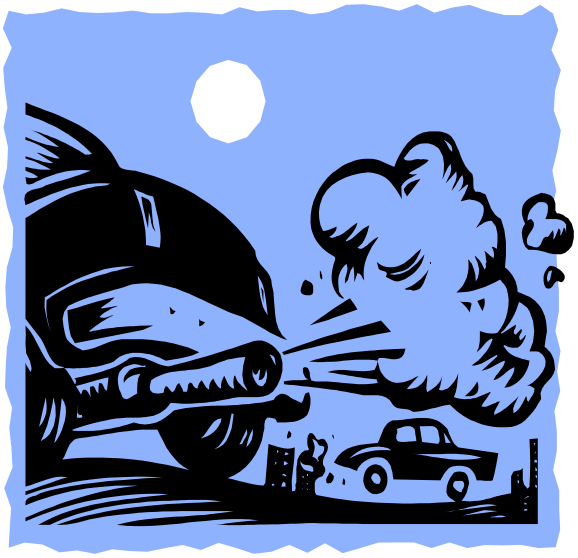
Pollution Prevention



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KSC/CCAFS Health Education and Wellness Program

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Introduction

In our fast-paced lives, we tend to disregard many things. Unfortunately, the one thing we disregard the most is our environment. Our American lifestyle seems to give us almost no choice, but to incorporate cars, fast food, disposable items, newspapers, air conditioning, household appliances, and many other items into our daily routines. Unfortunately, what we gain in ease, safety and comfort from using these items, we lose in the frustration of having to deal with the health problems that are directly related to the pollution we have put into the environment.

What is Pollution?

According to the Environmental Protection Agency (EPA), pollution is often a consequence of the producing, using, and disposing of the above named goods. When this unwanted or discarded material (also known as waste) is released into the environment, it becomes pollution. Pollution is generated by industries, agriculture, businesses, schools, vehicles, and even our homes.

Once pollution is generated, it is generally here to stay. Even if it is properly disposed of, wastes or pollution can migrate into the Earth's environmental media, including soil, water, and air. Although these environmental media may seem separate, they actually interact in ways that are not always apparent. The pollutants in each medium can move to and from any other medium. When we try to clean up pollution after it is generated, sometimes we just end up moving the pollutant from one medium to another. For example, pollution released into the air can fall to the ground and contaminate soil which can lead to aquifers, which are underground sources of water for communities that get their drinking water from wells.

The Media of Pollution

Soil

Soil contamination is either solid or liquid hazardous substances mixed with the naturally occurring soil. Usually, the contaminants in the soil are physically or chemically attached to soil particles, or, if they are not attached, are trapped in the small spaces between soil particles. Soil contamination results when hazardous substances are either spilled or buried directly in the soil or migrate to the soil from a spill that has occurred elsewhere. Contaminants in the soil can hurt plants when they attempt to grow in contaminated soil and take up the contamination of their roots. Contaminants in the soil can also adversely impact the health of animals and humans when they ingest, inhale, or touch contaminated soil, or when they eat plants or animals that have themselves been affected by soil contamination.

Water

One of the EPA's main goals is to ensure that all Americans have access to drinking water that is clean and safe, and that the nation's aquatic ecosystems and their ecological components are healthy and sustainable. The National Health and Environmental Effects Research Laboratory (NHEERL), which is led by the EPA's Office of Research and Development, supports this goal by conducting research on the effects of water contaminants on human and ecological health. This research helps provide a sound scientific foundation for risk management decisions under the Safe Drinking Water Act, the Clean Water Act, and other regulatory authorities. The two primary research areas of concern are drinking water and aquatic stressors.

For 100 years, public water supplies have been treated with disinfectants, such as chlorine, to reduce the risks of infectious disease from waterborne pathogens. Although water disinfection has been highly effective in reducing the incidence of certain diseases, such as cholera and typhoid, the continued occurrence of waterborne disease outbreaks demonstrates that contamination of drinking water with pathogenic bacteria, viruses, and parasites still poses a health risk when treatment is inadequate.

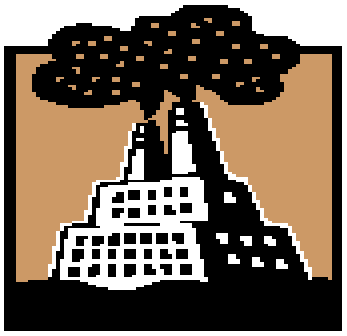
The use of disinfectants, while reducing microbial risks, creates new potential problems as chemical by-products are formed during the treatment process. Some of these disinfection by-products (DBPs) have been shown to cause cancer and other toxic effects in experimental animals. In humans, however, the scientific evidence is inconclusive. In addition, surface water and groundwater supplies that are used as a source of drinking water may be contaminated by a variety of chemicals of potential public health concern. For example, arsenic, a naturally occurring contaminant of drinking water in some areas, has been shown to cause cancer, cardiovascular disease and other effects in exposed individuals. Research is required to obtain sufficient understanding of the health risks posed by these chemical and microbiological contaminants, and to develop a strong scientific basis for setting new drinking water standards that may be needed to protect public health.

Air

Air pollution is a general term for a variety of substances and gases in our air that pose risks to health. Pollutants and irritants include nitrogen oxides, sulfur dioxide, carbon dioxide, particulate matter, volatile organic compounds (VOCs), toxic substances such as mercury, and some naturally occurring substances such as pollen. The combination of nitrogen oxides and VOCs in the presence of sunlight forms ozone, the major constituent of smog. Ozone has been shown to exacerbate asthma and cause shortness of breath and lung damage.

Most air pollution comes from human-made sources such as fossil fuel combustion, transportation, power plant emissions and emissions from other industrial processes.

Burning fossil fuels for electricity generation is the single greatest source of air pollution in the United States. Fossil fuel combustion produces many pollutants including nitrogen oxides, sulfur oxides, hydrocarbons, mercury and particulates. These pollutants can cause serious health problems including asthma, irritation of the lungs, bronchitis, pneumonia, decreased resistance to respiratory infections, and even early death.



Some pollutants also cause certain environmental conditions, such as acid rain and climate change. Carbon dioxide emissions are a primary contributor to climate change. According to climate scientists, if carbon dioxide levels continue to increase, the planet will become warmer in the next century, affecting human health and the environment. Increases in temperature will most likely result in a variety of impacts including more heat-related illness, more severe weather events such as floods and droughts and resulting damage, and an increase in cases of vector-borne and water-borne diseases, and sea-level rise. Nitrogen oxides and sulfur oxides are important constituents of acid rain, which destroys lakes and rivers, diminishes crop yields, and deteriorates buildings.

Some air pollutants are toxic. Also known as hazardous air pollutants, these pollutants are known or suspected to cause cancer or other serious health effects, such as reproductive effects or birth defects, or adverse environmental effects. Examples of toxic air pollutants include VOCs such as benzene, which is found in gasoline, persistent organic compounds such as dioxin, and metals such as mercury and lead.

In the United States, air pollution is regulated by the Environmental Protection Agency under authority given by Congress in the Clean Air Act. Health based standards are set for criteria pollutants. Criteria pollutants include ozone, nitrogen dioxide, particulate matter and sulfur dioxide. Areas that are out of compliance with these standards are known as non-attainment areas.

Research indicates that air pollution in the form of particle matter (PM) at concentrations currently allowed by national standards (the National Ambient Air Quality Standards) is linked to thousands of excess deaths and widespread health problems. Part of EPA's mission is to protect human health by strengthening the scientific basis of air quality regulations. Through its PM health effects research program, EPA is working to more clearly understand the characteristics of PM that produce adverse health effects, how PM induces these effects, and who is most at risk. EPA scientists conduct research related to the health effects of PM by conducting clinical studies and using the methods of epidemiology and toxicology.

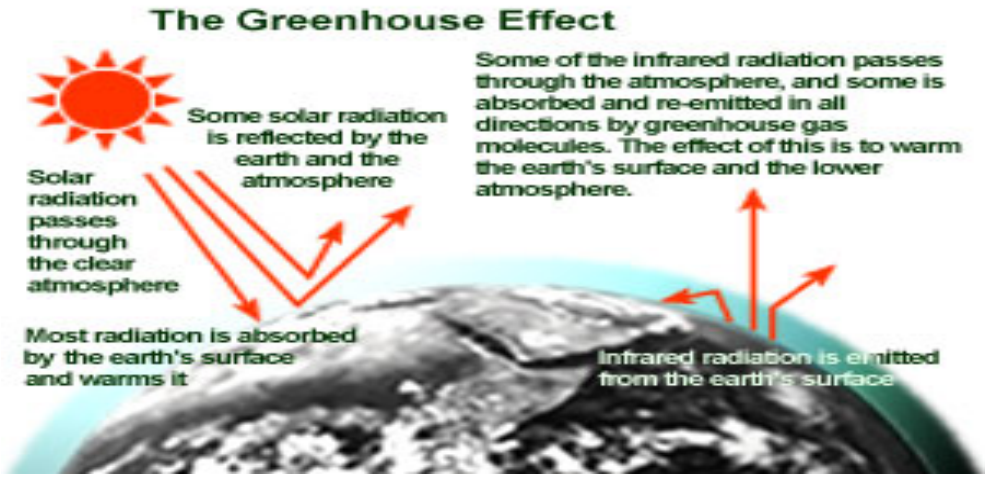
It is Not Just the Polar Bears Who Suffer

According to the National Academy of Sciences, the Earth's surface temperature has risen by about 1 degree Fahrenheit in the past century, with accelerated warming during the past two decades. There is new and stronger evidence that most of the warming over the last 50 years is attributable to human activities. Human activities have altered

the chemical composition of the atmosphere through the buildup of greenhouse gases – primarily carbon dioxide, methane, and nitrous oxide. The heat-trapping property of these gases is undisputed although uncertainties exist about exactly how earth's climate responds to them.

Energy from the sun drives the earth's weather and climate, and heats the earth's surface; in turn, the earth radiates energy back into space. Atmospheric greenhouse gases (water vapor, carbon dioxide, and other gases) trap some of the outgoing energy, retaining heat somewhat like the glass panels of a greenhouse.
Without this natural "greenhouse effect," temperatures would be much lower than they are now, and life as known today would not be possible. Instead, thanks to greenhouse gases, the earth's average temperature is a more hospitable 60°F. However, problems may arise when the atmospheric concentration of greenhouse gases increases.

Since the beginning of the industrial revolution, atmospheric concentrations of carbon dioxide have increased nearly 30%, methane concentrations have more than doubled, and nitrous oxide concentrations have risen by about 15%. These increases have enhanced the heat-trapping capability of the earth's atmosphere. Sulfate aerosols, a common air pollutant, cool the atmosphere by reflecting light back into space; however, sulfates are short-lived in the atmosphere and vary regionally.



Rising global temperatures are expected to raise sea level, and change precipitation and other local climate conditions. Changing regional climate could alter forests, crop yields, and water supplies. It could also affect human health, animals, and many types of ecosystems. Deserts may expand into existing rangelands, and features of some of our National Parks may be permanently altered.

Most of the United States is expected to warm, although sulfates may limit warming in some areas. Scientists currently are unable to determine which parts of the United States will become wetter or drier, but there is likely to be an overall trend toward increased precipitation and evaporation, more intense rainstorms, and drier soils.

Gases in the atmosphere such as carbon dioxide and methane trap the sun's energy and warm the earth. This natural "greenhouse effect" is intensified by human activities, especially the combustion of fossil fuels such as coal, oil, and natural gas. Increased energy use in cars, homes, and factories raises the concentration of carbon dioxide in the atmosphere. The steady accumulation of these greenhouse gases can cause a variety of impacts on global climate. As the climate changes, natural systems may be destabilized, which could pose a number of risks to human health. In general, these risks affect whole populations rather than individuals or groups of people.

The Impact on Human Health

Exactly how much risk is posed to human health by climate change is difficult to quantify in terms of numbers of increased deaths or illnesses. For one thing, human populations differ in vulnerability. Factors such as crowding, food scarcity, poverty, and local environmental decline make populations in some developing countries especially vulnerable. Likewise, in industrialized countries, the demographic trend toward an aging population raises the health risks.

Climatic changes may have wide-ranging effects on human health, via both direct and indirect pathways. Direct health effects include increases in heat-related mortality and illness resulting from expected increases in the intensity and duration of heat waves (although temperature increases should also result in fewer cold-related deaths). Deaths, injuries, psychological disorders, and exposure to chemical pollutants in water supplies could increase if extreme weather events, such as storms and floods, become more frequent.

Indirect effects include increases in the potential transmission of vector-borne infectious diseases caused by the extensions of ranges and seasons of some vector organisms and acceleration of the maturation of certain infectious parasites. Some increases in non-vector-borne infectious diseases could occur (especially in tropical and subtropical regions) because of climate impacts on water distribution, temperature, and microorganism proliferation. Climate-induced changes in pollens and spores and temperature increases that enhance the formation and persistence of certain air pollutants could result in increases in respiratory illnesses. Though still uncertain, the regional effects of climate change on agricultural, animal, and fisheries productivity could increase the local prevalence of hunger and malnutrition (particularly in developing countries). Finally, sea level rise could result in physical and demographic disruptions, with consequences for public health.

Public health and medical professionals are focusing not only on the risks but also adaptive options to mitigate adverse impacts. Adaptive options to minimize health impacts include improved and extended medical care services; enhanced disaster preparedness and relief, increased use of protective technology (air conditioning, water purification, vaccination, etc.), public education directed at personal behaviors, and

appropriate professional and research training. However, any technological adaptations such as use of pesticides to control disease-transmitting insects should also be assessed for potential health risks. In addition, improved and internationalize monitoring of health-risk indicators in relation to climate change are needed.

How Can I Help Prevent Pollution?

Pollution Prevention (P2) is an initiative formed by the Environmental Protection Agency. Instead of trying to clean up pollution after it has been created, pollution protection (P2) focuses on reducing the generation of pollution and waste by modifying plans, practices, or habits. P2 also includes activities that protect natural resources through conservation or more efficient resource use. Pollution protection focuses on ways to avoid producing pollution in the first place.

The following P2 concepts are used by many businesses and can also be used at home, work, or school.

1. **Change what you use.** Use non-hazardous or more efficient products (for example, use vinegar and hot water instead of hazardous commercial drain cleaners; or purchase products with less packaging).
2. **Change what you do.** Use more efficient or less wasteful methods (for example, turning off the lights when you leave a room).
3. **Improve your housekeeping.** Minimize spills and leaks (for example, immediately clean up outdoor spills before the spill is washed into the storm sewer.
4. **Educate yourself and others.** Learn about and showing others how to think "pollution prevention first" (for example, conduct a survey of your home to identify pollution prevention opportunities).

The following are ways to cut down on pollution. They are listed from most to least successful.

- **P2** source reduction (the preferred practice)
- **Reuse** –repeated use of products before discarding
- **Recycling** –processing waste for reuse
- **Treatment** –only if necessary; burning or using chemical or physical methods
- **Disposal** –responsibly disposing of waste (that cannot be prevented) in the environment

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Resources

The US Environmental Protection Agency
www.epa.gov

EnviroHealthAction
www.envirohealthaction.com

Environmental Working Group: Florida Pollution
http://www.ewg.org/reports/flpacreport/flpac.html