

# **CHEMICAL HAZARDS REFERENCE GUIDE**



**Division of Public Health  
Environmental Health Section  
Chemical Hazards Program**

**December 2002**



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**Georgia Department Of Human Resources**

## CHEMICAL HAZARDS PROGRAM

### CONTACT INFORMATION

Please call the Chemical Hazard Program staff at the following phone numbers or visit our website at:

<http://health.state.ga.us/programs/hazards>

Chemical Hazards Program	
<b>State Office, Atlanta</b>	(404) 657-6534
District Risk Communicators	
<b>District 1-1, Rome</b>	(706) 802-5343
<b>District 3-5, DeKalb County</b>	(404) 508-7900
<b>District 5-2, Macon</b>	(478) 751-6113
<b>District 9-3, Brunswick</b>	(912) 264-3931

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**IN AN EMERGENCY, DIAL 911  
OR PLEASE CONTACT:**

**Georgia Poison Center**

Throughout Georgia (800) 282-5846

Metro Atlanta (404) 616-9000

TTY (404) 616-9287

**Georgia Environmental Protection Division:  
Environmental Emergencies (spills, violations, etc.)**

Throughout Georgia (800) 241-4113

Metro Atlanta (404) 656-4300

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## **ABOUT THIS POCKET GUIDE**

The purpose of this pocket guide is to provide general information about many hazardous chemicals found in the environment, human exposure pathways, potential health effects from exposure, and referral resources.

The **Chemical Hazards Program** was established in 1994 to protect the health and promote the quality of life of Georgians through the prevention of exposure to hazardous chemicals in the environment.

The **Chemical Hazards Program** provides public health assessments and consultations, technical assistance, community education, professional training, and consultations and referrals. The Program serves district and local health departments, residents, educators, health care professionals, and state and federal environmental and public health agencies.

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## **CHEMICAL HAZARDS PROGRAM**

### **CONTACT INFORMATION**

Please call the Chemical Hazard Program staff at the following numbers or visit our website at:

<http://health.state.ga.us/programs/hazards>

### **CHEMICAL HAZARDS PROGRAM**

State Office, Atlanta (404) 657-6534

### **DISTRICT RISK COMMUNICATORS**

District 1-1, Rome (706) 802-5343

District 3-5, DeKalb County (404) 508-7900

District 5-2, Macon (478) 751-6113

District 9-3, Brunswick (912) 264-3931

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## **PROGRAM GOALS AND SERVICES**

The **Chemical Hazards Program** has three goals:

- **Goal 1** - Identify people at risk for health problems as a result of exposure to hazardous chemicals in the environment.
- **Goal 2** - Determine relationships between exposure to hazardous chemicals in the environment and human diseases.
- **Goal 3** - Eliminate exposures of health concern and prevent negative human health outcomes from exposure to hazardous chemicals in the environment.

To meet these goals, the **Chemical Hazards Program** can:

1. Determine whether actual or potential exposure to hazardous chemicals in the environment has occurred, is occurring, or might occur.
2. Document and address health concerns.
3. Educate the public about potential health hazards from exposure to environmental contamination.
4. Work as a liaison between the local community and government agencies.

The **Chemical Hazards Program** cannot:

1. Provide medical care.
2. Provide funds to the community.
3. Perform environmental sampling and testing.
4. Close down a business.

## PROGRAM GOALS AND SERVICES

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### **Focus**

- ❖ Residents
- ❖ District and local health departments
- ❖ State and federal agencies
- ❖ Community leaders and activists
- ❖ Health care professionals
- ❖ Educators
- ❖ Developers (brownfields redevelopment)

### **Approach**

The **Chemical Hazards Program** provides:

#### Public Health Assessments and Consultations

How to find documents completed for your area, and how to request a site investigation.

#### Health Studies and Health Advisories

Definitions and referral information.

#### Technical Assistance

Referral phone numbers, chemical facts, professional training, hazardous waste sites in Georgia, brownfields, and environmental terms and concepts.

#### Community Education

Education needs assessments, community involvement activities, household hazardous waste reduction, environmental justice, cancer cluster investigations, and fish consumption guidelines.

## PROGRAM GOALS AND SERVICES

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### **Air**

The **Chemical Hazards Program** investigates the potential for adverse health effects from exposure to indoor and outdoor air contaminated by chemicals, and odors from industry and other sources.

#### Indoor Air

Inhalation of chemical vapors, radon, and asbestos fibers can cause adverse health effects if people are exposed to high enough levels over an extended period of time.

#### Outdoor Air

Chronic exposure to industrial emissions and other sources of outdoor air pollution can cause adverse health effects if they are not properly regulated.

#### Odors

Although odors are not regulated, they can be a public health hazard when they affect the quality of life of those exposed. They may also exacerbate existing conditions, such as asthma, and cause symptoms such as nausea and headaches. These symptoms usually disappear when exposure to the odor ceases. The **Chemical Hazards Program** can meet with industry personnel and the regulatory authority to determine if engineering measures can reduce odors. We can also provide education to residents about the source of the odors, and ways to decrease adverse reactions.

## PROGRAM GOALS AND SERVICES

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### **Water**

#### Groundwater

Many people are concerned about the quality of their drinking water. Drinking water originates from an individual well or a municipal water supply that draws from groundwater. Municipal water supplies are regulated under the federal Clean Water Act, and are not considered to be a route of exposure to chemical contamination at levels that cause health effects. However, water from individual wells is not regulated in Georgia, and has been shown to be an exposure route in several instances where people live near a hazardous waste site. The **Chemical Hazards Program** assists residents who are concerned about the quality of their drinking water.

#### Surface Water

Chemical contamination from agriculture, industry, landfills, and other sources can enter streams, rivers, and lakes. Extensive water sampling and analyses programs are in place under federal laws to determine and monitor the extent of chemical contamination of Georgia waterways. Although most surface water bodies in Georgia are safe for recreational and fishing activities, there are certain areas where activities that expose people to contaminated water are limited. The **Chemical Hazards Program** provides detailed information about potential health effects from exposure to chemicals commonly found in surface water bodies, fish, and seafood.

## PROGRAM GOALS AND SERVICES

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### **Soil**

Soil contaminated with toxic chemicals can be ingested through inhaling dust and by consuming products grown in contaminated soil. In addition, children with a behavior disorder called *pica* often eat soil at levels high enough to be hazardous to their health.

The **Chemical Hazards Program** investigates whether exposure to contaminated soil above regulatory levels may be a health hazard, and provides education about specific chemicals and ways to reduce exposure. Contaminated soil is most commonly found at hazardous waste sites and where there is heavy use of pesticides, but it is also prevalent in industrial and urban settings. Several safety measures can be taken to prevent exposure to contaminated soil, such as planting in bare soil areas, regular cleaning of carpets, floors and other surfaces to reduce dust particles, and limiting the amount of time spent playing outdoors and gardening. Only a few toxic chemicals are absorbed by edible fruits and vegetables, so this exposure source is considered negligible.

### Background Levels

Many toxic chemicals, such as heavy metals, are found in soil at low levels because they are naturally occurring elements in the Earth's crust. Therefore, soil contamination levels are based on levels found above these background levels.

## PROGRAM GOALS AND SERVICES

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### **Child Health Initiative**

The Child Health Initiative recognizes that the unique vulnerabilities of infants and children demand special emphasis in communities faced with contamination of their water, soil, air, or food. Children are more likely to come into contact with contaminated dust, soil, and vapors close to the ground. Also, they often put toys and their hands into their mouths, and bring food into contaminated areas. Children receive higher doses of chemical exposure due to lower body weights. The developing body systems of children can sustain permanent damage if toxic exposures occur during critical growth stages.

The threat posed to children from exposure to contaminated environmental media is dependent on several factors. For example, a child's age, physical activity and the contaminants present are important factors. Parents of young children should exercise caution and implement interim measures to limit their child's exposure to toxic chemicals until more permanent measures are taken.

The **Chemical Hazards Program** can provide early intervention to reduce the health effects posed to children from exposure to chemicals in the environment. For example, medical referrals to specialty clinics and regular blood lead level testing can help to eliminate the threat of permanent damage and chronic health problems.

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## **PUBLIC HEALTH ASSESSMENTS AND CONSULTATIONS**

In response to concerns about adverse health effects from exposure to chemical contamination of the environment, public health assessments and consultations provide a thorough review of available environmental and epidemiological information and data, evaluation of the health implications of exposure, and recommendations for what actions may be needed to protect human health.

Public health assessments are more detailed than consultations and investigate all environmental media, while health consultations focus on one medium and are designed to answer a specific question (i.e., Is my drinking water contaminated?).

Both are published reports that help document local, state and federal agency activities at a site. They detail the site history, community concerns, the chemicals released and potential health effects from specific levels/pathways of exposure, assess populations at risk, and provide recommendations to protect public health.

Summaries of public health assessments and consultations conducted for sites in Georgia can be found at: <http://health.state.ga.us/programs/hazards>. For additional information or copies of specific documents, contact the **Chemical Hazards Program**.

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## **HEALTH STUDIES AND HEALTH ADVISORIES**

Investigations, surveillance, and analytic epidemiological studies evaluate exposed persons and explore the relationship between exposure and adverse health outcomes. These types of health studies try to determine how chemicals react in the environment, and involve medical examination of exposed people.

Health studies require extensive time and resources and are only conducted when humans have been exposed to significant levels of harmful chemicals over a long period of time. If the initial investigation detects hazardous exposures or an unusual pattern of disease, a health study may be initiated in an attempt to determine the adverse health effects caused by a particular substance.

Health advisories are issued when immediate threats to human health exist. A health advisory is a statement from a federal, state, or local agency that documents a release of hazardous substances posing a significant risk to human health. They recommend measures to take to reduce exposure and eliminate or substantially mitigate the significant risks to human health.

For more information about health studies and health advisories, please call the Agency for Toxic Substances and Disease Registry (ATSDR) Information Center at (888) 422-8737 or visit ATSDR online at [www.atsdr.cdc.gov](http://www.atsdr.cdc.gov).

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## TECHNICAL ASSISTANCE

### Referral Phone Numbers

#### Georgia Poison Center

Emergencies	(800) 282-5846
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#### Georgia Department of Human Resources (GDHR)

Chemical Hazards Program	(404) 657-6534
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Environmental Health Section	(404) 657-6534
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Lead Poisoning Prevention	(404) 657-2588
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Emergency Preparedness	(404) 463-2742
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#### Agency for Toxic Substances and Disease Registry (ATSDR)

General Information	(888) 422-8737
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Chemical Emergencies	(404) 498-0120
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#### Environmental Protection Agency (EPA)

General Information	(202) 260-2090
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Asbestos	(800) 368-5888
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Environmental Justice	(800) 962-6215
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National Lead Information Center	(800) 424-5323
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Pesticides	(800) 858-7378
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Radon	(800) 767-7236
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RCRA/Superfund Hotline	(800) 424-9346
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TECHNICAL ASSISTANCE

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**Referral Phone Numbers (continued)**

**EPA Region 4 (Southeast)**

General Information	(404) 562-9900
Toxics Management Division	(404) 562-9077
Water Management Division	(404) 562-9345
24 Hour Spill Reporting	(404) 562-8700
Lead Coordinators	(404) 562-8998

**Georgia Environmental Protection Division (GEPD)**

24 Hour Emergencies (Statewide)	(800) 241-4113
24 Hour Emergencies (Atlanta)	(404) 656-4300
Drinking Water Compliance Program	(404) 656-4807
Hazardous Site Inventory	(404) 363-7026

**GEPD Regional Offices**

Northeast Georgia Region	(706) 369-6376
Northwest Georgia Region	(404) 362-2671
Middle Georgia Region	(912) 751-6612
Southeast Georgia Region	(912) 264-7284
Southeast Georgia Region Satellite Office	(912) 353-3225
Southwest Georgia Region	(912) 430-4144

*Note: Visit GEPD at [www.ganet.org/dnr/environ](http://www.ganet.org/dnr/environ) and go to the bottom of the page for the Quick Look Guide that provides extensive contact information for GEPD departments and services.*

## TECHNICAL ASSISTANCE

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### **Chemical Facts**

The **Chemical Hazards Program** receives many inquiries about the health effects from specific chemicals. The following pages contain general information\* about the ten chemicals Georgians most often ask about.

1. Arsenic
2. Asbestos
3. Benzene
4. Cadmium
5. Dioxins
6. Lead
7. Mercury
8. Polychlorinated Biphenyl (PCB)
9. Tetrachloroethylene and Trichloroethylene
10. Vinyl Chloride

*\*Source: ToxFAQs™: Agency for Toxic Substances and Disease Registry, U.S. Department of Health and Human Services. Phone: (888) 422-8737, [www.atsdr.cdc.gov/toxfaq.html](http://www.atsdr.cdc.gov/toxfaq.html).*

For more information about these and other chemicals, please contact **Chemical Hazards Program** at (404) 657-6534, or visit our website at:

<http://health.state.ga.us/programs/hazards>

## TECHNICAL ASSISTANCE

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### Arsenic

Arsenic is a naturally occurring element widely distributed in the earth's crust. Arsenic is used to preserve wood and is an ingredient in pesticides, primarily for cotton plants. A person can be exposed to arsenic by:

- Eating food, drinking water, or breathing air containing arsenic.
- Breathing sawdust or burning smoke from wood treated with arsenic.
- Living in areas with unusually high natural levels of arsenic in rock.

Arsenic is a known human carcinogen. Ingesting high levels of inorganic arsenic can result in death. Lower levels can cause nausea and vomiting, decreased production of red and white blood cells, abnormal heart rhythm, damage to blood vessels, and painful tingling in hands and feet. Ingesting or breathing low levels of inorganic arsenic for a long time can cause a darkening of the skin and the appearance of small warts on the palms, soles, and torso. Skin contact with inorganic arsenic may cause redness and swelling.

Organic arsenic compounds are less toxic than inorganic arsenic compounds. Exposure to high levels of some organic arsenic compounds may cause similar effects as inorganic arsenic.

## TECHNICAL ASSISTANCE

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### Asbestos

Asbestos is a group of six different fibrous minerals that occur naturally in the environment. Asbestos fibers are strong, flexible, and heat resistant. Asbestos has been used for a wide range of manufactured goods, including roofing shingles, ceiling and floor tiles, paper products, automobile clutch, brake, and transmission parts, heat-resistant fabrics, packaging, gaskets, and coatings. A person can be exposed to asbestos by:

- working in and living near industries that make or use asbestos products or who are involved in asbestos mining.
- disturbance of asbestos-containing material during product use, demolition work, building or home maintenance, repair, and remodeling.

Breathing high levels of asbestos fibers for a long time may result in scar-like tissue in the lungs and in the pleural membrane (lining) that surrounds the lung. This disease is called asbestosis and can lead to disability and death. Breathing lower levels of asbestos may result in changes to the lungs called plaques, and can lead to a thickening of the pleural membrane that may restrict breathing. Asbestos can cause lung cancer and mesothelioma (cancer of the pleural membrane). Cigarette smoking along with exposure to asbestos can significantly increase the risk of getting lung cancer.

## TECHNICAL ASSISTANCE

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### Benzene

Benzene is a colorless liquid with a sweet odor formed from both natural processes and human activities. It evaporates into the air very quickly and is highly flammable. Benzene is widely used to make other chemicals for plastics, resins, nylon, synthetic fibers, some types of rubbers, glues, lubricants, dyes, detergents, drugs, and pesticides. Natural sources of benzene include volcanoes, forest fires, crude oil, gasoline, and tobacco smoke. A person can be exposed to benzene by:

- Automobile exhaust and air around gas stations.
- Leakage from underground storage tanks or from hazardous waste sites containing benzene.
- Working in industries that make or use benzene.
- Tobacco smoke.

Breathing very high levels of benzene can result in excessive bleeding, anemia and death. Lower levels can cause drowsiness, dizziness, rapid heart rate, headaches, tremors, confusion, and unconsciousness. Eating or drinking foods containing high levels of benzene can cause vomiting, irritation of the stomach, dizziness, sleepiness, convulsions, rapid heart rate, and death. It can also affect the immune system, increasing the chance for infection. Benzene is a known human carcinogen and can cause leukemia and cancer of blood-forming organs (i.e. bone marrow).

## TECHNICAL ASSISTANCE

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### Cadmium

Cadmium is a natural element in the earth's crust usually found as a mineral. All soils and rocks, contain some cadmium. Most cadmium is extracted during the production of other metals like zinc, lead, and copper. Cadmium does not corrode easily and has many uses including batteries, pigments, metal coatings, and plastics. A person can be exposed to cadmium by:

- Breathing contaminated workplace air (battery manufacturing, metal soldering or welding).
- Eating foods containing high levels (shellfish, liver, and kidney meats). All foods contain some cadmium.
- Breathing cadmium in cigarette smoke (doubles the average daily intake).
- Drinking contaminated water.
- Breathing contaminated air near the burning of fossil fuels or municipal waste.

Breathing high levels of cadmium damages the lungs and can cause death. Eating food or drinking water with very high levels severely irritates the stomach, leading to vomiting and diarrhea. Long-term exposure to lower levels of cadmium in air, food, or water leads to a buildup of cadmium in the kidneys and possible kidney disease. Other long-term effects are lung damage and fragile bones. Cadmium and cadmium compounds may reasonably be anticipated to be human carcinogens.

## TECHNICAL ASSISTANCE

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### Dioxin

Dioxins are a family of 75 compounds including 2,3,7,8-tetrachlorodibenzo-p-dioxin (2,3,7,8-TCDD), one of the most toxic, and most studied, of all chemicals. Dioxins are not intentionally manufactured by industry, but formed during the chlorine bleaching process at pulp and paper mills, chlorination of water, as contaminants in the manufacture of certain organic chemicals, and released into the air from municipal solid waste, medical, and industrial incinerators. A person can be exposed to dioxin by:

- Eating contaminated food (the source of more than 90% of human exposure to dioxins).
- Skin contact with dioxin-containing pesticides.
- Inhaling emissions from industries that release dioxins into air.
- Working in industries that produce products containing dioxins as impurities (e.g., paper and pulp mills, pesticide manufacturers, incinerators).

Exposure to high levels of 2,3,7,8-TCDD can cause chloracne, a severe skin disease with acne-like lesions, changes in blood and urine that may indicate liver damage, alterations in glucose metabolism, subtle changes in hormone levels, and a weakened immune system. Several studies suggest that exposure to 2,3,7,8-TCDD increases the risk of several types of cancer in people.

### Lead

Lead is a naturally occurring metal found in the earth's crust that can be found in all parts of our environment. Much of it comes from human activities including burning fossil fuels, mining, the production of batteries, ammunition, and metal products (solder and pipes), and devices to shield X-rays. A person can be exposed to lead by:

- Eating food or drinking water that contains lead.
- Inhaling dust from deteriorating surfaces containing lead-based paints.
- Working in industries where lead is used.
- Using health care products or folk remedies that contain lead.
- Engaging in certain hobbies in which lead is used (e.g., stained glass).

Lead can affect almost every organ and body system. At high levels, lead damages the kidneys and causes anemia and weakness in fingers, wrists, or ankles. The most affected is the central nervous system, particularly in young children and fetuses, whose developing bodies are extremely sensitive to its adverse health affects, including brain damage and impaired mental and physical growth. The effects from exposure to low levels of lead are uncertain. There is inadequate evidence to clearly determine if lead causes cancer.

## TECHNICAL ASSISTANCE

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### Mercury

Mercury is a naturally occurring metal that combines with other elements to form mercury compounds. Metallic mercury is used to produce chlorine gas, caustic soda, and is used in thermometers, dental fillings, and batteries. Mercury salts are sometimes used as antiseptic creams and ointments. Methylmercury is produced when metallic mercury combines with microscopic organisms in water and soil. A person can be exposed to mercury by:

- Eating fish and seafood with methylmercury in them.
- Breathing vapors in air from spills, incinerators, and industries that burn mercury-containing fuels.
- Dental work and medical treatments using mercury.
- Breathing contaminated air or skin contact in the workplace (health services, chemical industries).
- Rituals and folk medicines that include mercury.

Methylmercury and metallic mercury vapors are more harmful than other forms. Exposure to high levels of mercury can permanently damage the brain, kidneys, and developing fetus. It can cause irritability, tremors, and changes in vision or hearing. Short-term exposure to high levels of metallic mercury vapors may cause lung damage, nausea, vomiting, diarrhea, increases in blood pressure or heart rate, and skin rashes. There are inadequate human cancer data available for all forms of mercury.

## TECHNICAL ASSISTANCE

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### Polychlorinated Biphenyl (PCB)

Polychlorinated biphenyls (PCBs) are mixtures of individual chlorinated compounds. There are no known natural sources of PCBs. Many commercial PCB mixtures are used as coolants and hydraulic oils in transformers, capacitors, and other electrical equipment because they don't burn easily and are good insulators. PCBs do not readily break down in the environment and thus may remain there for very long periods of time. They may accumulate in fish and marine mammals, reaching levels that may be many thousands of times higher than in water.

A person can be exposed to PCBs by:

- Releases to air, water, and soil during their manufacture, use, and disposal; from accidental spills and leaks during their transport; and from leaks or fires in products containing PCBs.
- Facilities that release PCBs to the environment.
- Illegal or improper disposal of industrial wastes and consumer products.
- Leaks from old electrical transformers containing PCBs; and burning of some wastes in incinerators.

Exposure to large amounts of PCBs causes acne and rashes, and changes in blood and urine that may indicate liver damage. The few studies of workers exposed to high levels of PCBs indicate that they are associated with cancer of the liver and biliary tract.

## TECHNICAL ASSISTANCE

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### Tetrachloroethylene and Trichloroethylene

Tetrachloroethylene (PCE) or and trichloroethylene (TCE) are manufactured chemicals widely used for dry cleaning, metal-degreasing, and to make other products including adhesives, paint removers, and spot removers. They evaporate easily into the air and have a sharp, sweet odor. A person can be exposed to PCE and TCE by:

- Clothes from a dry cleaner that release small amounts of PCE into the air.
- Drinking, swimming, or bathing in water containing PCE and TCE.
- Breathing vapors from household products with PCE and TCE.
- Contact with PCE- and TCE-contaminated soil.
- Skin contact or breathing contaminated air during manufacturing using PCE and TCE.
- Using PCE and TCE-containing solvents to remove paint or grease from skin or equipment.

Breathing high concentrations of these chemicals can cause nerve, kidney, and liver damage, dizziness, headache, sleepiness, confusion, nausea, poor coordination, unconsciousness, and death. Irritation may result from repeated or extended skin contact. The health effects from exposure to low levels are not known. PCE and TCE may be a human carcinogen.

## TECHNICAL ASSISTANCE

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### Vinyl Chloride

Vinyl chloride is a colorless, flammable gas manufactured to make polyvinyl chloride (PVC) for a variety of plastic products including plumbing pipes, wire and cable coatings, furniture, and automobile upholstery. Vinyl chloride also results from the breakdown of other substances. Liquid vinyl chloride evaporates easily into the air from contaminated soil and water. In air, it can break down within a few days to other substances, some of which can be harmful. A person can be exposed to vinyl chloride by:

- Breathing vinyl chloride released from plastics industries, hazardous waste sites, and landfills.
- Breathing vinyl chloride in air or contact with skin or eyes in the workplace.
- Drinking water contaminated with vinyl chloride.

Breathing high levels of vinyl chloride can cause dizziness, sleepiness, unconsciousness, and death. People who breathe vinyl chloride for long periods of time can have changes to the structure of their liver, nerve damage, immune reactions, and breakdown of the bones in the hands. Vinyl chloride spilled on skin will cause numbness, redness, and blisters. The effects of drinking high levels of vinyl chloride are unknown. Vinyl chloride exposure can result in liver cancer.

## TECHNICAL ASSISTANCE

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### **Professional Training**

The **Chemical Hazards Program** provides professional training for district and local health department staff. Program information is presented every year at the New Environmentalists' Training, the Georgia Department of Human Resource Environmental Health Conference, and the Georgia Environmental Health Association's annual education conference.

The **Chemical Hazards Program** staff is available upon request to present information about general and/or specific issues related to hazardous materials at meetings, conferences, and in-services. We can address specific areas to help staff do a better job in hazardous waste exposure situations.

The **Chemical Hazards Program** serves as a continuing resource for district and county environmentalists and other public health and health care staff offering site-specific information, technical assistance, referrals; legislative updates, risk communication, community education, and public meeting representation.

For more information about these and other training opportunities and to request training, contact the **Chemical Hazards Program** at (404) 657-6534.

## TECHNICAL ASSISTANCE

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### **Hazardous Waste Sites in Georgia**

#### U.S. Environmental Protection Agency Superfund Sites

Congress enacted the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), or “Superfund”, in 1980. This law provides broad federal authority to respond directly to releases or threatened releases of hazardous substances that may endanger public health or the environment. CERCLA:

- established prohibitions and requirements concerning closed and abandoned hazardous waste sites;
- provided for liability of persons responsible for releases of hazardous waste at these sites; and
- established a trust fund to provide for cleanup when no responsible party could be identified.

Under Superfund, EPA conducts cleanups that require prompt response to protect public health and the environment at sites on the National Priorities List (NPL), and long-term response actions that permanently and significantly reduce the dangers associated with releases of hazardous substances at sites with no imminent hazard.

There are 15 NPL sites in Georgia, and many other federally listed sites. For more information, contact the **Chemical Hazards Program** at (404) 657-6534, or visit the EPA Superfund at [www.epa.gov/superfund/sites](http://www.epa.gov/superfund/sites).

## TECHNICAL ASSISTANCE

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### **Hazardous Waste Sites in Georgia (continued)**

#### Georgia Hazardous Site Inventory

The Hazardous Site Inventory (HSI) is a list of sites provided by the Georgia Environmental Protection Division (GEPD) where there has been a known or suspected release of a regulated substance into the environment above a reportable quantity, and has yet to show that they meet state clean-up standards.

There are several hundred sites on the HSI, and practically every county in Georgia has at least one HSI site. The HSI is updated annually as sites are added and removed. In the HSI, each site summary provides general information about the site: the name, location, a description of the regulated substances released, and the possible threats to human health or the environment from the release. For information about specific sites, contact the **Chemical Hazards Program** at (404) 657-6534.

Visit GEPD's website at [www.ganet.org/dnr/environ](http://www.ganet.org/dnr/environ) for an up-to-date list of these sites. There, you will find:

- sites listed by name in alphabetical order
- sites listed by county
- sites listed by site number
- sites listed by class
- maps of HSI site locations

## TECHNICAL ASSISTANCE

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### **Brownfields**

Brownfields are abandoned, idle, or underused industrial and commercial properties where redevelopment is hindered by real or perceived environmental contamination. They are most often found in economically distressed areas, such as inner cities.

In January 1995, the U.S. Environmental Protection Agency (EPA) launched the Brownfields Economic Redevelopment Initiative. The goal of the Initiative is to create a safer and cleaner environment, new jobs, increased property tax values, protection of thousands of acres of "greenfields," and a better community through redevelopment of used land. This goal is accomplished by:

- Giving seed money to local governments
- Removing liability barriers that prevent redevelopment of brownfields
- Developing partnerships with all stakeholders
- Promoting the local workforce
- Job training in brownfield site cleanup

Through this Initiative, a state, county, city, or tribe may apply for a Brownfields Assessment Pilot grant. The EPA uses an intensive screening process to select from many applications the communities that receive these grants of up to \$200,000.

## TECHNICAL ASSISTANCE

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### **Brownfields (continued)**

Georgia public health's role in brownfields redevelopment is to develop and implement strategies to ensure that public health issues are considered in the earliest phases of brownfields redevelopment. In Georgia, the following Pilot Grants have been awarded:

Community	Amount	Target
Atlanta	\$100,000	10 verified and 36 potential sites around downtown Atlanta
Augusta	\$200,000	ten-acre former salvage yard in Hyde Park
East Point	\$200,000	five-acre property near Atlanta Hartsfield International Airport
Macon	\$200,000	1,700-acre downtown industrial district
Fort Valley	\$200,000	cleanup and reuse of land in a downtown community

If you think there is a brownfield in your area that may benefit from this program, please contact the **Chemical Hazards Program** at (404) 657-6534 for a brownfields consultation.

For more information about brownfields, visit EPA's Brownfield website at: [www.epa.gov/brownfields](http://www.epa.gov/brownfields).

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## **COMMUNITY EDUCATION**

The **Chemical Hazards Program** provides community outreach in several ways:

### Education Needs Assessments

Site-specific community education programs based on community requests and formal needs assessments.

### Community Involvement Activities

The development of community organizations and information about how to organize and to become active in local environmental issues.

### Household Hazardous Waste

Common household products can be dangerous to you and your family – safe alternatives are available.

### Environmental Justice

Issues of discrimination when dealing with environmental hazards are often addressed at public meetings.

### Cancer Cluster Investigations

Investigations into environmental exposures and the resulting risks of developing cancer.

### Fish Consumption Guidelines

Providing information to sensitive populations such as pregnant women through the county health clinics.

## COMMUNITY EDUCATION

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### **Education Needs Assessment**

The education needs assessment is designed to assist communities and local health departments in working collaboratively to identify site-specific environmental health education needs and to develop and implement education programs to meet those needs. Below are the steps that the **Chemical Hazards Program** takes to conduct a needs assessment:

#### 1. Organizing Available Information

The process begins by gathering, evaluating, and organizing information already available from federal and state agencies, local governments, public repositories, the Internet, and many other sources. For example, identifying community resources (local officials, media, environmental groups), contact information, identifying outside resources, describing the site and significant events in its history, characterizing the area surrounding the site, and detailing perceived and actual health concerns.

#### 2. Community Involvement Activities

This part of the needs assessment process may be based on one of several models of community collaboration. Choosing one will depend on a number of factors such as the level of community involvement and organization, and public health threats or concerns.

**Education Needs Assessment (continued)**

3. Developing a Community Profile

The community profile consists of: community demographics (e.g., age, gender, race/ethnicity, religious preferences, literacy rates); details about each identified target population; practices or behaviors that place these populations at risk, and barriers to reaching each of the target populations.

4. Performing a Needs Assessment

This is conducted in collaboration with the community. Factors that define an education need, such as community concerns and knowledge, attitudes, and behaviors, are identified through research and communication with the affected public. Needs assessment methods include observation, focus groups, advisory groups, and surveys.

5. Developing an Action Plan

The needs assessment process concludes with the determination of priorities and development of an action plan that includes goals, measurable objectives, a program evaluation plan, and prioritized recommendations for public education activities and materials.

## COMMUNITY EDUCATION

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### **Community Involvement Activities**

Contact the **Chemical Hazards Program** to assist you with organizing a Community Advisory Group (CAG). A CAG is a panel of interested and/or affected persons who live near a hazardous waste site and will voice the concerns and education needs of the broader community,

The CAG will provide advice and guidance to state, local, and federal agencies. To ensure the development of a truly representative group of community members, consider geographic representation, professional diversity, income range, age, sex, race, and level of formal education. Identify leaders in the community and possible target populations that they may represent. Suggested sources for representatives include:

- Elected officials
- School systems
- Emergency response (police, fire) departments
- Clergy/religious organizations
- Chamber of Commerce
- Unions
- Medical community
- Environmental activist groups
- Special interest groups/charitable organizations
- Political organizations

### **Household Hazardous Waste**

Many of the products that are seen in homes today would be classified as hazardous waste if they were being used in an industrial setting. We often don't realize that these products need to be used and disposed of in ways that are specific to hazardous chemicals. If you have hazardous products in your home, it is important that you are aware of what the dangers are, and how to take appropriate measures to protect yourself. For more information about household hazardous waste, how you can protect yourself and your family from exposures, and safe alternatives to toxic chemicals, contact the **Chemical Hazards Program**.

#### What is a Household Hazardous Waste?

Household waste is any waste discarded from a home. Hazardous wastes are products that fall into four hazardous categories:

- Corrosive - damages human tissue
- Ignitable - catches fire under certain conditions.
- Toxic - causes injury or death if swallowed, absorbed, or inhaled
- Reactive - capable of causing an explosion

Examples of household hazardous wastes include anti-freeze, solvents (e.g., paint thinner), pesticides, drain openers, motor oil, acids, adhesives, and batteries.

### **Household Hazardous Waste (continued)**

#### Why are Household Hazardous Wastes a Concern?

If hazardous household products are used according to the instructions and are completely used up, then the product will not pose a threat to human health. However, most people have left over chemicals, and in some cases use the product improperly. When products are misused, stored, or disposed of improperly, they can contaminate air, soil, groundwater and surface water, injure homeowners or solid waste workers, and damage septic systems.

Examples of potentially hazardous behaviors are:

- One gallon of oil poured on the ground has the potential to contaminate over one million gallons of drinking water.
- Chemicals that get into a storm sewer can contaminate air, soil, lakes, and rivers, and can release vapors that can accumulate, possibly resulting in explosions or fires.
- Inadequately sealed containers release fumes that pose a health hazard to exposed individuals.
- Unused chemicals placed into the trash end up in landfills where they combine to form even more toxic chemicals that can take decades to biodegrade.

## COMMUNITY EDUCATION

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### **Environmental Justice**

The goal of environmental justice is to ensure that all people, regardless of race, national origin or income, are protected from disproportionate impacts of environmental hazards. To be classified as an environmental justice community, the majority of residents must be:

- a minority and/or low income group;
- excluded from the environmental policy setting and/or decision-making process;
- subject to a disproportionate impact from one or more environmental hazards; and
- experience a disparate implementation of environmental regulations, requirements, practices and activities in their communities.

Environmental justice is achieved when everyone, in a community enjoys the same degree of protection from environmental and health hazards and equal access to the decision-making process to have a healthy environment in which to live, learn, and work.

For more information, visit the U.S. Environmental Protection Agency's Environmental Justice website at [www.epa.gov/compliance/environmentaljustice](http://www.epa.gov/compliance/environmentaljustice).

## COMMUNITY EDUCATION

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### **Cancer and the Environment**

**The Chemical Hazards Program** responds to the many requests from citizens for investigations into possible cancer clusters. Cancer clusters may be suspected when people report that several family members, friends, neighbors, or co-workers have been diagnosed with cancer within a period of time. Reported disease clusters of any kind, including suspected cancer clusters, are investigated to try to determine whether a suspected cluster represents a true excess of cancer cases.

An investigation of environmental exposures and the resulting risks of developing cancer involve researching incidence and mortality rates and other health outcome data for one or more types of cancer in a population. Demographics, lifestyle factors, known or suspected releases of specific chemicals into the environment, and the potential pathways for exposure are analyzed to determine if an increased risk of cancer exists in an area.

A suspected cancer cluster is more likely to be a true cluster if it involves:

- A large number of cases of one type of cancer, rather than several different types;
- A rare type of cancer, rather than common types, or
- An increased number of cases of a certain type of cancer in an age group not usually affected by that type of cancer.

**Cancer and the Environment (continued)**

For a variety of reasons, most reports of suspected cancer clusters are not shown to be true clusters. Many reported clusters do not include enough cases to arrive at any conclusions. Sometimes, even when a suspected cluster has enough cases for study, a true statistical excess cannot be demonstrated. Other times, there is a true excess of cases, but no explanation for it can be found.

Epidemiologists try to establish whether the suspected environmental exposure has the potential to cause the reported type of cancer, based on what is known about that cancer's likely causes and what is known about the carcinogenic potential of the chemical and the type of exposure.

Various chemicals (e.g., benzene, asbestos, vinyl chloride, arsenic) show definite evidence of human carcinogenicity, while others are considered probable human carcinogens based on evidence from animal experiments (e.g., chloroform, formaldehyde, polychlorinated biphenyls [PCBs]). Often, direct evidence of human carcinogenicity has come from studies of workplace conditions involving sustained, high-dose exposures to specific chemicals. Occasionally, risks are greatly increased when particular exposures occur together (for example, asbestos exposure and cigarette smoking).

## COMMUNITY EDUCATION

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### **Cancer and the Environment (continued)**

Concerned individuals may report a suspected cancer cluster to the **Chemical Hazards Program**. We use established criteria when investigating reports of cancer clusters in which increasingly specific information is obtained and analyzed in stages. We are likely to request the following information:

- the potential cluster: type(s) of cancer, number of cases, suspected exposure(s), suspected geographic area, and time period.
- each person with cancer in the potential cluster: name, address, telephone number, gender, race, age, and area(s) lived in/length of time.
- each case of cancer: type of cancer, date of diagnosis, age at diagnosis, metastatic sites, date of death (if applicable), and physician contact.
- risk factors for each diagnosed person including lifestyle (i.e. smoking, sun exposure, diet), family history of cancer, and occupation(s).

The Georgia Department of Human Resource, Division of Public Health, provides available cancer statistics on their website at <http://health.state.ga.us>.

### **Cancer and the Environment (continued)**

#### Cancer Facts

Some concepts about cancer can be helpful when trying to understand suspected cancer clusters:

- Cancer is the uncontrolled growth and spread of abnormal cells in the body.
- Cancer is not just one disease; it is actually a term used for at least 100 different but related diseases.
- Each type of cancer has certain known and/or suspected risk factors associated with it (e.g., tobacco use, diet, heredity, and sun exposure).
- Cancer is not caused by injuries, nor is it contagious.
- Cancer is almost always caused by a combination of factors that interact in ways that are not yet fully understood.
- Carcinogenesis (the process by which normal cells are transformed into cancer cells) involves a series of changes within cells that usually occur over many years, which makes it difficult to pinpoint the cause and the time of onset of the cancer.
- Cancer is more likely to occur as people get older; because people are living longer, more cases of cancer can be expected in the future. This may create the impression of an abnormally high number of cases of cancer.

### **Fish Consumption Guidelines**

Fish and seafood are excellent sources of protein, minerals, and vitamins, and play a role in maintaining a healthy, well-balanced diet. Fish is the best source of Omega-3 fatty acids, which are essential for the development of a fetus.

Some fish contain contaminants that can be harmful if you are exposed to them over a period of time. By far, the most common toxic chemicals in Georgia fish are mercury and PCBs. Mercury is especially harmful to a developing child during pregnancy. A mother's exposure to mercury before pregnancy can also affect her baby.

Contaminated fish may not look, smell, or taste different, but they can still harm you and your child. Women who are or may become pregnant should follow fish consumption guidelines. These guidelines are designed so that you can still get the benefits of eating fish by wisely choosing:

- How much fish are eaten
- How often fish are eaten
- Safer types of fish
- Safer ways to prepare fish

## COMMUNITY EDUCATION

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### **Fish Consumption Guidelines (continued)**

The quality of sport fish caught in Georgia is very good; however, low levels of some toxic chemicals have been found in some fish. To know how often certain species of fish can be safely eaten, the Georgia Department of Natural Resources (GDNR) has developed guidelines that are available in the booklet, *Guidelines for Eating Fish from Georgia Waters*, and in the *Georgia Sport Fishing Regulations*.

The guidelines are updated annually and can be found at several places including GDNR's State and Regional offices, District and County Health Departments, and popular fishing-related outlets. In addition, they are available on the GDNR website: [www.ganet.org/dnr/environ](http://www.ganet.org/dnr/environ).

The guidelines are designed to help you understand the fish species that you should avoid eating, those that you can eat in limited amounts, and fish that can be eaten in unlimited amounts.

The guidelines list the lakes, rivers, streams, coastal areas, and other water bodies in Georgia, and specify the frequency and amount of each species that are safe to eat from each water body in weekly, monthly, or unlimited amounts. In addition, the guidelines contain detailed information on the parts of a fish that are less safe to eat,

## COMMUNITY EDUCATION

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### **Fish Consumption Guidelines (continued)**

such as the fat, and provide detailed preparation and cooking instructions that can greatly lower your risk of exposure. You can reduce exposure to contaminants in fish and seafood by following these recommendations:

#### Consider the source of the fish

- Avoid eating fish from areas known to have high levels of contaminants.
- When given recreationally caught fish, ask where it was caught, what species of fish it is, and check the guidelines to see if advice exists for that particular type of fish.
- If the safety of the fish is unknown, consider not eating it or consult the guidelines for advice on similar species or locations near where it was caught.

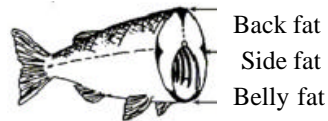
#### Choose the type of fish

- Eat a variety of fish from different sources.
- Avoid eating fish with more fatty flesh (catfish, bass, etc.) because many contaminants, including PCBs, are stored in fat.
- Eat smaller-sized fish (within state size regulation), because older or bigger fish tend to build up contaminants in their bodies.

**Fish Consumption Guidelines (continued)**

Safer preparation and cooking methods

- Avoid batter or breading because they hold in liquid that may contain contaminants.
- Eat less fried and deep-fat fried fish because frying seals in the chemicals that might be in the fish's fat. Recommended cooking methods include broiling, grilling, roasting, and steaming.
- Cooking does not destroy chemicals in fish, but heat from cooking melts the fat and allows some of the contaminated fat to drip away. Bake or broil the fish on an elevated rack that allows fat to drain away from the fish.
- After cooking, discard all liquids. Do not reuse for soup or sauces.
- Before cooking, remove and do not eat the organs, head, or skin. Trim all the fat from the belly, sides, back and under the skin (see diagram below):



Cut off and discard all fat

## COMMUNITY EDUCATION

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### **Fish Consumption Guidelines (continued)**

It is safe to eat most fish caught in Georgia waters and purchased in stores and restaurants. However, some fish are not safe for pregnant or nursing women, women who may become pregnant, or young children. To protect yourself and your children, follow fish consumption guidelines. In addition:

- Discuss the fish you eat with your health care provider.
- Remember to consider all sources of fish you eat when making your choices
- Consider making changes in the type of fish you eat, the source of the fish, how much you eat, how often you eat fish, and how you prepare them.

For more information about fish and seafood consumption guidelines in Georgia, and for a copy of *Guidelines for Eating Fish from Georgia Waters*, contact the **Chemical Hazards Program** at (404) 657-6534. For information about national fish and seafood consumption advisories, visit the U.S. Environmental Protection Agency at [www.epa.gov/ost](http://www.epa.gov/ost). For Information about commercial fish and seafood, contact the U.S. Food and Drug Administration, Seafood Hotline, at (800) FDA-4010 or visit [www.cfsan.fda.gov](http://www.cfsan.fda.gov).

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## ENVIRONMENTAL HEALTH TERMS AND CONCEPTS

This glossary is intended to help people become familiar with the terms and concepts they are likely to see in government reports, engineering studies and health literature. It is divided into two sections:

- Definitions
- Units of Measure

### Definitions

**Acute** - Occurring over a short time, usually a few minutes or hours. An acute exposure can result in short term or long-term health effects. An acute effect happens within a short time after exposure.

**Ambient** - Surrounding. Ambient air is usually outdoor air (as opposed to indoor air).

**Aquifer** - An underground source of water contained in a layer of rock, sand or gravel. Usually the source of drinking water for both individual wells and municipal water systems.

**Background level** - A typical or average level of a chemical in the environment. Background often refers to naturally occurring or uncontaminated levels. Many toxic chemicals (mercury, lead, arsenic, radon) are naturally found in the environment because they are elements in the Earth's crust.

## TERMS AND CONCEPTS

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- Biological monitoring** - Measuring chemical levels over a period of time in biological samples (e.g., blood).
- Body burden** - The total amount of a chemical in the body. Some chemicals build up in the body because they are stored in body organs, fat or bone, or are eliminated very slowly.
- Carcinogen** – A substance that tends to produce cancer.
- Case control study** - A study in which people with a disease or known exposure (cases) are compared to people without the disease or known exposure (controls) to determine whether cause and an effect exist.
- CERCLA** - Comprehensive Environmental Response, Compensation and Liability Act. See "Superfund."
- Chronic** - Occurring over a long period of time; usually over several years.
- Cohort study** - A study of a group of people who were exposed to a chemical during a given time period. The cohort study is used to determine if there is an increased health risk related to the exposure.
- Composite sample** - A sample of water, soil or other medium which is made by combining samples from two or more locations.
- Dermal** - Referring to the skin. Dermal absorption means absorption through the skin.
- Detection limit** - The amount of substance that a laboratory can reliably measure in a sample of air, water, soil or other medium.

## TERMS AND CONCEPTS

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**Dose** - The quantity of a substance to which a person is exposed. Dose often takes body weight into account.

**Epidemiology** - The study of the occurrence and causes of health effects in human populations. An epidemiological study often compares two groups of people who are alike except for one factor such as exposure to a chemical or the presence of an effect.

**Exposure** - Contact with a chemical by swallowing (ingestion), by breathing (inhalation), or through the skin (dermal). Exposure may be either short term (acute) or long term (chronic).

**Health Outcome Data or Disease Registry** - A record of people exposed to a specific substance (such as a toxic chemical), or displaying a specific health effect (such as cancer or a disease).

**Latency period** - The period of time between exposure to a toxic substance and the onset of health effects. Cancer caused by chemical exposure may have a latency period of 5 to 40 years.

**Maximum Contaminant Level (MCL)** - The highest (maximum) level of a contaminant allowed by federal or state regulations in a public water supply system.

**Media (medium)** - Soil, water, air, plants, animals or any other parts of the environment that can contain contaminants. Body tissues or fluids such as blood or bone may also be media.

**Morbidity** - Morbidity is the proportion of illnesses or cases of a disease in a geographic locality.

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**Mortality** – The relative frequency of death in a specific population.

**National Priority List (NPL)** - A listing of active hazardous waste sites eligible for federal funds for investigation and clean up. The list is produced and updated annually by the U.S. Environmental Protection Agency (EPA).

**Organic** - Originally coming from plants or animals, and made primarily of carbon and hydrogen.

**Plume** - A concentration of contaminants moving away from its source in a long band or column. For example, a plume can be a column of smoke from a chimney or chemicals moving with groundwater.

**Quality assurance and quality control (QA/QC)** - A system of procedures, checks and audits to judge the quality of measurements and allow for more accurate environmental data.

**Remediation** - Correction or improvement of a problem, such as work that is done to clean up or stop the release of chemicals from a hazardous waste site. Remedial work may include removing soil and/or drums, capping the site or collecting and treating the contaminated groundwater.

**Risk** - Risk is the possibility of injury, disease or death.

**Risk assessment** - A process that estimates the likelihood that people who have been exposed to chemicals may have health effects. The four steps of a risk assessment are: hazard identification (Can this sub

## TERMS AND CONCEPTS

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stance damage health?); dose-response assessment (What dose causes what effect?); exposure assessment (How much do people have contact with it?); and risk characterization (combining the other three steps to estimate risk).

**Risk management** - The process of deciding how to reduce or eliminate possible health effects by considering the risk assessment, remediation factors, and social, economic and political concerns.

**Route of exposure** - The way in which a person may contact a chemical substance. For example, drinking (ingestion) and bathing (skin contact) are two different routes of exposure to contaminants that may be found in water.

**Superfund (federal and state)** - The federal and state programs to investigate and clean up inactive hazardous waste sites.

**Target organ** - An organ (such as the liver or kidney) that is specifically affected by a toxic substance.

**Volatile organic compound (VOC)** - An organic chemical that evaporates easily. Chlorinated solvents such as those used by dry cleaners or contained in paint strippers are VOCs. Petroleum products such as kerosene, gasoline and mineral spirits contain VOCs.

## TERMS AND CONCEPTS

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### Units of Measure

#### **Length**

**meter (m)** - One meter is about 39 inches and slightly longer than a yard.

**Centimeter (cm)** - A centimeter is one one-hundredth ( $1/100$ ) of a meter. About 2.5 cm equal one inch. A penny is about 2 cm wide.

**millimeter (mm)** - One millimeter is equal to one one-thousandth ( $1/1,000$ ) of a meter. A dime is slightly thicker than one mm. About 25 mm equal one inch.

#### **Mass**

**kilogram (kg)** - A unit of mass equal to 1,000 grams. A kilogram is equal to about 2.2 pounds.

**gram (g)** - There are about 28 grams in one ounce and 454 grams equal about one pound. A teaspoon of sugar weighs about 8 grams.

**milligram (mg)** - A unit of mass equal to one thousandth ( $1/1,000$ ) of a gram. A milligram is about one half million times smaller than a pound.

**microgram (ug)** - A unit of mass equal to one millionth ( $1/1,000,000$ ) of a gram, or about one half billionth ( $1/500,000,000$ ) of a pound.

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### **Volume**

**liter (l)** - A liter is slightly larger than a quart and about 3.8 liters are equal to a gallon.

**milliliter (ml)** - A unit of volume equal to one one-thousandth (1/1,000) of a liter. One teaspoon holds about 5 ml of water.

**cubic meter (m<sup>3</sup> or cu.m.)** - Commonly used to measure a volume of air. A cubic meter is the space inside of a box that is one meter wide, one meter high, and one meter deep. One cubic meter is slightly larger than the volume of an average refrigerator.

### **Concentration**

**milligrams per liter (mg/l)** - The concentration of a substance dissolved in a liquid. One mg/l of sugar in water is about the same as a teaspoon of sugar in 2,100 gallons of water. For some liquids (including water) milligrams per liter (mg/l) is about the same as parts per million (ppm).

**milligrams per cubic meter (mg/m<sup>3</sup> or mg/cu.m.)** - The concentration of a substance in air. One mg/m<sup>3</sup> of ethyl alcohol in air would be about the same as 1 drop of alcohol in the air of a room that is 8 feet high, 10 feet wide and 23 feet long.

**micrograms per cubic meter (ug/m<sup>3</sup> or ug/cu.m.)** - The concentration of a substance in air. One ug/m<sup>3</sup> is 1,000 times smaller than one mg/m<sup>3</sup>

## TERMS AND CONCEPTS

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**milligrams per kilogram (mg/kg)** - The concentration of a substance in a solid. Often the dose of a drug or chemical: milligrams (mg) of substance per kilogram (kg) of body weight. For example, a 70 kilogram (kg) person (about 154 pounds) given one aspirin, which has 325 mg of active ingredient, would get a dose of 325 mg/70 kg, or 4.6 mg/kg.

**parts per million (ppm)** - The concentration of a substance in air, water or soil. One ppm means that there is one part of a substance for every million parts of the water or soil in which it is measured. One ppm is about one drop of dye in 18 gallons of water, about one inch in 16 miles, or one penny in \$10,000.

**parts per billion (ppb)** - The concentration of a substance in air, water or soil. One ppb means that there is one part of a substance for every billion parts of the air, water or soil in which it is measured. One ppb is about one drop of dye in 18,000 gallons of water or about 1 second in 32 years. One ppb is 1,000 times less than one ppm.

**parts per trillion (ppt)** - The concentration of a substance in air, water or soil. One ppt means that there is one part of a substance for every trillion parts of air, water or soil. One ppt is about one drop of dye in 18 million gallons of water or about 1 second in 32,000 years. One ppt is 1,000 times less than 1 ppb