Center for ecogenetics & Environmental Health

Fast Facts about

Health Effects of Air Pollution

What's in the air?

Air contains 78% nitrogen and 20% oxygen along with small amounts of carbon dioxide, argon, and water vapor.

What is air pollution?

Air pollution is suspended particles and gases including carbon monoxide, volatile organic compounds (VOCs), nitrous oxides, sulfur dioxide, and ozone. Suspended particles are called particulate matter (PM), which is a mixture of tiny particles and liquid droplets that includes acids, organic chemicals, metals, and dust. PM is measured by size: PM2.5 is 2.5 micrometers (μm) in diameter. For comparison, a human hair is 70μm in diameter.

Where does air pollution come from?

Air pollution comes from natural and human-generated sources. Natural sources include volcanoes, forest fires, pollen, and dust. Weather patterns such as temperature inversions hold the pollution in place.

Human sources of air pollution include industry, power plants, and vehicles including cars, trucks, trains, planes, and boats. Major worldwide sources of pollution from particulate material include burning of wood and land clearing, transportation, and industrial sources, particularly power generation.

How do we study its health effects?

First we have to decide which pollutant to study. There are four types of studies. Exposure assessment studies measure the amount of the pollutant in the place we're studying. Toxicology studies measure how poisonous the pollutant is to humans and animals. Epidemiology studies investigate the association of a pollutant with human disease and ask whether the pollutant causes a disease. Controlled exposure studies investigate the toxic effect of pollutants on animals and cells in the lab.

How does air pollution affect health?

The World Health Organization estimates that PM2.5 contributes to 800,000 premature deaths per year. A recent WA State Dept of Ecology study estimates 1100 deaths a year due to PM2.5. The largest sources of PM in Puget Sound are vehicle emissions and wood smoke.

Exposure to PM2.5 for just a few hours or weeks can cause cardiovascular effects including atherosclerosis, heart failure, heart attack, stroke, arrhythmia, thrombosis, and death. Brief exposure is more dangerous for the elderly, those with preexisting cardiac artery disease, people with diabetes or obesity, and for women. Longer-term exposure to high levels of PM2.5 increases the risk of death.

Exposure to PM appears to speed the development and progression of atherosclerosis, hypertension, heart failure and diabetes. Other health effects are lung diseases including asthma, chronic obstructive pulmonary disease (COPD), chronic bronchitis, reduced lung function, and lung cancer.

In children, air pollution is linked to asthma and bronchitis, increases in school absences and ER visits. Children living near diesel trucking routes are more likely to have decreased lung function, bronchitis and allergies.

Studies show that incidence of lung cancer increases with long-term exposure to traffic and the closer the residence is to a major road. Studies also show that children who live or attend school close to traffic have an increased risk of asthma.

What can we do to protect ourselves?

We can try to reduce air pollution. For example, the average American spends 55 minutes every day traveling in a car. Turn off your car engine when waiting in traffic.

We can limit our exposure by spending less time in and around traffic, avoiding secondhand smoke and wood smoke, limiting the amount of PM that penetrates into our homes, and reducing our workplace exposure. Drive with the windows closed, and set the vehicle ventilation to recycle the air.

Filters, room air cleaners and air conditioners can help reduce indoor PM. More aggressive measures include wearing a face mask, installing PM filters in your home, and moving to a less polluted region.

The EPA Air Quality Index and media alerts make people aware of local air quality. When air quality is unhealthy, those with heart or lung disease, older adults, and children should avoid prolonged or heavy exertion. Others should continue to exercise but try to avoid polluted places. When you have a choice, don't bike next to busy roads or at high traffic times.

Reducing exposure makes a difference: Decreasing the PM levels in an area can reduce cardiovascular mortality within a few years.

Can society help protect everybody?

Increasing evidence shows that air pollution from traffic has harmful cardiovascular effects. Traffic is everywhere in modern society. Many people live within 1/3 mile of a major road and are continually exposed to air pollution. Many of these people live where they do because they can't afford to live elsewhere.

Pollutant concentrations are monitored in the US and made available to the public through the Environmental Protection Agency at www.epa.gov. Ozone and PM2.5 often exceed the established government standard and public air quality warnings are issued.

Federal regulations for industrial and vehicle emissions that began 40 years ago with the Clean Air Act of 1970 have substantially reduced PM and other pollutant levels.

Local, state and federal policies that regulate vehicle and industrial emissions protect people from exposure to PM and other pollutants and help protect public health.

Food for thought

1. When and where am I exposed to air pollution?
2. When and where am I contributing to it?
3. How can I reduce my exposure?
4. How can I reduce my emissions?
5. Where is the worst local air pollution?
6. What can be done to reduce air pollution in Seattle?
7. What should be done, and who is responsible?

Where to go to learn more

1. Brook RD, et al., *Particulate matter air pollution and cardiovascular disease: An update to the scientific statement from the American Heart Association*. Circulation 2010, PMID 20458016.
2. Air Quality Index (AQI). Local air quality conditions and forecasts. http://airnow.gov
3. Puget Sound Clean Air Agency. www.pscleanair.org
4. The Environmental Protection Agency has information about air pollution, The Clean Air Act and more at www.epa.gov > Popular Topics > Air Pollution.
5. National Institute of Environmental Health Sciences, Health & Education. http://www.niehs.nih.gov/health/topics/exposure/air-pollution/

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