Puget Sound Clean Air Agency
pscleanair.org

Working Together For Clean Air

Air Toxics

"Air toxics" are air pollutants known or suspected to cause health problems. Potential health effects include cancer, birth defects, lung damage, immune system damage, and nerve damage.[1]

Our local study shows that air toxics are present in the Puget Sound area at levels that pose a health risk to residents.[2]

The US Environmental Protection Agency (EPA) placed the Puget Sound region in the top five percent of the nation for potential cancer risk from air toxics in their nationwide study, consistent with most major metropolitan areas.[3]

Studies increasingly link land use and air pollutant exposures. Recent studies show people living near ports and roadways have higher exposures and health risk.[4,5,6,7] Projected growth in our area presents a challenge to ensure that this development doesn't lead to greater air toxics emissions, exposures, and health risk.[8]

The Agency focuses its efforts on reducing the air toxics that pose the most health risk. ***In the Puget Sound area, diesel particulate matter (DPM) accounts for more than 70% of the potential cancer risk from all air toxics.***[9] In 2001, the Agency launched a "Diesel Solutions" program with partners to dramatically reduce diesel emissions. The Agency also prioritizes reducing wood smoke emissions, also shown to present significant health risk.

Background

Unlike the criteria air pollutants, air toxics do not have federal ambient air quality standards. The 1990 Federal Clean Air Act established 188 national air toxics, also called hazardous air pollutants. The Washington State Department of Ecology (WA Ecology) and the Agency list about 400 air toxics, which includes the 188 federal hazardous air pollutants as a subset.[10]

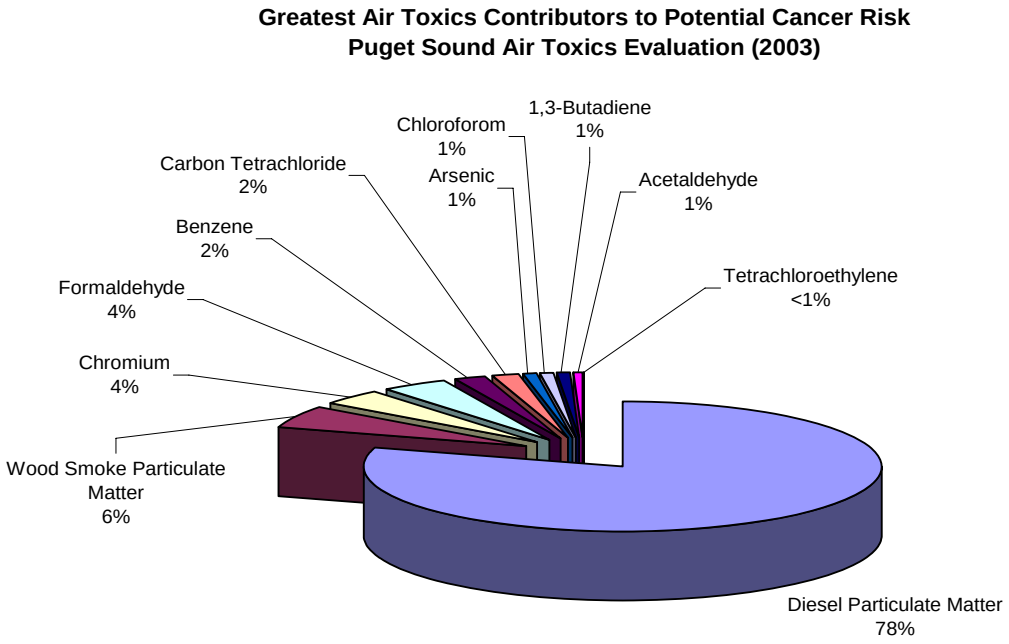
Potential cancer risks are often used to quantify health impacts from air toxics since no federal air quality standards exist. Potential risk incorporates both the amount of the air toxic as well as its potency. Potential risk from several air toxics can be added cumulatively, and is commonly presented as "X risk per million". This means the potential risk for X additional cancer cases in a population of one million people exposed over a lifetime.

Top Air Toxics of Concern and their Sources

Diesel particulate matter overwhelmingly represents the highest potential cancer risk in the Puget Sound area. This pollution comes from diesel-fueled trucks, cars, buses, construction equipment, rail, marine, and port activities. Particulate matter from wood smoke (a result of burning in woodstoves and fireplaces or outdoor fires) presents the second-highest potential cancer health risk.

Wood smoke and auto exhaust also contain formaldehyde, chromium, benzene, 1,3-butadiene, and acrolein. Chromium is also emitted in industrial plating processes. The Agency also prioritizes reductions of these air toxics.

Acrolein is another air toxic of concern in the Puget Sound region but is not shown in the following chart because its primary health effect is respiratory irritation (not cancer). Acrolein is emitted from auto exhaust, wood burning, and other combustion.



Health Effects

Air toxics are associated with a broad range of health effects, including cancer. As air toxics are primarily inhaled, many adverse health effects involve the respiratory system. Some studies have linked air toxics to asthma.[11,12] Other respiratory effects include lung inflammation, coughing, wheezing, and reduced lung function. The cardiovascular, neurological, reproductive, and immunological systems can also be affected by various air toxics.

People are affected differently by exposure to air toxics. Children, the elderly, pregnant women, and those with compromised immune systems or illnesses are especially susceptible.

Some air toxics are persistent and bio-accumulative, meaning they build up in the food chain and result in higher exposures with relatively lower concentrations.

Federal Reduction Strategies

The EPA continues to pursue reductions in air toxics emissions:

- Federal rules for cleaner diesel fuel will be phased-in beginning in fall 2006 and require that new on-highway diesel vehicles be considerably cleaner starting in 2007.[13]
- EPA provides grants that reduce air toxics emissions through diesel retrofits, woodstove change-out programs, and various community-scale projects.
- EPA continues to develop rules, implemented by states and local agencies, to reduce air toxics emitted from large and small industrial sources.

Local Reduction Strategies

The Agency reduces air toxics emissions throughout the Puget Sound region through actions that also reduce criteria air pollutant emissions (most notably fine particulate and ozone precursors):

- **Diesel Solutions®.** The Agency works with multiple partners to reduce diesel emissions throughout the Puget Sound area.
- **Less wood smoke.** The Agency partners to reduce pollution from burning in wood stoves and fireplaces and outdoor burning.
- **Cleaner cars.** The Agency and partners encouraged adoption of the stricter Washington vehicle standards that will reduce mobile source air toxics emissions.
- **Cleaner fuels.** The Agency works with local fuel suppliers to provide gasoline that releases fewer toxics into the air. The Agency also adopted new gas station rules to reduce gas station emissions. The Agency encourages the use of biofuels that also emit fewer air toxics.
- **Cleaner Business and Industry.** The region has had success reducing commercial air toxics pollution. An example is dry cleaners: they've replaced old-technology machines with new equipment that emit almost no air toxics.

Air Toxics Monitoring

Air toxics monitoring is conducted on a much smaller scale than criteria air pollutant monitoring. Air toxics monitoring is expensive, and monitoring methods don't yet exist for many air toxics. Direct monitoring methods don't yet exist for diesel and wood smoke particulate matter; instead, a complex combination of monitoring and modeling is used to estimate concentrations.

Locally, WA Ecology has monitored 17 air toxics since 2000 in Seattle at the Beacon Hill site. Five years of monitoring data is too short to reflect or comment on local air toxics trends.

In 2001, WA Ecology monitored air toxics at six sites around the Seattle area. We based our local evaluation on this monitoring. While there were some differences noted (particularly in the most industrial site), this study showed that toxics levels are relatively consistent across the Seattle urban area.[14]

Air Toxics Challenges

The complexity of air toxics makes their reduction especially challenging. There are hundreds of air toxics with thousands of toxicology and epidemiology studies attempting to quantify their health effects. There's considerable uncertainty and debate surrounding the potency of several air toxics of concern. The variability of potency, depending upon the persons exposed, adds another dimension of complexity.

In addition to uncertainty and debate around health effects, there's considerable uncertainty as to the ambient concentrations that people are exposed to. The air toxics monitoring network is minimal and monitoring methods haven't yet been developed for several air toxics.

There are no federal standards to regulate air toxics. In addition, there is no consensus as to what levels are considered an "acceptable" health risk. This lack of "bright lines" has led to much variability around the country. The Agency's approach has been to use risk assessment to prioritize our work and then implement all reasonable strategies to reduce the risk as much as is feasible.

For More Information

- Our Air Toxics Website http://www.pscleanair.org/specprog/airtoxics/index.shtml.
- Our 2004 Air Quality Data Summary (Toxics data included) http://www.pscleanair.org/ds04/docs/2004AQDSFINAL.pdf.
- Our Diesel Solutions® Website http://www.pscleanair.org/dieselsolutions/index.shtml.
- EPA Region 10 Air Toxics Website http://yosemite.epa.gov/R10/AIRPAGE.NSF/webpage/Air%2BToxics%2BProgram.
- Washington Department of Ecology's Air Toxics Website

https://fortress.wa.gov/ecy/aqp/Toxics/AirToxicsHome.shtml.

- What you Should Know About Diesel Exhaust… http://www.epa.gov/otaq/retrofit/documents/f03021.pdf.
- Health Effects of Wood Smoke http://www.ecy.wa.gov/pubs/92046.pdf.

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[1] Environmental Protection Agency. About Air Toxics, Health, and Ecological Effects. http://www.epa.gov/air/toxicair/newtoxics.html.

[2] Puget Sound Clean Air Agency. Puget Sound Air Toxics Evaluation. October 2003. http://www.pscleanair.org/news/other/psate_final.pdf. Monitoring of 17 air toxics at the Beacon Hill Seattle site indicates an average of 530 potential additional cancer cases for every million people. This is 530 times the acceptable risk for individual air toxics cleanup levels at hazardous waste sites. Risk estimates are based on a 70-year exposure period.

[3] Environmental Protection Agency. National Air Toxic Assessment. 1996. http://www.epa.gov/ttn/atw/nata/.

[4] California Environmental Protection Agency. Draft Diesel Particulate Matter Exposure Assessment Study for the Ports of Los Angeles and Long Beach. October 2005. http://www.arb.ca.gov/msprog/offroad/marinevess/documents/100305draftexposrep.pdf.

[5] Pearson, RL, Wachetel H, and K Ebi. *Distance-Weighted Traffic Density in Proximity to a Home Is a Risk Factor for Leukemia and Other Childhood Cancers.* Journal of Air and Waste Management Association. February 2000. Volume 50, pages 175-180.

[6] Wilhelm, Michelle and Beate Ritz. *Residential Proximity to Traffic and Adverse Birth Outcomes in Los Angeles County, California, 1994-1996.* Environmental Health Perspectives. February 2003. Volume 111; Number 2, Pages 207-216.

[7] Jerrett et al. *Spatial Analysis of Air Pollution and Mortality in Los Angeles.* Epidemiology 16:6 (November 2005).

[8] Projected growth based on Puget Sound Regional Council's growth target of almost 1 million more residents by 2022 http://www.psrc.org/projects/monitoring/growthtargets/cover-ch1.pdf

[9] Based on Beacon Hill speciation monitoring and receptor modeling estimates. 2003 Puget Sound Air Toxics Evaluation.

[10] The EPA's original list of Hazardous Air Pollutants: http://www.epa.gov/ttn/atw/188polls.html Washington State's toxic air pollutants: http://www.pscleanair.org/reg3/asil.pdf.

[11] Weisel, Clifford. *Assessing Exposure to Air Toxics Relative to Asthma* Environmental Health Perspectives 10, Supplement 4 (August 2002): 527-535. http://ehp.niehs.nih.gov/members/2002/suppl-4/527-537weisel/ehp110S4p527.pdf.

[12] Peden, David. *Pollutants and Asthma: Role of Air Toxics*. Environmental Health Perspectives 10, Supplement 4 (August 2002): 565-568. http://ehp.niehs.nih.gov/members/2002/suppl-4/565-568peden/ehp110s4p565.pdf.

[13] http://www.epa.gov/otaq/toxics.htm

[14] For more information on the six monitoring sites, see the Final Puget Sound Air Toxics Evaluation. 2003.