Preventing Exposure to Workplace Chemicals

Assessing Chemical Hazards

&

Understanding Safety Data Sheets (SDS's)

Training from the
NJ Work Environment Council

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About WEC

The New Jersey Work Environment Council (WEC) is a non-profit collaboration of organizations working for safe, secure jobs, and a healthy, sustainable environment.

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The Small Group Activity Method

Basic Structure

The Small Group Activity Method* is based on a series of problem-solving activities. An activity can take from 45 minutes to an hour. Each activity has a common basic structure:

- **Small Group Tasks**
- **Report-Back**
- **Summary**

1. Small Group Tasks: The training always begins with groups working together at their tables. Each activity has a task, or set of tasks, for the groups to work on. The task asks that the groups use their experience and the factsheets to solve problems and make judgements on key issues.

2. Report-Back: For each task, the group selects a scribe that takes notes on the small group discussion and reports back to the class as a whole. During the report-back, the scribe informs the entire class as to how his or her group solved the particular problem. The trainer records each scribe's report-back on large pads of paper in front of the class so that everyone can refer to them.

3. Summary: Before the discussion drifts too far, the trainer needs to bring it all together during the summary. Here, the trainer highlights the key points of the activity and brings up any problems or points that may have been overlooked during the report-back.

***The Small Group Activity Method (SGAM) is based on a training procedure developed by England's Trades Union Congress (TUC) in the 1970s. The Labor Institute and Oil, Chemical, and Atomic Workers Union (now part of the United Steelworkers) used a similar method around economic and health and safety issues for workers and further developed the procedure into SGAM. The New Jersey Work Environment Council has used SGAM since 1986.**

Three Basic Learning Exchanges

The Small Group Activity Method (SGAM) is based on the idea that every training is a place where learning is shared. With SGAM, learning is not a one-way street that runs from trainer to worker. Rather SGAM is a structured procedure that allows us to share information. It is based on three learning exchanges:

- **Worker-to-Worker**
- **Worker-to-Trainer**
- **Trainer-to-Worker**

Worker-to-Worker: Most of us learn best from each other. SGAM is set up in such a way as to make the worker-to-worker exchange a key element of the training. The worker-to-worker exchange allows participants to learn from each other by solving problems in their small groups.

Worker-to-Trainer: Lecture-style training assumes that the trainer knows all the answers. With SGAM it is understood that the trainers also have a lot to learn and this is the purpose of the worker-to-trainer exchange. It occurs during the report-back and it is designed to give the trainer an opportunity to learn from the participants.

Trainer-to-Worker: This is the trainer's opportunity to clear up any confusion and make points they think are key. By waiting until the summary section, trainers know better what people need to know.

The Factsheet Reading Method

The process described below focuses everyone on the important information in the factsheets.

The process is as follows:

First, select a scribe for this Task.

Each of you will be assigned a small number of factsheets to read. You will then share the factsheet information with your table.

Your trainer will assign your individual factsheets this way:

Starting with the scribe and moving to the left, count out loud from 1 to 8. Keep going around the table until all numbers (factsheets) are distributed. The assigned numbers correspond to Factsheets 1 through 8 on the following pages.

Once everyone has read their assigned factsheets individually, your scribe will go around the table and ask each of you to explain to the group what you have learned. Factsheets should be explained in the order assigned (1 through 8), since the factsheets build on the previous one. In this way, we all start at the same place and with the same information.

Understanding SDS's & Assessing Chemical Hazards

Purpose

To increase our knowledge of the how we may be exposed to hazardous chemicals on the job and what we can do to reduce the risks.

This activity has two tasks.

Task 1

In your groups, read the factsheets on pages 4 - 17. Then based on the factsheets and your own experience write a response to the statement below.

For each paragraph, list the factsheets that helped you write your response.

Statement:

"We work with so many chemicals, it's part of the job. I hear there is a binder in the control room that I can look at with the safety information if I ever get exposed.

Anyways, I always know when the chemicals are bad for you because the smell is nasty.

Aside from drinking the stuff, or pouring it directly into your eyes, chemicals really can't get into your system.

I should know, I was exposed a few times but nothing ever happened to me. As long as you can avoid getting a heavy dose in your system, small amounts of the stuff won't hurt you.

I've worked with this stuff for 20 years and I'm okay. I think the whole thing is overblown and I'm not going to worry about the chemicals being used at my work."

Task 1 continued

How would you respond? (Please make a list and what factsheet you used)

1.

2.

3.

4.

5.

Factsheet #1

Hazardous Chemicals in Our Workplaces

The Occupational Safety and Health Administration (OSHA) requires all employers to comply with the Hazard Communication Standard (HAZCOM). It requires employers to inform employees about the chemical hazards they are potentially exposed to on the job.

The Process Safety Management Standard also requires employers to train employees about safety and health hazards, including effects of chemical exposures from highly hazardous process chemicals.

Under HAZCOM, employers must develop a hazard communication program that includes training employees on how to safely use the chemicals they work with.

A basic HAZCOM program must include the following:

- A list of the hazardous chemicals used at the workplace
- Chemical labeling procedures*
- Safety Data Sheets
- Employee training
- A written plan explaining how the employer will comply with the hazard communication standard

Public Employees in New Jersey

The Public Employees Occupational Safety and Health Act, which covers non-federal government employers in New Jersey, enforce a very similar hazard communication standard.

*For more information on chemical labeling refer to *A Guide to The Globally Harmonized System of Classification and Labeling of Chemicals (GHS):* https://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf

OSHA's Hazard Communication Standard, 29 CFR 1910.1200, addresses the informational needs of employers and workers with regard to chemicals. The HCS was first promulgated in 1983, and covered the manufacturing sector. It was later expanded to cover all industries where workers are potentially exposed to hazardous chemicals. In 2012, the HCS was modified to align its provisions with the United Nations' Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

Hazardous Chemicals Found in Industrial Facilities

Chemicals	Uses	Overexposure Health Effects
ANHYDROUS AMMONIA A corrosive, colorless gas with a strong odor.	It is used in refrigeration and in making fertilizer, plastics, dyes, textiles, detergents, and pesticides.	*ACUTE:* Skin irritation, burning eyes, causing temporary or permanent blindness, headaches, nausea, and vomiting. *HIGH:* Fluid in the lungs, which may lead to death. *CHRONIC:* Lung damage, bronchitis with coughing or shortness of breath.
CHLORINE A greenish-yellow gas with a strong, irritating odor.	It is used in making other chemicals, as a disinfectant, in bleaching, and for purifying water and sewage.	*ACUTE:* Severe eye and skin burns, throat irritation, tearing, coughing, nose bleeds, chest pain. *HIGH*: Permanent lung damage, fluid build-up in the lungs and death. *CHRONIC*: Tooth damage, bronchitis, coughing, and shortness of breath.
ETHYLENE OXIDE A colorless gas that is highly flammable, reactive, and explosive.	It is used to make antifreeze, polyesters, and detergents, and is used for industrial sterilization.	*ACUTE*: Irritation of the eyes, skin, nose, throat, and lungs, shortness of breath, headache, nausea, vomiting, diarrhea, drowsiness, weakness, and loss of muscle control. *HIGH*: Loss of consciousness, fluid in the lungs, and death. *CHRONIC*: May cause cancer and birth defects, damage to the liver, kidneys, and nervous system.
HYDROGEN CHLORIDE (HYDROCHLORIC ACID) A corrosive, colorless to slightly yellow gas with a strong odor.	It is used in metal processing, analytical chemistry, and in making other chemicals.	*ACUTE*: severe burns of the skin and eyes, coughing, shortness of breath. HIGH: Fluid build-up in the lungs and possibly death. *CHRONIC*: Lung and tooth damage.

HYDROGEN FLUORIDE (HYDROFLUORIC ACID) A corrosive, colorless fuming liquid or gas with a strong irritating odor.	It is used in etching glass and in making other chemicals, including gasoline.	*ACUTE:* Severe skin and eye burns. *HIGH:* Extreme respiratory irritation (with cough, fever, chills, and tightness) that may be fatal. *CHRONIC*: liver and kidney damage, and fluorosis, (symptoms of weight loss, malaise, anemia, and osteosclerosis.
TOLUENE-2,4-DIISOCYANATE A colorless to pale yellow liquid with a strong fruity odor.	It is used to make polyurethane foams, elastomers, and coatings.	*ACUTE*: Skin and eye irritation and burns, coughing, chest tightness, and shortness of breath. *HIGH*: fluid in the lungs. *CHRONIC*: concentration and memory problems, and possibly cancer.

* Health hazard information sources include:

- New Jersey *Hazardous Substance Fact Sheets* (NJ Department of Health webpage)
- National Library of Medicine Hazardous Substance Data Bank (toxnet.nlm.nih.gov)
- Environmental Protection Agency *Hazardous Substance Fact Sheets* (www.epa.gov/enviro/html/emci/chemref/index.html)

Factsheet #2

Chemical Hazard Awareness

There are four basic ways that chemicals can enter your body:

- **Direct contact** - on the skin or eyes
- **Absorption** - through the skin
- **Accidental Ingestion** - through the mouth
- **Inhalation** - through the lungs

Direct Contact = Surface
The chemicals we work with can burn or irritate the skin and eyes on contact, causing damage on the surface. Dermatitis (inflammation of the skin) and conjunctivitis (inflammation of the eye membrane) are two examples.

Absorption = Penetration

*Reproduction Hazards

From the Preamble to NIOSH's National Occupational Research Agenda (NORA) Statement on Reproductive Hazards:

"While more than 1,000 workplace chemicals have shown reproductive effects in animals, most have not been studied in humans. In addition, most of the 4 million other chemical mixtures in commercial use remain untested. Physical and biological agents in the workplace that may affect fertility and pregnancy outcomes are practically unstudied. The inadequacy of current knowledge coupled with the ever-growing variety of workplace exposures pose a potentially serious public health problem."

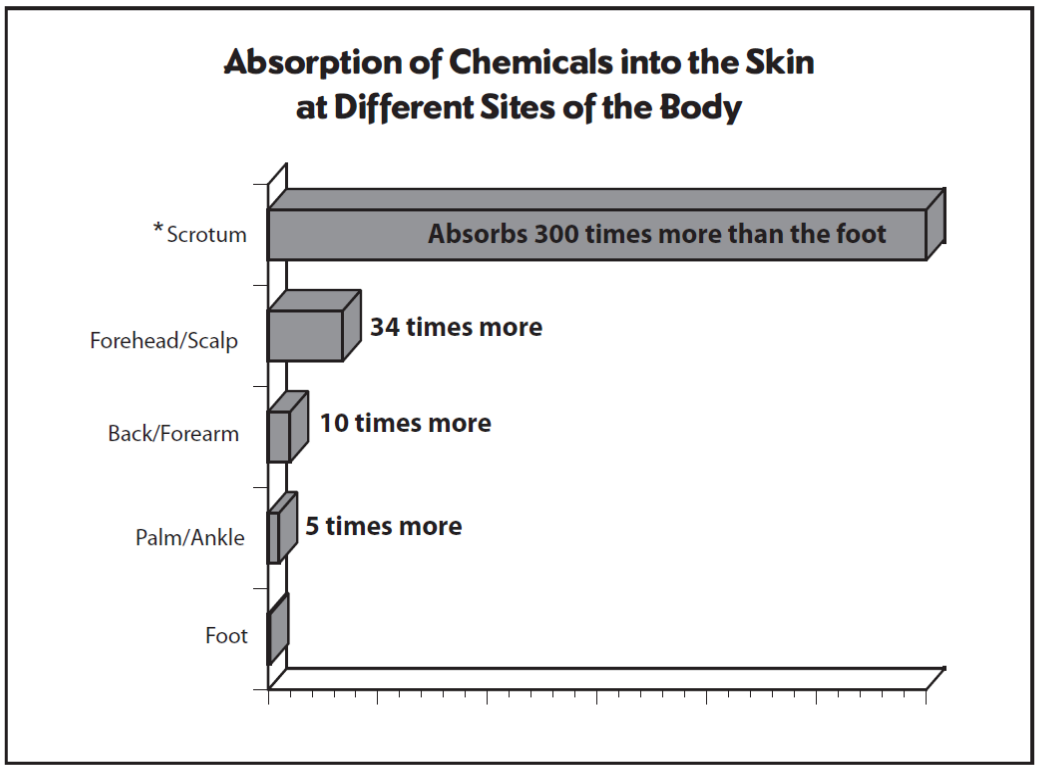
Some chemicals can pass right through the skin undetected and enter the bloodstream. They are carried throughout the body, causing harm. Broken skin or puncture wounds greatly increase the rate at which chemicals are absorbed.

* Source: OSHA.Gov, Reproductive Hazards https://www.osha.gov/SLTC/reproductivehazards/hazards.html

Factsheet #2 continued

Absorption of Chemicals by Your Body

Chemicals can enter your system by being absorbed through the skin. In fact, as the chart below shows, when it comes to absorption through the skin, different parts of your body absorb chemicals at very different rates. (If you are working with chemicals you should wash your hands **BEFORE** and after using the bathroom!)



*For men (studies of female workers yet to be done at the time).
Source: E. Hodgson and P.E. Levi, A Textbook of Modern Toxicology, Second Edition. Stamford: Appleton & Lange, 1997, pg. 36-40.

Factsheet #3

Don't Trust Your Nose

You can't rely on your sense of smell to protect you from exposure to toxic chemicals. Let's face it, your nose has some important limitations.

Here are the basic ones:

- Some dangerous chemicals, such as carbon monoxide, are odorless. No nose can smell them.
- For some chemicals, you can only detect the smell when the toxin is around you in such large quantities that your health is being harmed by it. For example, by the time you can smell ethylene oxide (used in gas sterilizers), you're already in trouble.
- Our noses can become accustomed to chemicals. That means that after a while we can't smell even very powerful odors. For instance, our noses can learn to turn off strong odors like ammonia and bleach.

Factsheet #4

Dose and the Body's Response

After ingestion, inhalation or skin contact, toxic chemicals as well as their by-products react in the body. For most toxic substances to cause harm there needs to be a sufficient "dose" given.

"Dose" refers to how much a substance reacts with the body. Dose is measured by the concentration of the substance and the time period of the exposure.

The higher the concentration, the larger the dose.

The longer the exposure, the larger the dose.

There are basically two ways the body reacts to a dose of a toxic substance:

- **Linear/Non-Threshold** For any dose, no matter how small, the body may have a reaction. This type of response may be found with cancer-causing chemicals and cancer-causing physical agents, such as radiation. **Any** dose carries a risk.

- **Threshold** There needs to be a certain level of dose before there is a bodily response. This type of response is found with most toxic chemicals (not for cancer-causing agents and chemicals). For example, low-level exposure to methanol throughout the plant is not very harmful, but at higher concentrations it will cause irritation to the eyes, mucous membranes, and upper respiratory tract. Nausea, dizziness and headaches may result.

Source: Moeller, Dade W., Environmental Health, Harvard University Press, Cambridge, Massachusetts and London, England, 1997.

Factsheet #5

The Long and Short of It

There are two different types of effects that result from toxic exposure. They are acute and chronic.

Acute Effects
"Acute" means that health effects are felt at the time of exposure or shortly after, or result from a short-term, highly concentrated exposure. Examples of acute effects:

- Hydrogen chloride (HCl), when inhaled, causes fluid to collect in the lungs (pulmonary edema) and bleeding in the respiratory tract. When it comes into contact with the skin, it causes severe burns unless promptly washed off.

- Caustic soda, also known as sodium hydroxide (NaOH), corrodes the skin. It burns, and actually dissolves the skin while in contact with it.

- Carbon monoxide (CO) bonds to the protein in blood that is responsible for carrying oxygen to the cells. If enough of the blood bonds with CO instead of oxygen, the cells "starve" and you may die.

Although acute toxicity is often seen within minutes or hours after a sudden, high exposure there are some instances where a one-time high-level exposure causes delayed effects. For example, symptoms of high exposures to certain pesticides may not appear for several days.

Factsheet #5 continued

Chronic Effects

"Chronic" is a word that means the ill effects will not be seen for some time after exposure. It is associated with low concentration exposures over a longer period of time.

- Cancer is a chronic effect, as is asbestosis.
- Lung diseases, like bronchitis and emphysema, are examples of noncancerous, chronic diseases.
- Solvents can cause chronic damage to the liver, kidneys and brain.

Many chemicals can cause either chronic or acute effects. The difference is in the amount of the dose. High doses generally cause acute effects. Low doses over time cause chronic effects.

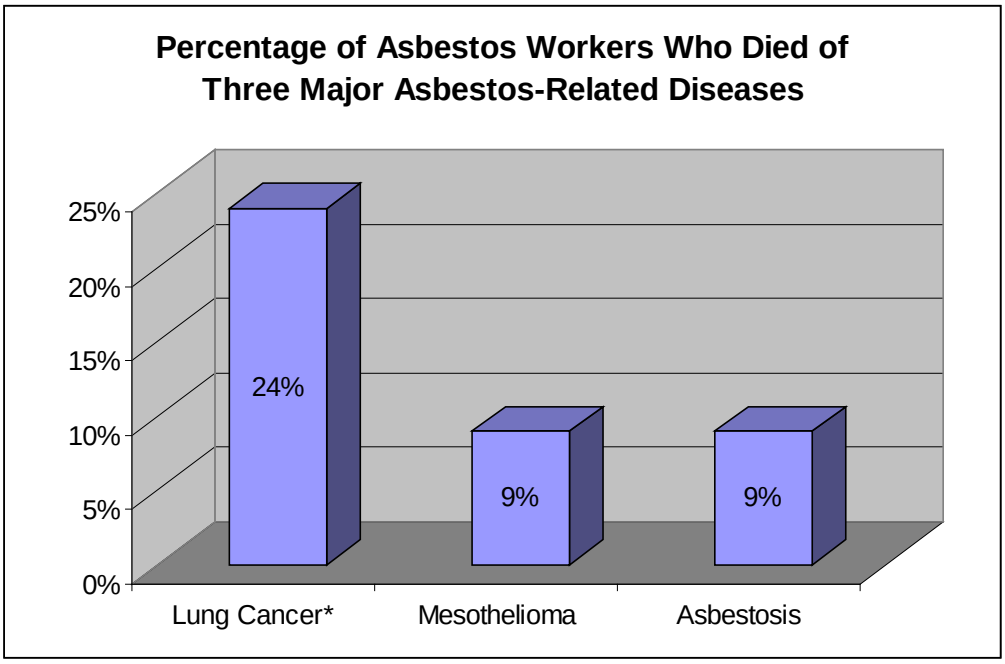
- Exposure to PCBs in large doses can cause a skin disease called chloracne.
- Exposure to benzene over a long period of time can cause leukemia, a chronic effect.
- Exposure to arsenic over a long period of time can cause lung cancer, a chronic effect.

Factsheet #6

The Odds of Getting a Disease

A funny thing about humans is that while we have the same physical make-up, we're also different. If a large group of us gets a very large dose of a toxic chemical, not all of us will develop a disease. But, we do know that such an exposure will give some of us a disease, and there is really no way of knowing who that might be.

For example, look at asbestos workers. As a group, they run a high risk of dying from lung cancer, mesothelioma, and asbestosis. But not all asbestos workers get these diseases. The chart below shows just what the odds were for asbestos workers who died between 1967 and 1986.

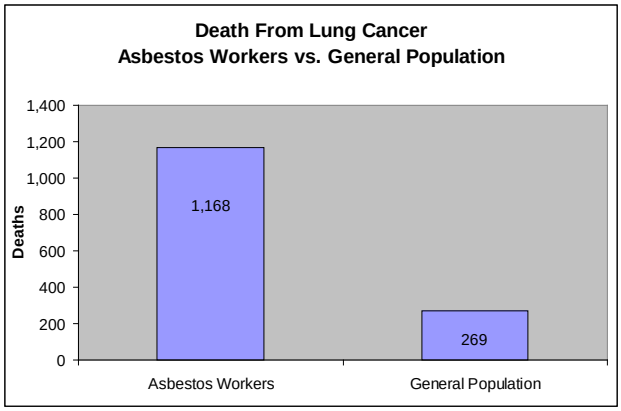


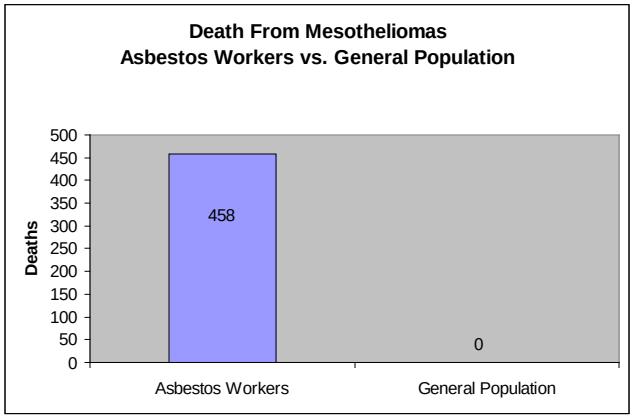
* Fourteen to nineteen percent of these deaths could have been avoided if the workers had not been exposed to asbestos. Source: I.J. Selikoff, "The Third Wave of Asbestos Disease: Exposure to Asbestos in Place, Public Health Control." *Annals of the New York Academy of Sciences, Vol. 643, 1991.*

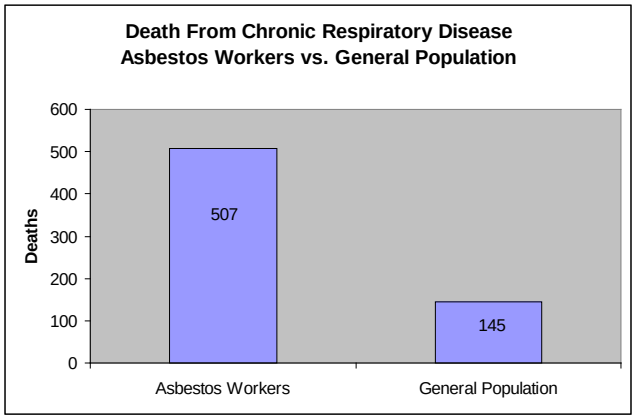
Factsheet #7

How Do We Know When a Toxic Substance Really Causes Human Disease?

The most certain method of identifying cancer-causing substances is to observe whether they have caused cancer in people. Epidemiologists design studies that follow certain populations over time to observe whether a specific agent (e.g., arsenic or benzene) or exposure (e.g., sunlight or smoking) is likely to cause cancer. Environmental causes of cancer have frequently been noticed in the workplace first. This is because workers in certain occupations have higher exposures to particular chemicals and for longer periods of time than the general population. The International Agency for Research on Cancer (**http://www.iarc.fr**), an agency of the World Health Organization, classified certain occupations as associated with cancer-causing exposures because of the increased incidence of cancers in these settings. The graphs compare deaths in a population of 17,800 asbestos workers and 17,800 people in the general population from 1967 to 1986.







Source: CANCER AND THE ENVIRONMENT: *What You Need to Know; What You Can Do*
Published by the DHHS, NIH, NCI & NIEHS. NIH Publication No. 03-2039, August 2003; I.J. Selikoff, "The Third Wave of Asbestos Disease: Exposure to Asbestos in Place, Public Health Control." *Annals of the New York Academy of Sciences, Vol. 643, 1991.*

Factsheet #8

Known to Cause Cancer in Laboratory Rats?

For many years, researchers have relied on animal testing in order to identify substances as potential human carcinogens. The tests provide accurate information about doses and duration of exposure and interactions of substances with other chemicals.

In these studies, the chemical, substance, or mixture is administered to one or two laboratory rats over a range of doses and duration of exposure. All experimental conditions are carefully chosen to maximize the likelihood of identifying any cancer effects.

It is not possible to predict with absolute certainty from animal studies alone which agents, substances, mixtures, or exposure levels cause cancer. However, we are certain that all known human cancer-causing agents also produce cancers in laboratory animals. We also know that in many cases, agents found to cause cancer in animals were later confirmed to cause cancer in humans.

Studies of laboratory animals are a reliable source for detecting potential human health hazards of all kinds, including cancer.

Source: U.S. Department of Health and Human Services, Public Health Services National Toxicology Program (NTP), *11th Report on Carcinogens*, 2005.

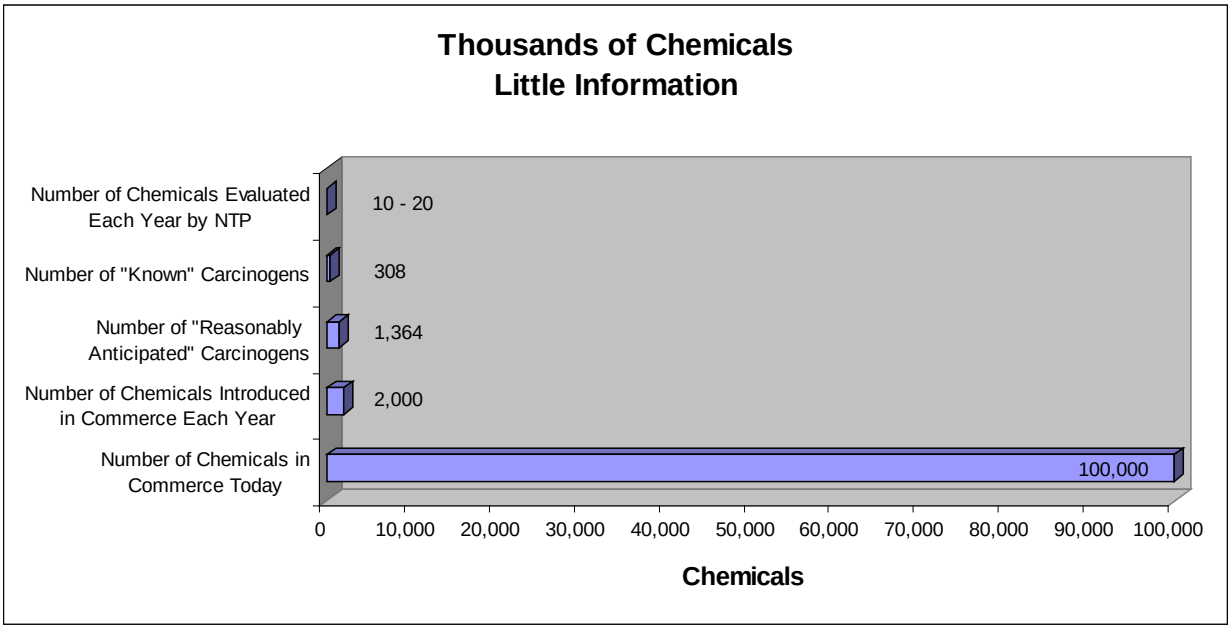
Factsheet #9

What We Know

There are more than 100,000 chemicals commonly used by Americans in household cleaners, solvents, pesticides, food additives, lawn care, and other products. Each year, an estimated 2,000 new ones are introduced for use in such everyday items as foods, personal care products, prescription drugs, household cleaners, and lawn care products.

Of those, the U.S. Department of Health and Human Services National Toxicology Program (NTP) has identified 308 chemicals to be "known" carcinogens and an additional 1,364 chemicals that are "reasonably anticipated" to be carcinogens. NTP is only able to evaluate 20 chemicals at a time. At any one time, EPA typically has an average of 300 new chemical cases under review.

Unfortunately, we produce chemicals first and ask questions later. The chart below shows just how many chemicals are in use today compared to the chemicals evaluated for carcinogens and the few chemicals that get tested on an annual basis.



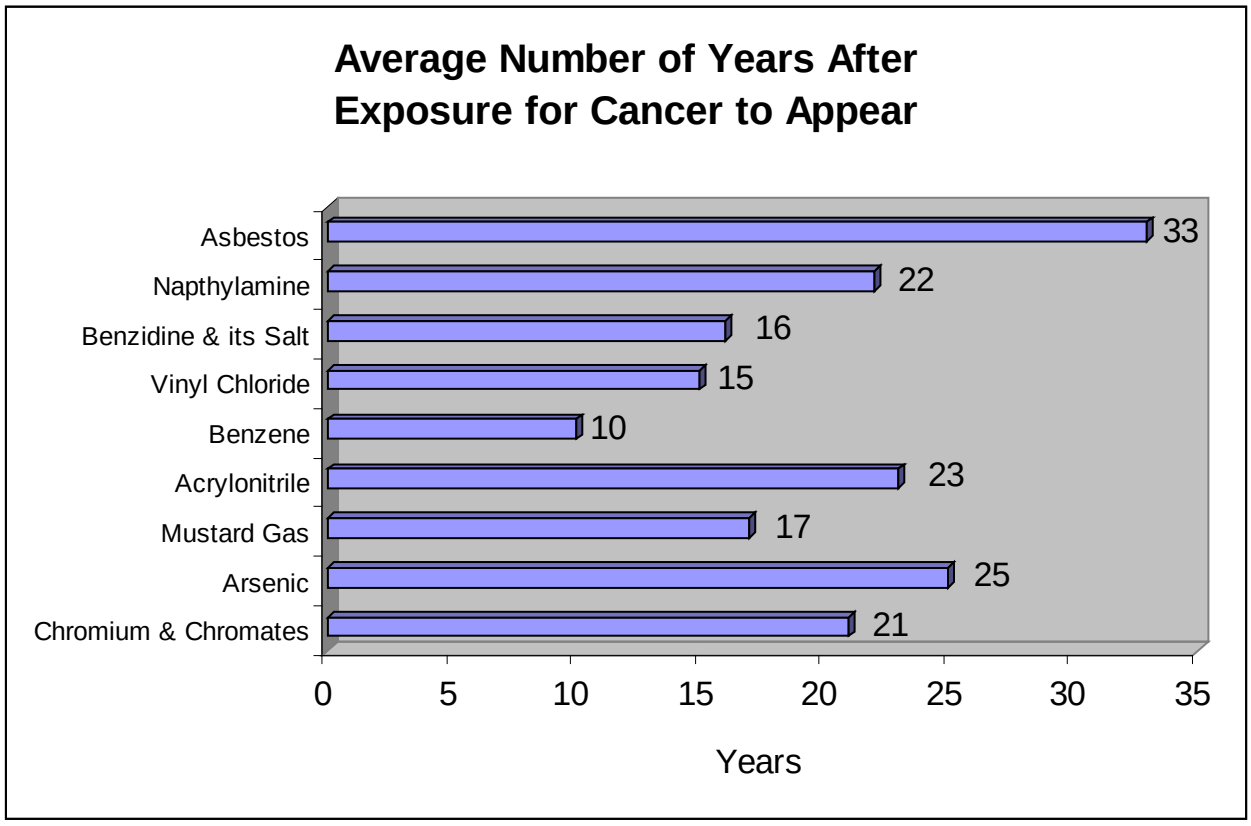
Source: CANCER AND THE ENVIRONMENT: *What You Need to Know; What You Can Do, pg. 22*
Published by the DHHS, NIH, NCI & NIEHS. NIH Publication No. 03-2039, August 2003; U.S. Department of Health and Human Services, Public Health Services National Toxicology Program (NTP), *11th Report on Carcinogens*, 2005.
NATIONAL TOXICOLOGY PROGRAM (NTP): NIEHS webpage
EPA.GOV: Reviewing New Chemicals under the Toxic Substances Control Act (TSCA)

Factsheet #10

The Toxic Time Bomb

It may be a big mistake to think that because you've been exposed for many years and have no symptoms, all is well. In fact, it can take 10 to 40 years to see the results of a harmful exposure to a cancer-causing chemical. You may be healthy for 20 years and get it the very next year.

The time it takes cancer to show up is call the latency period. The chart below shows some of the latency periods for different carcinogens. Unfortunately, there may be thousands of unknown time bombs ticking in our workplaces that have not been discovered yet.



Source: B.S. Levey and D.H. Wegman, eds., *Occupational health: Recognizing and Preventing Work Related Disease*, Boston; Little Brown & Co., 1995.

Task 2

In your groups review the factsheets on pages 20 – 28. Then working together, use the SDS handout, the factsheets and your own experience answer the questions below. Please record what section of the SDS you found the answer.

1. If you worked with the chemical in the SDS would you be concerned about a fire or explosion hazard?

□ Yes
□ No

2. What personal protective equipment (PPE) does the SDS call for in handling the chemical?

3. What first aid is recommended?

4. What is recommended for the proper storage of the chemical?

5. Is the chemical incompatible with other chemicals?

Task 2 continued

6. What are the health hazards that could result from exposure to the chemical?

Acute (Short-Term) Hazards Chronic (Long-Term) Hazards

7. Could the chemical affect other workers in the area where it is being used? If you work with patients could the chemical affect them? From what part of the SDS sheet could you get this information?

8. Were there any pictograms on the SDS? What did they mean?

9. Did you find working with the SDS difficult or confusing? Why or why not?

10. Are SDSs a useful health and safety resource tool at work? Why or why not?

Factsheet #11
What's in an SDS?

The Hazard Communication Standard (HCS) requires chemical manufacturers, distributors, or importers to provide Safety Data Sheets (SDSs) (formerly known as Material Safety Data Sheets or MSDSs) to communicate the hazards of hazardous chemical products. As of June 1, 2015, the HCS will require new SDSs to be in a uniform format, and include the section numbers, the headings, and associated information under the headings below:

Section 1, Identification includes product identifier; manufacturer or distributor name, address, phone number; emergency phone number; recommended use; restrictions on use.

Section 2, Hazard(s) identification identifies the hazards of the chemical presented on the SDS and the appropriate warning information associated with those hazards and required label elements.

Section 3, Composition/information on ingredients identifies the ingredient(s) contained in the product indicated on the SDS, including impurities and stabilizing additives and trade secret claims

Section 4, First-aid measures describes the initial care that should be given by untrained responders to an individual who has been exposed to the chemical and includes important symptoms/ effects, acute, delayed; required treatment.

Section 5, Fire-fighting measures lists suitable extinguishing techniques, equipment; chemical hazards from fire.

Section 6, Accidental release measures lists emergency procedures; protective equipment; proper methods of containment and cleanup.

Section 7, Handling and storage lists precautions for safe handling and storage, including incompatibilities.

Section 8, Exposure controls/personal protection indicates the exposure limits, engineering controls, and personal protective measures that can be used to minimize worker exposure. ex. OSHA's Permissible Exposure Limits (PELs); Threshold Limit Values (TLVs); appropriate engineering controls; personal protective equipment (PPE).

Factsheet #11 continued

Section 9, Physical and chemical properties lists the chemical's characteristics and identifies physical and chemical properties associated with the substance or mixture

Section 10, Stability and reactivity lists chemical stability and possibility of hazardous reactions. This section is broken into three parts: reactivity, chemical stability, and other.

Section 11, Toxicological information includes routes of exposure; related symptoms, acute and chronic effects; numerical measures of toxicity.

Section 12, Ecological information* provides information to evaluate the environmental impact of the chemical(s) if it were released to the environment.

Section 13, Disposal considerations* provides guidance on proper disposal practices, recycling or reclamation of the chemical(s) or its container, and safe handling practices. To minimize exposure, this section should also refer the reader to Section 8 (Exposure Controls/Personal Protection) of the SDS

Section 14, Transport information* provides guidance on classification information for shipping and transporting of hazardous chemical(s) by road, air, rail, or sea.

Section 15, Regulatory information* identifies the safety, health, and environmental regulations specific for the product that is not indicated anywhere else on the SDS. The information may include: Any national and/or regional regulatory information of the chemical or mixtures (including any OSHA, Department of Transportation, Environmental Protection Agency, or Consumer Product Safety Commission regulations)

Section 16, Other information, includes the date of preparation or last revision.

*Note: Since other Agencies regulate this information, OSHA will not be enforcing Sections 12 through 15(29 CFR 1910.1200(g)(2)).

Employers must ensure that SDSs are readily accessible to employees.
See Appendix D of 1910.1200 for a detailed description of SDS contents.

Source: OSHA Brief, Hazard Communications Standard: Safety Data Sheets, https://www.osha.gov/Publications/OSHA3514.html

Factsheet #12

Revised HAZCOM Standard

OSHA revised its Hazard Communication Standard (HCS) to align with the United Nations' Globally Harmonized System of Classification and Labeling of Chemicals (GHS) and published it in the Federal Register in March 2012 (77 FR 17574). Two significant changes contained in the revised standard require the use of new labeling elements and a standardized format for Safety Data Sheets (SDSs), formerly known as, Material Safety Data Sheets (MSDSs). The new label elements and SDS requirements will improve worker understanding of the hazards associated with the chemicals in their workplace.

To help companies comply with the revised standard, OSHA phased in the specific requirements over several years (December 1, 2013 to June 1, 2016).

The first compliance date of the revised HCS was December 1, 2013. By that time employers must have trained their workers on the new label elements and the SDS format. It is critical that employees understand the new label and SDS formats.

Employer Responsibilities with Safety Data sheets (SDS's)

Employers must ensure that the SDSs are readily accessible to employees for all hazardous chemicals in their workplace. This may be done in many ways. For example, employers may keep the SDSs in a binder or on computers as long as the employees have immediate access to the information without leaving their work area when needed and a back-up is available for rapid access to the SDS in the case of a power outage or other emergency. Furthermore, employers may want to designate a person(s) responsible for obtaining and maintaining the SDSs. If the employer does not have an SDS, the employer or designated person(s)

Factsheet #13

Hazard Communication Standard Pictogram

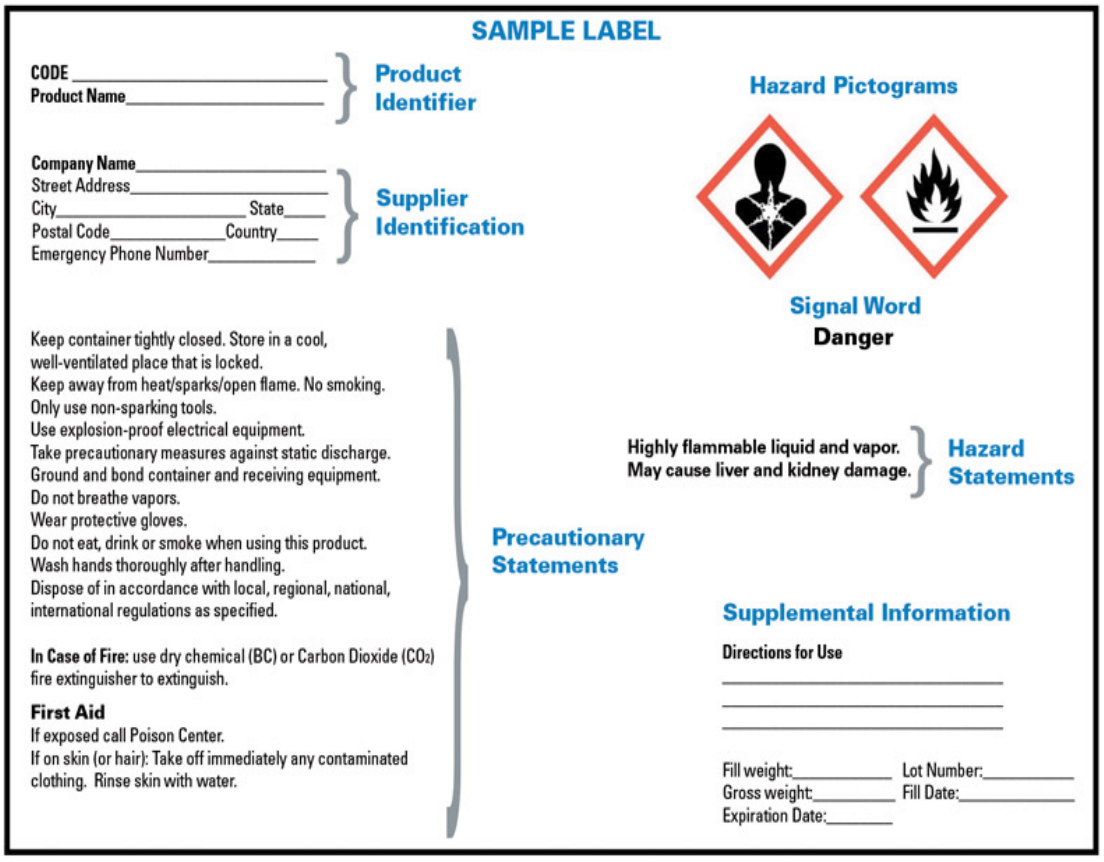
As of June 1, 2015, the Hazard Communication Standard (HCS) requires pictograms on labels to alert users of the chemical hazards to which they may be exposed. Each pictogram consists of a symbol on a white background framed within a red border and represents a distinct hazard(s). The pictogram on the label is determined by the chemical hazard classification.

Health Hazard  ▪ Carcinogen ▪ Mutagenicity ▪ Reproductive Toxicity ▪ Respiratory Sensitizer ▪ Target Organ Toxicity ▪ Aspiration Toxicity	**Flame**  ▪ Flammables ▪ Pyrophorics ▪ Self-Heating ▪ Emits Flammable Gas ▪ Self-Reactives ▪ Organic Peroxides	**Exclamation Mark**  ▪ Irritant (skin and eye) ▪ Skin Sensitizer ▪ Acute Toxicity ▪ Narcotic Effects ▪ Respiratory Tract Irritant ▪ Hazardous to Ozone Layer (Non-Mandatory)
Gas Cylinder  ▪ Gases Under Pressure	**Corrosion**  ▪ Skin Corrosion/Burns ▪ Eye Damage ▪ Corrosive to Metals	**Exploding Bomb**  ▪ Explosives ▪ Self-Reactives ▪ Organic Peroxides
Flame Over Circle  ▪ Oxidizers	**Environment** (Non-Mandatory)  ▪ Aquatic Toxicity	**Skull and Crossbones**  ▪ Acute Toxicity (fatal or toxic)

Factsheet #14

Hazard Communication Standard Labeling

Hazard communication Standard Labels OSHA has updated the requirements for labeling of hazardous chemicals under its Hazard Communication Standard (HCS). All labels are required to have pictograms, a signal word, hazard and precautionary statements, the product identifier and supplier identification. Supplemental information can also be provided on the label as needed.



Source: Hazard Communications Standard Labels, https://www.osha.gov/Publications/OSHA3492QuickCardLabel.pdf

Factsheet #15

pH: A Basic Chemical Term

The pH of a chemical tells you if the chemical is an acid, a base (also called alkali or caustic), or neutral. The pH scale goes from 0 to 14, with 7 being neutral (water is neutral with a pH of 7).

pH less than 7 = acid
pH more than 7 = base

Strong Acid **Neutral** **Strong Base**

0 1 2 3 4 5 6 7 8 9 10 11 12 13 14

The lower the pH (below 7), the stronger the acid. The higher the pH (above 7), the stronger the base. Many organic hydrocarbons (e.g., gasoline, benzene, kerosene, etc.) have almost neutral pHs (close to 7).

Here are some things to remember about pH:

- Chemicals with a pH much lower or much higher than 7 will cause irritation and burns to the part of the body coming into contact with the material.

- Basic chemicals (those with a pH above 7) are much more dangerous to the eyes than are acids. Acids "sit" on the surface of the eyes, if splashed, and can therefore be washed off (if done quickly), often without resulting in permanent damage.

- Base substances rapidly penetrate the eye tissue, often causing quick and lasting damage.

- Store like with like. Chemicals with lower or higher pH should only be stored with chemicals of like pH and never with their opposite or a neutral chemical.

Factsheet #15 continued

The Fearsome Incompatibles

Keep These	**Away From These**	**Or You May Get These**
Acids	Bases	Heat Violent Reaction
Acids or Bases	Reactive Metals (Aluminum, Beryllium, Calcium, Lithium, Potassium, Magnesium, Sodium, Zinc Powder), Metal Hydrides	Fire Explosion Hydrogen gas
Water or Alcohols	Concentrated Acids or Bases Calcium, Lithium, Potassium, Metal Hydrides, Other Water Reactive Wastes	Heat Fire Explosions Flammable and Toxic Gases
Reactive Organic Compounds or Solvents (Alcohols, Aldehydes, Nitrated Hydrocarbons)	Concentrated Acids or Bases, Reactive Metals and Metal Hydrides	Fire Explosion
Cyanide or Sulfide Solutions Acids	Acids	(Toxic) Hydrogen Cyanide Sulfide Gas
Strong Oxidizers (Chlorates, Chlorine, Chrome Acid, Hypochlorites, Nitrates, Perchlorates, Permanganates, Peroxides)	Organic Acids, Concentrated Mineral Acids, Reactive Metals, Metal Hydrides, Reactive Organic Compounds or Solvents, Flammable or Combustible Waste	Fire Explosion

Factsheet #16

Your Right to Know about Chemical Hazards

The Hazard Communication standard, known as the "right-to-know" standard, requires employers to inform and train workers about hazardous chemicals and substances in the workplace.

OSHA requires your company to:

- Keep a current list of hazardous chemicals that are in the workplace and have a SDS for every hazardous chemical used in the workplace and provide you or your representative with a copy no later than 15 days after the request, at no charge.
- Ensure that SDSs are readily accessible to all employees during each shift.
- Provide effective information and training to you and your co-workers prior to handling hazardous chemicals so that you understand the health effects of these chemicals and how to work with them safely. This training must be in a language and vocabulary that workers can understand
- Make sure that hazardous chemical containers are properly labeled with the identity of the hazardous chemical and appropriate hazard warnings
- Pay for Personal Protection Equipment that Section 8 of the SDS requires. Examples include hand, eye, skin or body, and respiratory protections.

Factsheet #17

An Alternative Source of Information

Through New Jersey's Right to Know program you can obtain factsheets (at no charge) for 1,717 commonly used hazardous substances and chemicals (630 are available in Spanish). The factsheets are easier to read than most SDSs. (website: http://web.doh.state.nj.us/rtkhsfs/indexfs.aspx).

The phone number for the Right to Know program is 609-984-2202. The e-mail address is rtk@doh.nj.gov.

Summary: Assessing Chemical Hazards & Understanding SDS's

1. The Occupational Safety and Health Administration (OSHA) requires all employers to comply with the Hazard Communication Standard (HAZCOM). It requires employers to inform employees about the chemical hazards they are exposed to on the job. Plants using highly hazardous chemicals are also required to train employees about chemical safety under OSHA's Process Safety Management Standard.

2. There are four basic ways that chemicals can enter your body:
   - Direct contact - on the skin or eyes
   - Absorption - through the skin
   - Ingestion - through the mouth with food
   - Inhalation - through the lungs

   Reproductive Hazards should be considered - physical and biological agents in the workplace that may affect fertility and pregnancy outcomes are practically unstudied.

3. You can't rely on your sense of smell to protect you from exposure to toxic chemicals.

4. After ingestion, inhalation or skin contact, toxic chemicals as well as their by-products affect the body. For most toxic substances to cause harm there needs to be a sufficient "dose" given. The higher the concentration, the larger the dose. The longer the exposure, the larger the dose.

5. There are two different types of effects that result from toxic exposure. They are acute and chronic. "Acute" means that health effects are felt at the time of exposure or shortly after, or result from a short-term, highly concentrated exposure. "Chronic" is a word that means the ill effects will not be seen for some time after exposure.

6. According to the U.S. Environmental Protection Agency, there are over 100,000 chemicals used in commerce today. Unfortunately, we produce chemicals first and ask questions later. Each year, 2,000 new chemicals are introduced in commerce. NTP is only able to evaluate 10 - 20 chemicals each year.

7. Safety Data Sheets (SDSs) give detailed information on chemical and physical dangers, safety procedures and emergency response techniques. Employers are required to have SDSs for every hazardous chemical in the workplace. The SDSs must be readily accessible to all employees on every shift and in the employee's work area.

8. The pH of a chemical tells you if the chemical is an acid, a base (also called alkali or caustic), or neutral. Chemicals with lower or higher pH should only be stored with chemicals of like pH and never with their opposite or a neutral chemical.

9. Through New Jersey's Right to Know program you can obtain factsheets (for no charge) on over 1,700 commonly used hazardous substances and chemicals. The factsheets are easier to read than most SDSs (formally known as MSDS's).