SECTION 1

Chemical Hazards

Section Contents

Forms of Chemical Substances

Chemical substances can take a variety of forms. The form of a substance will have a lot to do with how it can get into your body and what harm it can cause. A substance can change forms while you work with it. Here are two questions to ask when getting information about chemicals on a site:

1. What forms of the substance are present?

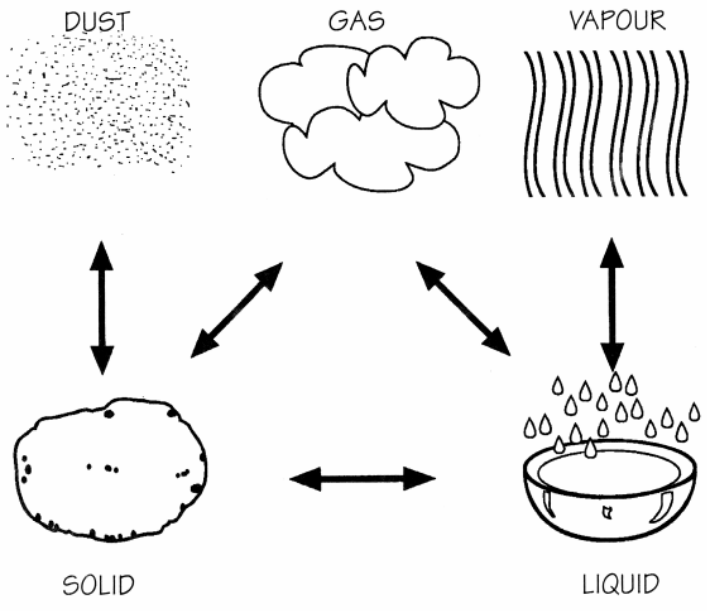
2. How can the substance get into my body?

What forms of the substance are present?

The forms of toxic materials are:

Bulk Solids:	These are large chunks of solid material.
Dusts:	These are tiny particles of solids.
Fumes:	These are even tinier particles than dust, formed in the air when a heated metal vapor cools and solidifies.
Liquids:	Unlike solids, the molecules of liquids move freely. This is why liquids can be poured.
Mists:	These are tiny droplets of liquid suspended in the air.
Vapors:	These are the individual molecules of a substance suspended in the air from a liquid or solid.
Gases:	These are materials that exist as individual molecules in the air at room temperature.

Recognizing the form of a chemical can be difficult. Bulk 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. In order to determine all the chemical forms present, a comprehensive sampling and monitoring program must be in place.



Workplace Chemicals and Your Health

It's not always easy to recognize when health problems are related to your work. Don't ignore headaches, frequent colds and coughs, dizziness, skin problems, or other health problems you think may be related to your job.

How do I know if I'm exposed to chemical hazards on the job?

To help figure out what the chemical hazards on your job may be, ask these questions:

1. What chemicals do I use on the job?

Some chemicals are more toxic than others. Always check the label of the chemicals you work with for more information.

2. How are chemicals being used?

The way you are using a chemical can affect whether or not it can get into your body. Some work processes are more hazardous than others. For example, if a chemical is being heated or if you are grinding it, the chances you will breathe it in are greater.

A toxic chemical won't hurt you unless it gets on or into your body. Toxic chemicals can get into your body when you breathe them in, accidentally swallow them, or get them on your skin.

3. How toxic is the chemical, and how much of it is getting into my body?

Some chemicals are more toxic than others. If you get exposed to small amounts of most chemicals, you will not be harmed. Other chemicals are so toxic that a small amount could hurt you.

How Do Chemicals Get Into My Body?

In order to cause health problems, chemicals must enter your body. There are three "routes of entry" or ways a chemical can get into your body:

1. NOSE:
   Breathing in chemical gases, mists, or dusts that are in the air

2. SKIN:
   Absorbing chemicals through the skin, including your eyes

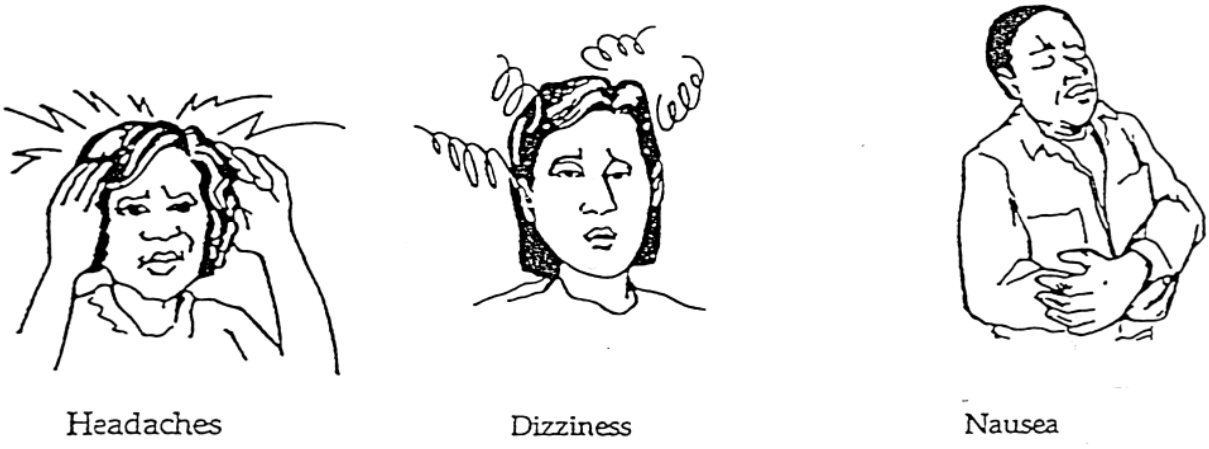
3. MOUTH:
   Breathing or swallowing chemicals that have spilled or settled onto food, beverages, cigarettes, beards, or hands

Once chemicals enter the body, they move into your bloodstream and reach internal "target" organs, such as the liver, kidneys, or nervous system.

Acute and Chronic Effects

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

Acute effects show up immediately or soon after your 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 fumes. What all these effects have in common is that they happen right away.

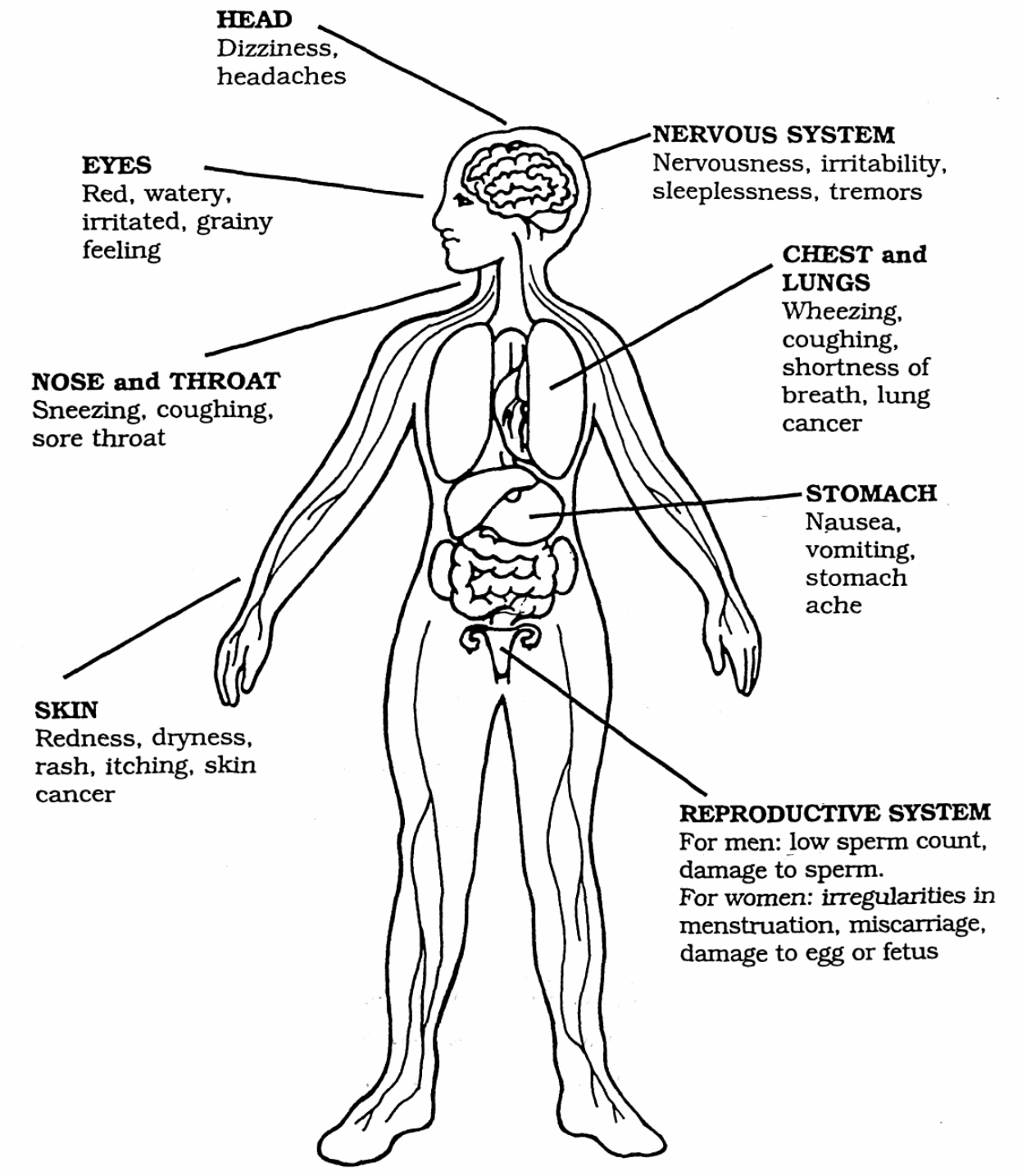


Headaches Dizziness Nausea

Chronic 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).

How Chemicals Can Affect Your Body



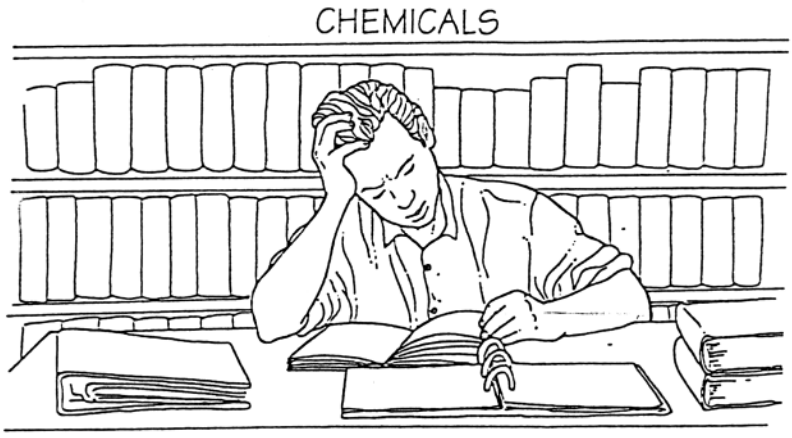
How Chemicals Can Affect Your Health

These symptoms may be caused by chemicals or other conditions at work:

Symptoms	Common Causes
Head Dizziness, headaches	Solvents, paint, ozone, smoke (including tobacco)
Eyes Red, watery, irritated, grainy feeling	Smoke, gases and vapors, fumes, dusts, ultraviolet (UV) radiation, paint, cleaners
Nose and Throat Sneezing, coughing, sore throat	Smoke, ozone, solvents, dust, paint, cleaners
Chest and Lungs Wheezing, coughing, shortness of breath, lung cancer	Metal fumes, dusts, smoke, solvents, paint, cleaners
Stomach Nausea, vomiting, stomach ache	Some metal fumes, solvents, paint, long-term lead exposure
Skin Redness, dryness, rash, itching, skin cancer	Solvents, radiation, chromium, nickel, detergents and cleaners, paint
Nervous System Nervousness, irritability, sleeplessness, tremors	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 and some other solvents, radiation, ethylene oxide

Dose: What Affects My Risk?

Factors That Influence Whether A Worker Who Is Exposed to Chemicals Will Get Sick	Examples
1. How **toxic** the chemical is	The more toxic, the more likely the chemical will cause health problems, even in small amounts. Methyl alcohol, which can cause blindness, is more toxic than ethyl alcohol, which is used in alcoholic beverages. Methylene chloride and acetone are both solvents , but methylene chloride is much more toxic.
2. The **amount** of chemical that a worker is exposed to (that is in the air he or she breathes, or that comes in contact with the skin or mouth)	Acetone is an industrial solvent that is also found in nail polish remover. It is more dangerous to the worker who uses larger amounts of it than to the person who uses a small amount of nail polish remover.
3. **How long** the worker is exposed to the chemical	Someone may work with a chemical for half an hour per day, while another person is exposed 8 hours a day. Also, someone may be exposed for one month, while another person may have 20 years of exposure.



Factors That Influence Whether A Worker Who Is Exposed to Chemicals Will Get Sick	Examples
4. How the chemical gets into the person's body **(route of entry)**	Some chemicals, like the pesticide parathion, are very toxic whether they get into the body through the skin, by breathing or ingestion. On the other hand, asbestos is only harmful when inhaled. For example, 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.
5. **Individual factors** (e.g. heredity, body size, age, whether he or she smokes or drinks, allergies, sensitivities, exposures to other toxic chemicals)	Lead is much more harmful to small children than adults because it affects their developing brain and central nervous system. If two people work with asbestos and one of them smokes, the one who smokes is more likely to develop asbestos-related lung cancer than the non-smoker.

The Affects of Chemical Mixtures

Your risk may be higher if you are exposed to more than one chemical. There can be an interaction between chemicals. Two different chemicals together may produce an effect much worse than either of them alone. This is called synergism.

For example:

- Asbestos workers' risk of lung cancer is 5 times higher than average.

- Smokers' risk of lung cancer is 10 times higher than average.

Asbestos workers who smoke have a risk of lung cancer 50 times higher than average.

Chemical Odors

Does smelling a chemical odor mean that exposure will hurt you?

Some chemicals can be smelled at levels that are below those that are harmful. Smelling or detecting a chemical odor does not necessarily mean that you are inhaling harmful amounts. Some examples of chemicals that have strong odors that are lower than the legal limit are solvents like acetone or methyl ethyl ketone. On the other hand, some chemicals can be present without generating an odor. Some chemicals cannot be smelled at levels that are harmful.
The section on occupational exposure limits explains more about how chemicals are measured at the workplace, and how exposure limits are developed.

What is an odor threshold?

The odor threshold is the lowest level of a chemical that can be smelled by most people. If a chemical's odor threshold is lower than the amount that is hazardous, the chemical is said to have good warning properties. One example is ammonia. Most people can smell ammonia at very low levels.

For most chemicals, the odor thresholds vary widely from person to person. In addition, some chemicals, like hydrogen sulfide, cause you to lose your ability to smell them. This is called olfactory fatigue.

Chemical odor is only one clue to possible exposure.

Don't depend on a chemical odor alone to warn you about whether a chemical is hazardous or not. Remember, your sense of smell may be better or worse than average. Some very hazardous chemicals, like carbon monoxide (one of the exhaust fumes from cars) have no odor. Some chemicals, like solvents, may have an odor even at a very low exposure limit. It is important to collect more information about a specific chemical – including exposure limits, monitoring results and health effects – in order to figure out if an exposure can hurt you.

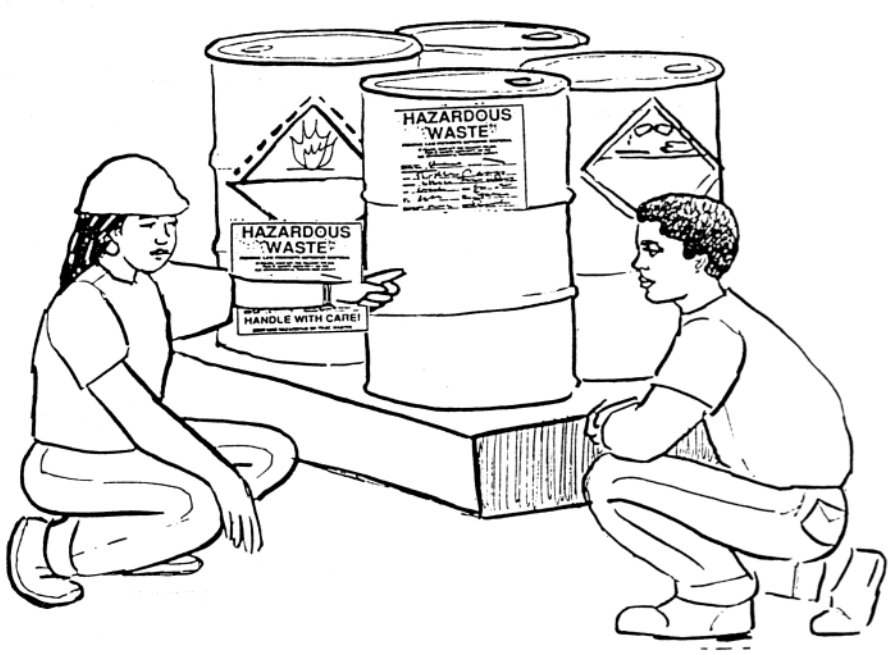
Learning More About Chemicals

The right to know about chemicals hazards is an important issue for workers and the community. In the United States, workers and unions won the right to better information about chemicals in 1985. The U.S. law is called the Hazard Communication Standard, commonly called the "Right to Know" law.

Suppliers of chemicals are required by law to provide their customers with the Material Safety Data Sheets (MSDSs) of their products. Some companies also provide Chemical Safety Data Sheets (CSDSs) to give basic information about chemicals.

There are four basic ways that workers, supervisors and community members can learn more about chemicals used in the workplace:

- Labels on Products
- Material Safety Data Sheets (MSDSs)
- Chemical Safety Data Sheets (CSDSs)
- Training



Chemical Labels

What can I find out from a chemical label?

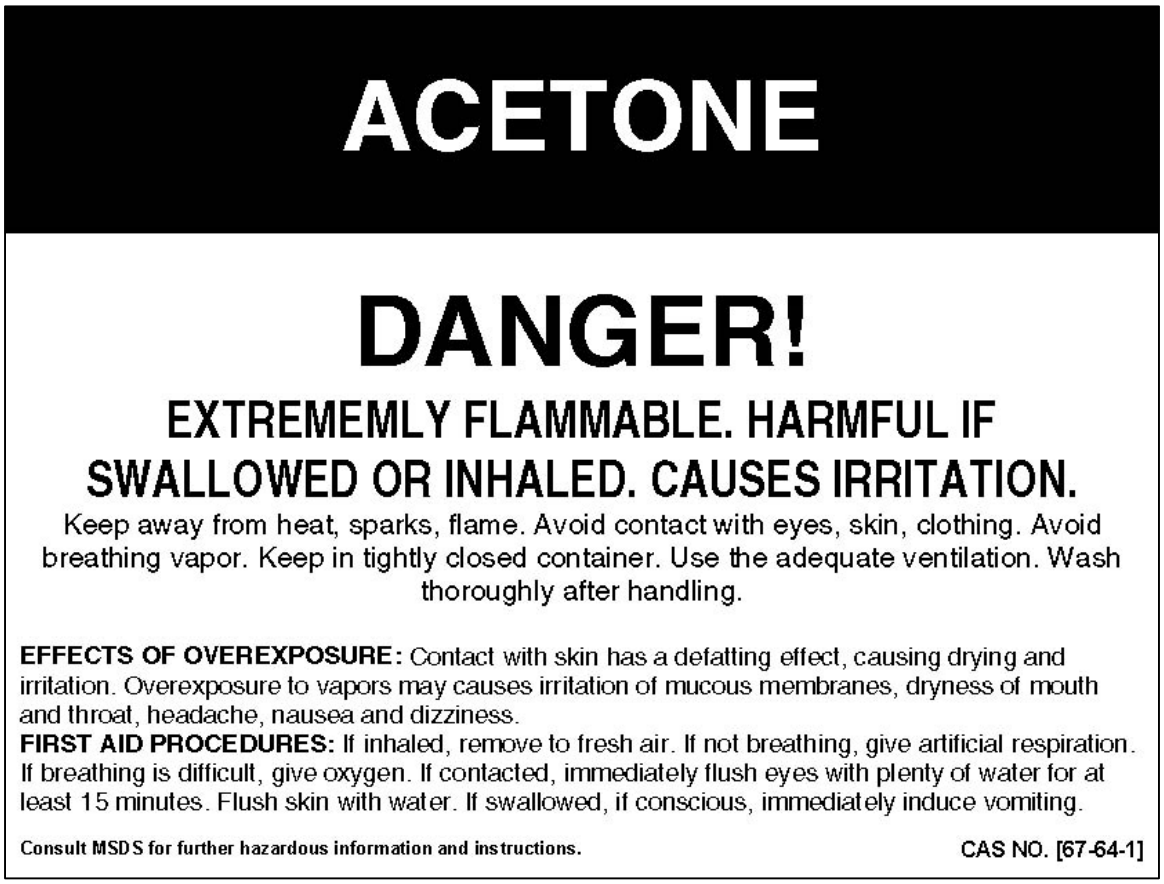
Under the "Right to Know" laws, labels from suppliers only need to contain the following information:

1. Product identity, such as chemical or trade name.

2. Hazard warnings, including what type of hazard (for example lung or kidney damage).

3. Name and address of the manufacturer.

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



ACETONE

DANGER!

EXTREMEMLY FLAMMABLE. 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 the adequate ventilation. Wash thoroughly after handling.

EFFECTS OF OVEREXPOSURE: Contact with skin has a defatting effect, causing drying and irritation. Overexposure to vapors may causes 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. If contacted, immediately flush eyes with plenty of water for at least 15 minutes. Flush skin with water. If swallowed, if conscious, immediately induce vomiting.

Consult MSDS for further hazardous information and instructions. **CAS NO. [67-64-1]**

What is often missing from a chemical label?

There is a lot of information that you often cannot find out from a chemical label:

- 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 to another department in the plant, it needs to have a label.

Material Safety Data Sheets(MSDSs)

Material Safety Data Sheets (MSDSs) are data sheets that contain information about the health and safety properties of workplace chemicals. They are usually written by the supplier or manufacturer of the chemicals.

What can I find out from a Material Safety Data Sheet?

An MSDS is divided into different sections. Each section contains different information about a specific chemical.

The table below tells you some of the information you can find out about a chemical from looking at an MSDS.

Questions	What to look for	*Sections of an MSDS
Who makes it?	Manufacturer's name	Section one
What is this product?	• Ingredients • Who makes it	Hazardous ingredients Identity
Can this product hurt my health?	• Health effects • Symptoms • Cancer hazard • First Aid	Health Hazard Data
Is this product dangerous?	• Fire and explosion hazard • Materials to avoid • Stable or unstable	Fire and Explosion Hazard Data Reactivity Data Special Precautions
How can I protect myself?	• Personal protective equipment to use • Control measures • Work/Hygiene practices	Controls Measures Special Precautions Spill Procedures
How should the product be handled?	• Safe handling & storage • Fire & spill procedures • Waste disposal	Precautions for Safe Handling & Storage Spill Procedures
Where do I get more information?	• Name and telephone number	Section one

What information does an MSDS have to include?

Under the U.S. "Right to Know " law, an MSDS must contain certain information. However, there is no requirement that all MSDSs be designed or formatted the same. Some MSDSs may have 8 sections; some may have 16 sections. Some MSDSs are 1 or 2 pages; others are as long as 20 pages!

MSDSs MUST INCLUDE:

1. Product identity and ingredients.
2. Physical and chemical characteristics.
3. Fire and explosion hazards.
4. Reactivity information.
5. Health hazards: symptoms and routes of exposure and potential to cause cancer.
6. Legal exposure limits.
7. Precautions for safe handling and use.
8. Protective control measures.
9. Personal protective equipment.
10. Emergency and first aid measures.
11. Spill and leak procedures.

What can I learn about the Health Effects of a Chemical from an MSDS?

The information in this section of the MSDS includes:

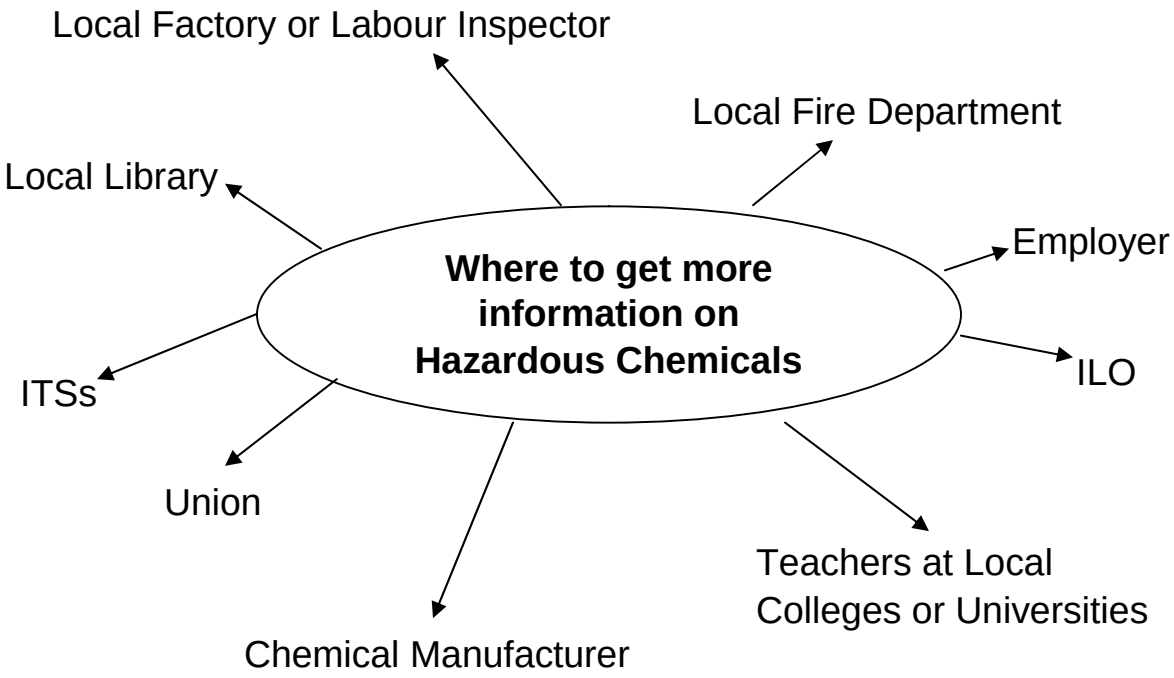
- How the chemical enters your body (called routes of entry).
    - inhalation (breathing)
    - skin (absorbed through the skin or harmful to the skin)
    - ingestion (swallowing)
- What harmful health effects can be caused by the chemical.
    - acute (effects that occur immediately or shortly after exposure to the chemical), or
    - chronic (effects that may not show up for many years).
- Whether the chemical causes cancer. Chemicals which cause cancer are called carcinogens. The MSDS should tell you if scientists consider the chemical to be a carcinogen.
- What medical conditions can be made worse by exposure to the chemical. For example, people with certain types of heart problems should avoid exposure to methylene chloride and 1,1,1-trichloromethane.

Limitations of MSDSs

Some MSDSs can tell you a lot about the hazards of a chemical. They may be the only source of information about chemicals at a worksite.

Yet, many MSDSs are missing valuable information. They may use a lot of technical words and can be hard to understand. Others are out of date or contain inaccurate information.

Remember, all MSDSs are not created equal. Do not rely on the MSDS sheets alone. Try using other sources of information as well.



Chemical Safety Data Sheets (CSDSs)

MSDSs give very detailed information about the properties of chemicals. However, they are not written in a way that is easy to read or understand. Some companies develop and also use Chemical Safety Data Sheets (CSDSs). CSDSs give brief information in use and handling. They should be written in simple language to ensure that each worker can understand them. Operating Procedures and CSDSs should be posted in areas where the chemicals of concern are stored or used.

Example of a CSDS

Substance Identification

Acetone

Hazards for an environment

Breathing in, swallowing or absorption through the skin may result in health damage. May cause irritation etc.
Increased risk of fire etc.

Protective Measures

Work only with fresh air supply, above all in the floor area. Use only intrinsically safe fans etc.
Avoid contact with eyes, skin and clothing etc.

First Aid

After eye contact: Rinse for 10 minutes with water or with eye wash solution.
After skin contact: Take off soiled clothing etc.

Disposal

Do not pour into the sewage or a refuse bin!
For disposal collect in...

This sample CSDS is from the Adidas-Salomon Health, Safety and Environment Guidelines.

Training

Effective training is an important means of providing information on chemical hazards. If you work with chemicals, your employer should provide you with training for the chemicals **you** use. Training should include:

- information on the possible or known hazards of specific chemicals, including any health effects;
- information on how to work safely with the particular chemicals;
- emergency and first aid measures;
- use and care of any protective equipment that may be necessary;
- how to identify whether control measures are operating effectively;
- how to interpret labels, hazard data sheets and other hazard information provided on the chemicals

Training is essential for new workers and existing workers should receive refresher courses periodically.

Key Provisions of International Labor Organization's C170 Chemicals Convention (1990) – Ratified by China

Article	Key elements
Article 7: Labeling and Marking	All containers must be labeled and marked to indicate their identity, hazards, and safety precautions
Article 8: Chemical Safety Data Sheets	Chemical Safety Data Sheets (CSDSs) must provide "detailed essential information" regarding the identity, supplier, hazards, safety precautions, and emergency procedures of the chemical.
Article 10: Responsibilities of Employers	The employer is responsible for ensuring that all chemicals are labeled and marked as required; to provide CSDSs to the workers; and to maintain an inventory list of chemicals on site.
Article 11: Transfer of Chemicals	Chemicals transferred from shipping containers into secondary containers on site must be labeled and marked as required in Article 7.
Article 12: Exposure	The employer must keep employee exposures to chemicals below regulatory limits; must monitor the workplace and evaluate employee exposures; and maintain records of these activities.

Article	Key elements
Article 13: Operation Control	The employer must control exposures to employees through engineering controls (substitution, ventilation), administrative controls (work practices) and personal protective equipment (gloves, respirators).
Article 15: Information and Training	The employer must inform workers of the chemical hazards at the workplace; inform workers where to obtain the information on the CSDSs; and to train workers “on a continuing basis” on safe work practices and procedures for the specific workplace.
Article 17: Duties of Workers	The workers must cooperate closely with their employer and comply with all safety procedures and practices in the use of chemicals at work.
Article 18: Rights of Workers and their Representatives	Workers have the right “to remove themselves from danger resulting from the use of chemicals” if the danger is imminent and serious; and to be “protected against any undue consequences” resulting from exercising their rights under the convention.

Chemical Exposures

Equipment: flashlight, tape measure, ventilation smoke tube

Question	Answer/Comments
Pick one or two work areas to inspect. Name of work area or station:_____ Job title or classification:_____	
OBSERVE OR MEASURE ***Chemicals***	
1. What chemicals are used?	
2. Are containers labeled?	” Yes Locations of unlabeled containers: ” No
3. Are Chemical Safety Data Sheets (CSDSs) available in Chinese?	” Yes Products with no CSDS in Chinese: ” No
4. Are Material Safety Data Sheets (MSDSs) available in Chinese?	” Yes Products with no MSDS in Chinese: ” No
Personal Protective Equipment and Ventilation	
5. What Personal Protective Equipment is being used?	❑ Gloves ❑ Glasses ❑ Cartridge Respirator ❑ Cloth masks ❑ Steeled-toed shoes ❑ Coveralls ❑ Hearing protection
6. Is local exhaust ventilation installed at work stations?	” Yes ” No
7. Use smoke tube to see if exhaust ventilation is working:	” Working ” Not working
8. Is there an emergency eyewash/shower?	” Yes ” No
9. Is the eyewash within a 10-second walk of the work area?	” Yes ” No

ASK WORKERS

10. Find two workers who are using respirators.

Names of respirator user:	1._____	2._____
a. Did the worker have a Medical Evaluation for respirator use?	” Yes ” No	” Yes ” No
b. Did the worker have an individual fit test?	” Yes ” No	” Yes ” No
c. How often are cartridges changed?		
d. What training on respirator use and care did the worker receive?		

11. Find two workers who are using gloves

	Employee #1	Employee #2
a. What type of glove used (cotton, latex, nitrile, butyl).		
b. How often are gloves changed?		
c. What chemicals is the worker using?		

12. Find two workers who are working with chemicals.

	Employee #1	Employee #2
a. Has individual monitoring of employees for chemical exposures ever been conducted?	” Yes ” No Job: Chemical:	” Yes ” No Job: Chemical:
b. Has the worker received training on chemical hazards and how to read CSDSs and MSDSs?	” Yes ” No	” Yes ” No

Question	Answer/Comments
ASK SUPERVISORS OR MANAGERS	
13. Has the flow rate of the local exhaust ventilation been tested in the last 12 months?	” Yes ” No
14. Has individual monitoring of employees for chemical exposures ever been conducted?	” Yes ” No
15. Have workers received training on respirator use?	” Yes ” No
16. Have workers received training on chemical hazards and information sheets?	” Yes ” No

Ask management for the following documents:	Are these documents available?
17. Written hazard communication plan	” Yes ” No
18. Written respirator use program	” Yes ” No
19. Records of employees’ medical evaluation and fit-tests for respirator use	” Yes ” No
20. Records of local exhaust ventilation testing	” Yes ” No
21. Records of employee monitoring results	” Yes ” No
22. Records of employee training: hazard communication; respirator use and care; use of gloves and other personal protective equipment (PPE)	” Yes ” No

Health Effects of General Chemicals

Health Effects	Controls
Solvents	
Acetone *Short term*: eye and mucous membrane irritation; central nervous system depression at high concentrations	• **Substitute safer products** (such as alcohol-based or water-based solvents) when possible. • **Ventilation:** Avoid breathing solvent vapors by providing good ventilation in the work area. • **Use tools to prevent putting arms and hands in solvents.** • **Don't use solvents to clean skin.** • **Use gloves** designed specifically for the solvents you are using. Gloves are often necessary, even with controls.
Benzene *Short term:* lightheadedness; headaches; abdominal discomfort; convulsions Long term: *damage to blood-forming system*	
Ethyl acetate *Short term:* nose and throat irritation *Long term:* liver damage	

Health Effects of General Chemicals

Health Effects	Controls
Solvents	
Methanol *Short term:* nausea; abdominal pain; headache; eye, nose, and throat irritation; blindness or death at high levels *Long term:* liver, kidney, and heart damage	• **Substitute safer products** (such as alcohol-based or water-based solvents) when possible. • **Ventilation:** Avoid breathing solvent vapors by providing good ventilation in the work area. • **Use tools to prevent putting arms and hands in solvents.** • **Don't use solvents to clean skin.** • **Use gloves** designed specifically for the solvents you are using. Gloves are often necessary, even with controls.
Methyl ethyl ketone (MEK) *Short term:* headache; throat, nose, and eye irritation; numbness of fingers and arms; *Long term:* liver damage; nervous system damage	
Methylene chloride *Long term:* May cause cancer	

Health Effects of General Chemicals

<table>
<tr><th>Health Effects</th><th>Controls</th></tr>
<tr><td colspan="2">Solvents</td></tr>
<tr><td>Trichloroethylene (TCE)

Short term: Headaches; mental confusion; drowsiness; dizziness; irregular heartbeat

Long term: Liver damage; may cause cancer</td><td rowspan="2">• Substitute safer products (such as alcohol-based or water-based solvents) when possible.

• Ventilation: Avoid breathing solvent vapors by providing good ventilation in the work area.

• Use tools to prevent putting arms and hands in solvents.

• Don’t use solvents to clean skin.

• Use gloves designed specifically for the solvents you are using. Gloves are often necessary, even with controls.</td></tr>
<tr><td>Toluene

Short term: Weakness; confusion; headaches; nausea

Long term: May cause birth defects at high levels; kidney and liver defects; loss of appetite; mood changes</td></tr>
</table>

Health Effects of General Chemicals

Health Effects	Controls
Metals	
Lead *Short term:* Very rare (only if exposure is high). Symptoms are similar to long term. *Long term:* Damage to brain and nerves (tremors, muscular weakness, lack of coordination); damage to reproductive systems (men and women); stomach problems; anemia; damage to kidneys.	• **Avoid welding on toxic metals or coatings** if possible. • Natural or general ventilation is often adequate in open areas. Position yourself so that fumes don't blow in your face. **Provide local exhaust ventilation** in small or confined spaces. • **Respirators** should be worn when other controls are not possible. • **Shower and change** to avoid bringing lead home to your family.

Health Effects of General Chemicals	
Health Effects	**Controls**
Gases	
Carbon monoxide *Short term:* headaches; dizziness; concentration problems; sleepiness; weakness *Long term:* heart disease	• Where possible, **change the process so that toxic gases are not created** (such as using electric forklifts that do not emit carbon monoxide while working in closed warehouses). • **Local exhaust ventilation** (at the point where the gas is created) may be necessary for some work processes. Always make sure there is good general ventilation.
Chlorine *Short term:* throat, nose, skin, and eye irritation; lung damage and death at very high concentrations	

Health Effects of General Chemicals

Health Effects	Controls
Others	
Acrylics *Short term:* Eye, nose, and throat irritation; allergic reaction; stomach trouble. *Long term:* Lung damage	• **Substitute safer chemicals** when possible. • **Local exhaust ventilation** (at the point where the gas is created) may be necessary for some work processes. • When there is not good ventilation, wear the proper **respirator.** • With dusts (i.e., asbestos) you can **wet the area or process** to prevent exposure. • **Avoid skin and eye contact** by wearing **safety goggles** and the right **gloves** for the chemical you are using**.**
Asbestos *Short term:* Lung irritation at very high levels. *Long term:* Cancer of the lung, stomach, and intestinal tract; asbestosis (scarring of the lungs).	
Epoxy resins *Short term:* eye, nose, and throat irritation. *Long term:* asthma	

Health Effects of General Chemicals

<table>
<tr><th>Health Effects</th><th>Controls</th></tr>
<tr><td colspan="2">Others</td></tr>
<tr><td>Formaldehyde

Short term: eye, nose, throat, and skin irritation; asthma and allergic skin reaction

Long term: may cause cancer</td><td rowspan="6">•

• Substitute safer chemicals when possible.

• Local exhaust ventilation (at the point where the gas is created) may be necessary for some work processes.

• When there is not good ventilation, wear the proper respirator.

• With dusts (i.e., asbestos) you can wet the area or process to prevent exposure.

Avoid skin and eye contact by wearing safety goggles and the right gloves for the chemical you are using.</td></tr>
<tr><td></td></tr>
<tr><td>Glycol ethers

Long term: may cause birth defects; damage to sperm; anemia</td></tr>
<tr><td></td></tr>
<tr><td>Isocyanates

Short term: eye, nose, and throat irritation; asthma and allergic lung disease; sensitization

Long term: may cause cancer</td></tr>
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General Chemicals Index and Synonyms

Acetic ether - see Ethyl acetate
Acetylene trichloride - see Trichloroethylene
Acetone
Acrylics
Amosite - see Asbestos
Anthophyllite - see Asbestos
Asbestos
Benzene
Benzol - see Benzene
2-Butanone - see Methyl ethyl ketone
Carbinol - see Methanol
Carbonic oxide - see Carbon monoxide
Carbon monoxide
Carbon tet - see Carbon tetrachloride
Carbon tetrachloride
Chlorine
Chrysotile - see Asbestos
Crocidolite - Asbestos
Cyclohexatriene - see Benzene
1,1-Dichloro-2-chloroethylene - see Trichloroethylene
Dichloromethane - see Methylene chloride
Dimethyl ketone - see Acetone
Epoxy resins
Ethyl acetate
Ethylene trichloride - see Trichloroethylene
Ethyl ester - see Ethyl acetate
Ethyl ethanoate - see Ethyl acetate
Exhaust gas - see Carbon monoxide
Formaldehyde
Formic aldehyde - see Formaldehyde
Glycol ethers
Isocyanates
Lead
MDI - see Isocyanates
MEK - see Methyl ethyl ketone
Methanal - see Formaldehyde

Methanol
Methyl alcohol - see Methanol
Methyl aldehyde - see Formaldehyde
Methylene bichloride - see Methylene chloride
Methylene bisphenyl isocyanate - see Isocyanates
Methylene chloride
Methylene dichloride - see Methylene chloride
Methylene diisocyanate - see Isocyanates
Methylene oxide - see Formaldehyde
Methyl ethyl ketone
Methylol - see Methanol
Oxomethane - see Formaldehyde
Oxomethylene - see Formaldehyde
2-Propanone - see Acetone
TCE - see Trichloroethylene
Tetrachloromethane - see Carbon tetrachloride
Methyl benzene - see Toluene
Phenylmethane - see Toluene
TDI - see Isocyanates
Toluene
Toluene diisocyanete - see Isocyanates
Toluol - see Toluene
Tremolite - see Asbestos
Trichloroethene - see Trichloroethylene
Trichloroethylene
Wood alcohol - see Methanol
Wood naphtha - see Methanol
Wood spirits - see Methanol

Cancer-Causing Chemicals		
Chemical	**Workers Affected/Workplace**	**Cancer**
Arsenic and arsenic compounds	Semiconductor industry; metallurgy; pigment production; glass manufacture; used in insecticides and fungicides; by-product of smelting copper ores	Skin; lung; liver
Asbestos	Construction (cement products); ship-yard workers (building materials); mechanics (brake pads); mining ore with asbestos; used in thermal and electrical insulation	Lung; pleura; gastrointestinal
Benzene	Dry cleaners; paint removal; rubber cements; degreasing artists	Leukemia
Cadmium	Electroplating; semiconductors; pigment production; dying and printing	Prostate; kidney
Chloroform	Photographic processes; dry cleaning; fluorocarbon manufacture; used as a solvent	Liver; kidney; thyroid

Cancer-Causing Chemicals		
Chemical	**Workers Affected/Workplace**	**Cancer**
Chromium VI (hexavalent chrome)	Electroplating; steel industry	Lung
Ethylene Oxide	Used as a fumigant and insecticide; sterilization in hospitals	Stomach; leukemia
Formaldehyde	Building materials manufacture; fabric coatings; rubber, leather, and insulation manufacture	Nasal; lung
Isocyanates (toluene di-, TDI)	Polyurethane foam and plastics production; used in paints	Animal studies show liver and pancreas cancer. Severe sensitization of respiratory system
Lead chromate	Pigment production	Lung
	Methylating reactions; plastic foams; refrigeration	Animal studies show some cancer
Methylene chloride	Urethane foam production; paint remover; used as a solvent	Liver; lung; pancreas

Cancer-Causing Chemicals		
Chemical	**Workers Affected/Workplace**	**Cancer**
Nickel	Electroplating; battery manufacture; smelting and refining	Lung; nose; throat
Polychlorinated Biphenyls	Capacitor and transformer industries; casting processes; used as a hydraulic and heat exchange fluid	Liver
Styrene	Rubber manufacture; resin production; manufacture of polymerized synthetic materials	Lung
Trichloroethylene (TCE)	Used widely as a solvent	Liver
Vinyl Chloride	Plastics production; vinyl chloride and polyvinyl chloride production	Liver; brain; lung

Cancer-Causing Chemicals Index and Synonyms

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Actinolite - see Asbestos
Amosite - see Asbestos
Anthophyllite - see Asbestos
Arochlor 1242 - see Polychlorinated biphenyls
Arsenic and arsenic compounds
Asbestos
Benzene
Benzol - see Benzene
Cadmium
Chlorodiphenyl, 42% chlorine - see Polychlorinated biphenyls
Chloroethene - see Vinyl chloride
Chloroethylene - see Vinyl chloride
Chloroform
Chloromethane
Chromium VI
Chrome yellow - see Lead chromate
Chrysotile - see Asbestos
Cinnamene - see Styrene
Crocidolite - Asbestos
Cyclohexatriene - see Benzene
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Dichloromethane - see Methylene chloride
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Polychlorinated biphenyls
Styrene
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TDI - see Isocyanates
Toluene diisocyanete - see Isocyanates
Tremolite - see Asbestos
Trichloroethene - see Trichloroethylene
Trichloroethylene
Trichloromethane - see Chloroform
Vinyl benzene - see Styrene
Vinyl chloride

Notes