Objectives

Upon completion of this module, you will be able to

- Identify and understand the different types of outdoor pollutants and their toxic effects

- Understand the toxic effects of various types of metals, pesticides, and other important chemicals

- Become familiar with ATSDR’s ToxFAQs, Toxicological Profiles, and Fact Sheets
Main Outdoor Pollutants

- Carbon Monoxide
- Sulfur Oxides
- Ozone
- Nitrogen Oxides
- Particulates
Carbon Monoxide (CO)

- Colorless, odorless, and tasteless gas
- Lighter than air, dissolves in water
- Decreases the amount of oxygen available to cells
Carbon Monoxide (CO) (continued)

- Common Sources:
  - Automobile exhaust
  - Charcoal, wood, kerosene, or gas stoves
  - Smoking Tobacco
  - Foundries, coke ovens, and refineries
Carbon Monoxide (CO) (continued)

Health effects:

- Headache, nausea, irritability, increased respiration, chest pain, impaired judgment, and fainting.

- Damage to central nervous system (CNS), poor memory, and general mental decline
Sulfur Oxides

- **Common Sources:**
  - Automobile exhaust
  - Petroleum refineries
  - Paper manufacturing
  - Chemical industries

- **Two Types:**
  - Sulfur Dioxide ($SO_2$)
  - Sulfur Trioxide ($SO_3$)
Sulfur Oxides (continued)
Sulfur Dioxide (SO₂)

- Colorless gas with a bitter taste
- Under pressure it is a non-flammable liquid
- Biotransformed in the body
- Effects:
  - Lungs
  - Eyes
  - Skin
Ozone (O$_3$)

- Colorless gas, very light odor
- Major air pollutant in large industrialized cities

Symptoms:
- Eye, nose, throat, and lung irritation
- Coughing and problems with breathing
- Chest pain and pneumonia
Nitrogen Oxides

- **Sources:**
  - Combustion of coal and oil
  - Burning fuels in furnaces and internal combustion engines
  - Detonation of explosives and welding
  - Tobacco smoke

- **Symptoms:**
  - Coughing, heavy breathing, chest pain, irregular heartbeat, and eye irritation
Nitrogen Oxides (continued)

- Nitric Oxide (NO)
- Nitrogen Dioxide (NO₂)
- Nitrogen Trioxide (N₂O₃)
- Nitrogen Tetroxide (N₂O₄)
- Nitrogen Pentoxide (N₂O₅)/Nitrous Oxide (N₂O)
Particulates

- Sources:
  - Automobile exhaust
  - Smokestacks
  - Blowing dust

- Size and Composition play a big role in determining health risk
  - Small particles and heavy metals pose a threat to health
- Heavy Metals
  - Arsenic
  - Cadmium
  - Lead
  - Mercury
Arsenic

- One of the most toxic metals on earth
- Forms:
  - Trivalent
  - Pentavalent
- Routes of Exposure:
  - Ingestion
  - Inhalation
Health Effects
- Fever, anorexia, liver enlargement, death
- Neurotixicity of PNS and CNS, liver damage, gangrene of lower limbs
- Skin cancer, lung cancer
- Dermatitis, darkening of the skin, leukemia, kidney, and bladder cancers
Cadmium

- Non-corrosive and primary used for electroplating
- By-product of the mining and smelting of lead and zinc
- Found in:
  - Fertilizer
  - Cigarettes
  - Irrigation waters
  - Shellfish
Health effects
- Nausea, vomiting, and abdominal pain
- Chemically induced lung inflammation and fluid on the lung
- Irritation of the nose and throat, coughing, dizziness, weakness, chills, fever, chest pains, and labored breathing
- Metal fume fever
- Obstructive pulmonary disease, emphysema, kidney disease
Lead

- Used in manufacture of batteries, plastics, china, ceramic glass, and paint products

- Routes of exposure
  - Ingestion of lead-contaminated glaze in pottery, paint chips, dust in older homes

- Deficiencies in nutrients can enhance lead absorption
Health effects

- Lethargy, vomiting, irritability, loss of appetite, and dizziness

- High blood pressure, lowered sperm count and sperm motility
Mercury

- Found in:
  - Vapor lamps
  - Fluorescent tubes
  - Thermometers
  - Electrical products

- Health effects:
  - Tremors, personality defects and disturbances
  - Permanent CNS damage
Benzene
Benzene

- Used as a solvent in rubber, ink, adhesives, and transformer fluids
- Route of exposure is through inhalation
Benzene (continued)

Health effects:
- Fatigue and anorexia
- Bone marrow damage resulting in anemia
- Leukemia
- Unconsciousness and death
Polychlorinated Biphenyls (PCBs)

- Used in plasticizers and adhesives

- Health effects:
  - Chloracne
  - Cancer
Pesticides

- Insecticides
- Herbicides
- Fungicides
- Fumigants
- Rodenticides
Insecticides

- Affect the nervous system
  - Dermal absorption
  - Inhalation
  - Ingestion

- Health effects:
  - Headache, anxiety, chest tightness, seizures, loss of consciousness, and liver dysfunction
Herbicides

Health effects:
- Chloracne
- Liver disorders
Fungicides

- Used in the treatment of plants such as fruit trees and vegetables

- Health effects:
  - Skin irritation, lethargy, dermatitis, headache, vomiting
Fumigants

- Used to eradicate insects, bacteria and rodents

- Health effects:
  - Nausea, vomiting, dizziness, dermatitis, headache, pulmonary irritation, and dementia
Rodenticides

- Used to eradicate rodents (mice, rats, rabbits, and gophers)

- Health effects
  - Inhibition of cell function
  - Anticoagulant activity
  - Neurotoxicity
Radiation and Radioactive Materials

- Ionizing radiation
- Non-Ionizing radiation
Ionizing Radiation

- Affects the bone marrow

- Health effects
  - Reddening of skin
  - Decreased red blood cell production
  - Gastrointestinal and reproductive effects
  - Cataracts, birth defects, respiratory illness
Non-Ionizing Radiation

Health effects on the skin, and thyroid, and causes lung cancer
Question and Answer Period