes, skin, clothing. Avoid breathing vapor. Keep in tightly closed container. Use with adequate ventilation. Wash thoroughly after handling.

EFFECTS OF OVEREXPOSURE: Contact with skin has a defatting effect, causing drying and irritation. Overexposure to vapors may cause irritation of mucous membranes, dryness of mouth and throat, headache, nausea, and dizziness.

FIRST AID PROCEDURES: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Flush skin with water. If swallowed, if conscious, immediately induce vomiting.

Consult an MSDS for further hazardous information and instructions.

CAS NO. [67-64-1]



What Information May Be Missing?

There is a lot of information that can often not be found on a chemical label, such as:

- What to do if the chemical spills.
- How to store the chemical safely.
- How to protect yourself from harmful health effects.



Remember: All chemical products in the workplace should have labels. If a chemical is poured into a smaller container and taken elsewhere in the workplace, it still needs to have a label. The only exception is if the worker who poured it can carry a portable container at all times and empties it at the end of the shift.

Material Safety Data Sheets

Material Safety Data Sheets (MSDSs) are data sheets that contain information about the health and safety properties of workplace chemical products. They are usually written by the supplier or manufacturer of the product, and provided to purchasers. When employers receive an MSDS, they are required to let workers see and copy it.

An MSDS is divided into sections, and must have certain required information. Each section provides a different type of information about the chemical product. These sections are not always the same on every MSDS.

What's an MSDS?

Under Cal/OSHA's Hazard Communication standard, an MSDS must contain certain information. This includes:

- Product identity and ingredients
- Physical and chemical characteristics
- Fire and explosion hazards
- Reactivity data
- Health hazards: symptoms, routes of exposure, and potential to cause cancer
- Legal exposure limits
- Precautions for safe handling and use
- Protective control measures
- Personal protective equipment
- Emergency and first aid procedures
- Spill and leak procedures



Although an MSDS must contain all the information above, the sections may not always appear in the same order. Note: As of 2014 MSDSs must contain the same kind of information and follow a consistent format.



The table below lists some of the information you can find about a chemical product by looking at its MSDS.

QUESTIONS	WHAT TO LOOK FOR	SECTION OF THE MSDS
What is this product?	<ul style="list-style-type: none"> Name of chemical? Who makes it? 	<ul style="list-style-type: none"> Identification
Can this product harm my health?	<ul style="list-style-type: none"> Ingredients Health effects Symptoms Cancer hazard Emergency and First Aid procedures 	<ul style="list-style-type: none"> Hazardous Identification Health Hazards
Does this product have other dangers?	<ul style="list-style-type: none"> Fire and explosion hazard Incompatible materials to avoid Stable or unstable 	<ul style="list-style-type: none"> Fire and Explosion, Hazard Data Reactivity Data
How can you protect yourself?	<ul style="list-style-type: none"> Personal protective equipment to use Other control measures 	<ul style="list-style-type: none"> Control Measures
How should the product be handled?	<ul style="list-style-type: none"> Safe handling and storage Spill and accidental release procedures Waste disposal 	<ul style="list-style-type: none"> Precautions for Safe Handling and Use
Where do you get more information?	<ul style="list-style-type: none"> Name and phone number of manufacturer 	<ul style="list-style-type: none"> Manufacturer of Product



What are the Strengths and Limitations of an MSDS?

WHY ARE MSDSs USEFUL?

- An MSDS provides more information than a label. If it's well-written, it can be a valuable tool.
- It may give detailed health information.
- It may give comprehensive information on how to protect yourself, and what your employer should do to protect you.
- It may give you information on safe storage, legal exposure limits, incompatibility, and what to do in an emergency.

WHAT ARE THE LIMITATIONS OF MSDSs?

- One chemical could have many different MSDSs from different suppliers, with different information.
- An MSDS may be missing information.
- An MSDS may be difficult to read and understand. It may require a lot of reading. It may be too technical. If you don't read English, it may not be available in your own language. However, some companies have successfully asked their suppliers (the chemical manufacturers) to provide MSDSs in other languages, like Spanish.

It's also important to use other sources of information about chemical hazards, including the internet, factsheets, Cal/OSHA Consultation Service, and materials available from the Worker Occupational Safety and Health Training and Education Program (WOSHTEP) Resource Centers.



Evaluating Your Workplace Hazard Communication Program

Cal/OSHA regulations require employers to provide information to employees about the chemicals and other hazardous substances to which they may be exposed at work by providing MSDSs, chemical labels and training. Use this checklist to see if your employer’s hazard communication program meets Cal/OSHA requirements. See Title 8, California Code of Regulations, section 5194 for details.

DOES YOUR WORKPLACE HAVE THE FOLLOWING ELEMENTS IN PLACE?

Yes No A WRITTEN HAZARD COMMUNICATION PROGRAM

- Is there a written hazard communication program for your workplace and is there someone who is responsible for preparing and maintaining the program?
- Does the written program describe how chemical containers will be labeled, how Material Safety Data Sheets (MSDSs) will be compiled and maintained for each chemical at the worksite, and how employee information and training requirements will be met?
- Does the written program include a list of the hazardous substances that are present in the workplace (either for the workplace as a whole or for individual work areas)?
- Does the written program include the methods the employer will use to inform employees of the hazards that may be created by non-routine tasks or situations?
- Is the written hazard communication program made available, upon request, to employees and their designated representatives?
- For workplaces that have more than one employer, does the written program include the methods to be used to inform all employees in the workplace of the hazards and suggestions for protective measures?

YES NO LABELS ON CHEMICALS

- Is someone responsible for making sure chemicals are properly labeled?
- Does each chemical container have a clear label with the product name, hazard warnings, and the name and address of the manufacturer, importer, or other responsible party?

**YES NO MATERIAL SAFETY DATA SHEETS**

- Is someone responsible for obtaining and maintaining MSDSs for each chemical used in the workplace and making sure they are up-to-date?
- Is there an MSDS for each chemical used in the workplace?
- Are MSDSs readily accessible to workers? Do workers know where MSDSs are kept?

YES NO TRAINING

- Is someone responsible for providing health and safety training to workers?
- Is training and information on the hazardous substances in employees' work areas provided both at the time of their initial assignment and whenever a new hazard is introduced into their work area?
- Does training include information on the following topics?
- The Hazard Communication standard requirements;
 - The location and availability of the employer's written hazard communication program;
 - An explanation of the labeling system and where Material Safety Data Sheets are kept;
 - The hazards of the specific chemicals used and how to protect oneself from exposure.