

ENVIRONMENTAL HEALTH

I. Environmental Health

- A. People often affect the environment in ways that can have an impact on their health.
- B. The study of the effects of environmental factors on humans and the effects of humans on their environments is called environmental health.
- C. Until products containing CFCs were banned in 1979, these chemicals contributed to the depletion of the earth's ozone layer.
- D. People in industrialized nations like the United States produce millions of tons of municipal solid waste (garbage) each year.
- E. This waste ends up in landfills and may release toxic chemicals that seep into water supplies, polluting them.
- F. Many of the toxic chemicals present in the home, workplace, or outdoor environments affect health.
- G. Toxic chemicals result in poisoning (toxicity) that damages body tissues and affects bodily functions.
- H. Skin inflammation, asthma, lung disease, and immune system disorders may result from exposure to toxic chemicals.

II. Environmental Health in and Around the Home

- A. Poisoning
 - 1. Most human poisonings in 2011 occurred in the home
 - 2. Approximately 84% of poisonings were unintentional, which included medication errors, bites and stings, food poisonings, and occupational mishaps.
 - 3. In 2012, poisoning occurred in children under the age of 6 approximately 44% of the time.
 - 4. Suspect poisoning in a person who becomes ill suddenly with symptoms that affect many body systems, appears drowsy or indifferent, or exhibits bizarre behavior.
 - 5. If poisoning is suspected, one should call the local poison control center for instructions.
 - 6. Refer students to the Managing Your Health box, "Tips to Prevent Poisonings"
- 7. Toxic Plants
 - a. Some common plants or parts of plants that are toxic include holly berries, morning-glory seeds, narcissus, daffodil bulbs, rhubarb leaves, and sweet pea seeds.
 - b. Other poisonous plants include hemlock, jimson weed, dieffenbachia, philodendron, and mountain laurel.
 - c. Poinsettia is not toxic.

- d. Houseplants and cut flowers should be kept out of the reach of children.
 - e. 1-2% of mushroom species are toxic.
8. Ingestion of Household Cleaning Aids, Medications, and Vitamins
- a. Children under 5 years of age are at most danger of being poisoned from ingesting household cleaning aids, and over-the-counter and prescription drugs and vitamins.
 - b. The Federal Hazardous Substances Act, passed in 1966, has been helpful in lowering the incidence of poisoning in children by controlling the concentration of toxic chemicals in household products.
 - c. The Poisoning Prevention Packaging Act of 1972 established standards for the packaging of potentially harmful household products and medications.
 - d. The use of warning stickers such as Mr. Yuk has not lowered the incidence of poisoning in children.
 - e. All potentially poisonous substances should be kept in locked cabinets.
 - f. Children can become poisoned by accidental overdoses of certain vitamins and minerals.
 - g. Adults can become poisoned by taking intentional overdoses of these dietary supplements.
9. Lead Poisoning
- a. In the United States, lead poisoning is still a health problem in children, even though many sources of lead, such as leaded gasoline, leaded solder in food and drink cans, and leaded paint, have been eliminated.
 - b. Lead poisoning is serious because it affects the central nervous system and can cause coma, convulsions, and even death.
 - c. While adults absorb about 11% of lead reaching the digestive tract, children absorb from 30% to 75%. When lead is inhaled, up to 50% is absorbed.
 - d. Certain ceramic ware can have high levels of lead that can leach out of the dishes and into food.
 - e. Car batteries contain lead and some pipes that bring water into households have lead-based solder.
 - f. Although lead is not in gasoline, the soil surrounding roads often still contains lead from past emissions.
 - g. Dwellings built before 1978 were frequently painted with lead-based paint that can create leaded dust.
 - h. This dust can be inhaled or the paint can be eaten by children, poisoning them.
 - i. Lead-based paints must be carefully removed from homes by special means.
 - j. Although deaths resulting from lead poisoning are rare, low levels of lead in the blood are associated with decreased intelligence, learning disabilities, impaired nervous system development, and delayed or stunted growth.
10. Carbon Monoxide Poisoning
- a. Carbon monoxide is a colorless, odorless, tasteless gas that can kill.
 - b. The incomplete combustion of carbon-containing fuels—such as coal, oil, wood, natural gas, charcoal, and gasoline—produces carbon monoxide.

- c. Fires are a major source of carbon monoxide poisoning.
 - d. Automobile exhaust, malfunctioning furnaces, charcoal fires, gasoline powered tools, wood stoves, fireplaces, unvented kerosene and gas space heaters, gas-cooking ovens and stoves, and tobacco smoke are all sources of carbon monoxide.
 - e. To avoid carbon monoxide poisoning, one should use charcoal grills and gas-powered engines or tools in well-ventilated areas.
 - f. Do not leave a car running in an attached garage where fumes can leak into the house.
 - g. Carbon monoxide sensors are available for home use.
 - h. Carbon monoxide kills because it binds to hemoglobin in blood, interfering with hemoglobin's ability to carry oxygen.
 - i. The signs and symptoms of carbon monoxide poisoning include progressively worsening headache, fatigue, dizziness, nausea, vomiting, a cherry-red skin color, and blurry vision.
- B. Inhalation of Asbestos Fibers
1. Asbestos is a fiber-like mineral that resists damage by fire or other natural processes.
 2. Long-term inhalation of microscopic asbestos fibers can result in asbestosis, lung cancer, and stomach cancer.
 3. In 1989, the Environmental Protection Agency (EPA) banned all asbestos products by 1996.
 4. Intact asbestos poses no health risk; the danger occurs when products that contain asbestos deteriorate or become damaged or disturbed.
 5. Under these conditions, asbestos fibers are released and become airborne.
 6. Asbestos removal requires trained, certified personnel who can do this job safely and properly.
- C. Electromagnetic Radiation
1. The effects of extremely low frequency (ELF) radiation have been studied extensively.
 2. ELF is a type of electromagnetic radiation, electric and magnetic fields of energy, that travels at the speed of light through atmosphere, such as sunlight.
 3. X-rays, UV light, infrared light, and radio waves are forms of electromagnetic radiation.
 4. Extremely low frequency radiation is the type of radiation emitted by electric power lines, electrical distribution substations, video display terminals, televisions, electric blankets, microwave ovens, cell phones, and electrical appliances.
 5. So far, most scientists see no major negative effects of ELF radiation and no reason to recommend extreme caution.
 6. However, it may be prudent to avoid excess exposure to ELF.
 7. Cell phones generate a form of non-ionizing radiofrequency (RF) energy.
 8. The main source of the energy is the phone's antenna.
 9. The World Health Organization's International Agency for Research on Cancer (IARC), in a May 31, 2011 press release, revealed that they had "classified radiofrequency electromagnetic fields as possibly carcinogenic [cancer-causing] to humans...based on an increased risk for glioma, a malignant type of brain cancer,

associated with wireless phone use.” The many sources of data that the IARC reviewed suggested a 40% increase in risk for glioma in heavy cell phone users, defined as an average of 30 minutes per day for 10 years.

D. Irradiation of Food: The Debate

1. One method of killing organisms in food is irradiation; that is, treating food with radiation.
2. Radiation is the emission of energy by the unstable nuclei of certain atoms in the form of rays or waves.
3. Irradiation kills organisms in the food, and it can inhibit the sprouting of vegetables and delay the ripening of fruits.
4. The FDA allows irradiation of fresh produce, herbs, spices, pork, poultry, and red meat.
5. Opponents to food irradiation are primarily consumers and consumer groups who think this process induces chemical changes in the nutrients that compose food, affecting the color, odor, and texture of food.
6. They argue that these changes could result in unidentified toxins that might be harmful to humans.

III. Environmental Health in the Workplace

A. Pesticide Poisoning

1. Pesticides are chemicals that kill plant and animal pests.
2. People rarely become poisoned by using pesticides in their homes or yards, but they should be cautious.
3. People should store pesticides in clearly marked containers.
4. Pesticide residues on foods are not considered toxic.
5. Most cases of pesticide poisoning involve workers who manufacture or apply pesticides.
6. The relationship of high-level exposure to pesticides and cancer has been studied by many researchers. Determining if a causal link exists between pesticide exposure and cancer is difficult in that occupational exposure may include a variety of pesticides and cancer can have many causes.

B. Exposure to and Inhalation of Other Toxic Chemicals

1. A *solvent* is a liquid in which another substance is dissolved.
2. Exposure to most solvents slows nerve transmission in the brain and spinal cord, resulting in slower body movement and thought processes.
3. Some solvents are skin irritants.
4. Processing metals such as aluminum, tin, copper, and iron can release toxic dusts and vapors.
5. Exposure to heavy metals (such as lead, mercury, or manganese), and solvents can damage the lungs, nervous system, and other parts of the body.
6. The Occupational Safety and Health Administration (OSHA) regulates procedures in industries to protect the health of workers.

C. Indoor Air Pollution

1. Sick building syndrome refers to a variety of symptoms reported by occupants of large buildings.
2. Workers complain of headaches; unusual fatigue; eye, nose, and throat irritation; and shortness of breath.
3. The primary cause appears to be poor ventilation in these buildings.
4. Office furniture and building materials may emit toxic chemicals, such as formaldehyde, that produce breathing problems and other health ailments.
5. Air ventilation systems designed to remove toxic chemicals may improve indoor air quality.
6. **Formaldehyde** is a chemical used in the manufacture of many building materials and furnishings, which then release formaldehyde into the air.
7. Radon gas may also contaminate indoor air.
 - a. Radon is present in rocks and soils in many areas of the United States.
 - b. The gas leaks into homes through cracks in basement walls.
 - c. People who breathe this gas are at risk of lung cancer.

IV. Environmental Health in the Outdoors

A. Water Pollution

1. Underground and above ground sources of water can become contaminated with pathogens or toxic chemicals from the environment.
2. Water-borne infectious diseases are widespread problems in countries that have no water purification systems.
3. In developed countries, sewage treatment plants treat wastewater so it does not contaminate water supplies and public drinking water is chlorinated to kill pathogens.
4. Chemicals can contaminate surface water and groundwater (aquifers).
5. In the United States, the Clean Water Act of 1972 and the Federal Water Pollution Control Act of 1972 (and their amendments) prohibit industries from discharging toxic chemicals into surface water.
6. The Safe Drinking Water Act authorizes the EPA to monitor the safety of drinking water and requires the use of lead-free solder in plumbing pipes.
7. The toxic waste cleanup bill known as the “Superfund” provided money to find polluters and force them to pay to clean up their toxic waste sites.
8. Chlorine is used to treat drinking water, and some scientists are concerned that it can form chloroform or other toxic substances.
9. At normal levels of consumption, chlorinated water is not likely to produce cancer, miscarriages or birth defects.
10. Tap water can be tested for pollutants; carbon filters can be used to remove carbon-containing compounds and chlorine from tap water.
11. Bottled water is not necessarily safer than tap water.

B. Air Pollution

1. Sulfur dioxide (SO₂), nitrogen dioxide (NO₂), ozone (O₃), particulates, and carbon monoxide (CO) are the primary substances in air that can harm people. These substances form when fossil fuels burn.
2. Fossil fuels include gasoline, coal, natural gas and oil.
3. Automobiles and coal-fired power plants are the two main contributors to air

pollution.

4. The use of small gas-powered machines such as leaf blowers, chain saws, and snow blowers also contribute to air pollution.
5. Sulfur dioxide combines with water in the atmosphere to produce sulfuric acid, the main component of acid precipitation.
6. Acid precipitation damages living and nonliving things and acidifies surface water supplies.
7. Sulfur oxides and particulates combine with water in the air to form a haze called smog (smoke plus fog).
8. The components of smog damage the lungs and make existing respiratory ailments worse.
9. Particulates are small particles dispersed in air that can accumulate in the lungs.
 - a. They are a factor in the development of respiratory diseases such as bronchitis, emphysema, and asthma. Breathing particulates can also worsen these illnesses.
10. Sulfur dioxide in air irritates mucous lining of the eyes and lungs.
11. The combined effects of sulfur dioxide and particulates have a greater effect than if only one of these pollutants are present.
12. Carbon monoxide, nitrogen dioxide, and ozone are produced primarily as a result of emission from vehicles.
13. Nitrogen dioxide and ozone irritate the eyes, lungs, and other mucous membranes.
14. When exposed to air pollution, people with the highest risk of developing respiratory problems are the elderly, the very young, and individuals with chronic lung or heart disease.
15. Cities polluted primarily by automobile emissions (photochemical smog) are located primarily in the southwestern United States.
16. The Air Quality Index (AQI) is a means by which the public is informed of air quality.
17. Since the passage of the Clean Air Act and related amendments, air quality in the United States has improved greatly.

C. Noise Pollution

1. Noise pollution can have a negative effect on health.
2. Loudness is measured in *decibels* (dB).
3. Sounds that are soft or quiet are 50 dB or less; sounds as loud as 80 dB are annoying and ,at 85 dB, hearing may be permanently damaged.
4. Sounds of 120 dB or more produce pain.
5. An estimated 40% of Americans are exposed to enough noise to produce permanent hearing loss.
6. The damaging effects that noise has on hearing are cumulative.
7. Tinnitus is ringing or roaring sensation in the ears that can result from partial hearing loss.
8. Exposure to loud noises increases the heart rate, raises blood pressure, and contributes to muscle tension.
9. Exposure to noise also increases the amount of stress hormones secreted into the bloodstream.
10. Even moderate daytime noise levels can increase anxiety and hostile behavior in

- some people.
11. If you are in a noisy place, request that the volume of sound be turned down.
 12. Wear ear protection in noisy environments.

V. Across the Life Span: Environmental Health

- A. Environmental health hazards are a risk for all segments of the population.
- B. Young children are most at risk for unintentional poisoning by ingestion of toxic substances because they lack understanding that these materials are harmful and they put most things in their mouths;
- C. Also extremely susceptible to carbon monoxide poisoning or air pollutants are the elderly and persons with chronic lung or heart disease, whose lung function may be impaired.