

# *The Utah Environmental Health Letter*

## *Greetings*

Increasing scientific evidence indicates that environmental pollution is responsible for significant morbidity and mortality both in our country and throughout the world. Despite the unquestionable importance of this subject, the relationships between environmental pollution and human health are rarely discussed in the classroom. *The Utah Environmental Health Letter*, published by the University of Utah School of Medicine student chapter of Physicians for Social Responsibility, hopes to address this issue by providing the latest in environmental health research, information and news to the community.

## *A Focus On Air Pollution*

At certain times of the year, Salt Lake City has some of the worst air quality in the nation. This not only compromises the aesthetics of our city, but also the health of its residents. It is because of the significant, recurrent air quality problems in Salt Lake City that this edition of *The Utah Environmental Health Letter* focuses on this topic.

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 particulate matter, volatile organic compounds (VOCs), nitrogen oxides, sulfur dioxide and toxic metals such as mercury. 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.

The majority of air pollution in the Salt Lake Valley is due to fossil fuel combustion from automobiles and power plants, as well as emissions from industrial sources such as the refineries in North Salt Lake. 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 particulates, hydrocarbons, nitrogen oxides, sulfur oxides and mercury. 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 hazardous air pollutants are known or suspected to cause cancer and reproductive effects. Examples of toxic air pollutants include volatile organic compounds such as benzene, which is found in gasoline, polycyclic aromatic hydrocarbons, formed from combustion processes, and metals such as mercury and lead.

In the United States, air pollution is regulated by the Environmental Protection Agency under the Clean Air Act. Health based standards are set for criteria pollutants which include ozone, nitrogen dioxide, particulate matter and sulfur dioxide. Areas that are out of compliance with these standards are known as non-attainment areas. At certain times during the past several years, Salt Lake City has not attained the EPA standards for ozone and particulate matter pollution. Unhealthy ozone levels occur most frequently during the summer, while high particulate levels tend to occur during winter "inversion" periods. Air pollution levels throughout the Wasatch Front are monitored daily by the Utah Division of Air Quality (DAQ). Current and forecasted pollution levels are updated daily on the DAQ website at [www.eq.state.ut.us/EQAMC/amc.htm](http://www.eq.state.ut.us/EQAMC/amc.htm).

## *New Research*

### **Lung Cancer, Cardiopulmonary Mortality, and Long-term Exposure to Fine Particulate Air Pollution**

Source: *JAMA*. 2002. 287: 1132-1141.

In arguably one of the most significant recent papers in the field of environmental health, Arden Pope, Ph.D., of Brigham Young University and colleagues demonstrated a very strong association between long-term exposures to low levels of fine particulate air pollution and an increased risk for lung cancer and cardiopulmonary mortality. Risk factor data for 500,000 adults included age, sex, race, weight, height, smoking history, education, marital status, diet, alcohol consumption and occupational exposures. These data were linked with air pollution data from metropolitan areas throughout the United States and combined with vital status and cause of death data. Each 10 $\mu\text{g}/\text{m}^3$  increase in the concentration of fine particulate air pollution was associated with approximately a 4%, 6%, and 8% increased risk of all-cause, cardiopulmonary, and lung cancer mortality, respectively. Dr. Pope presented a lecture on his current work last fall during an SPSR-sponsored event at the University of Utah.

### **Air Pollution Induces Heritable DNA Mutations**

Source: *PNAS*. 99: 15904-15907

A recent study by Canadian scientists suggests that human and wildlife populations may be at risk for developing heritable germline mutations from long-term inhalation of mutagenic chemicals present in airborne pollutants. Heritable mutation frequency at tandem-repeat DNA loci in mice exposed 1 km downwind from steel mills was 1.5-2.0-fold elevated compared to mice populations 30 km from the site. Previous studies have shown that bird populations nesting near steel mills have significantly increased germline mutation rates at minisatellite DNA loci compared to populations nesting in rural, non-polluted sites. One can argue that these findings are particularly relevant to Utah residents given the significant steel-mill related air pollution that has historically plagued the valley lands surrounding Provo, Utah. This study was published in the December 10th issue of the Proceedings of the National Academy of Sciences.

### **Air Pollution and Low Birth Weight**

Source: *Environmental Health Perspectives* 111: 201-205

Common levels of urban air pollutants can adversely affect fetal development, according to a new study from Columbia University's Center for Children's Environmental Health. The study found a significant link between prenatal exposure to the common air pollutants and combustion by-products known as polycyclic aromatic hydrocarbons (PAHs) and reduced birth weight and head circumference in two inner-city minority populations.

The researchers monitored more than 260 black and Dominican women during their pregnancies and collected biological samples from each mother and baby at delivery. During pregnancy, the mothers wore personal air monitors to gauge their exposure to eight airborne carcinogenic PAHs. The team's approach combined the use of biomarkers with epidemiologic methods.

The team found that exposure to PAHs during pregnancy was associated with a 9% reduction in birth weight and a 2% reduction in head circumference in newborns. The toxicological mechanism of the pollutant-induced effects on fetal growth and development is not known. In previous studies of mothers and newborns in Krakow, Poland, researchers found associations between these same birth outcomes and PAH exposure. Several studies have reported that reduction in head circumference at birth or during the first year of life correlates with lower IQ and poorer cognitive functioning and school performance in childhood.

## ***Air Pollutant Exposure and An Increased Risk of Birth Problems for Mothers Living Near Major Roadways***

Source: *Environmental Health Perspectives* 111: 201-205

Several recent epidemiological studies have suggested that exposure during pregnancy to ambient air pollution--including compounds released in motor vehicle exhaust--can increase the risk of preterm birth and low birth weight. Investigators at the UCLA School of Public Health report that pregnant women residing close to heavily traveled roadways have a greater occurrence of these adverse birth outcomes, especially if their third trimester falls during the autumn or winter months.

The epidemiologic case-control study involved nearly 51,000 infants in Los Angeles County, California. The researchers mapped home locations for each of the cases and controls, and calculated a distance-weighted traffic density (DWTd) value for each subject as a measure of exposure to traffic-related air pollution. They observed an approximately 10-20% increase in the risk of preterm birth (both normal and low birth weight infants) and the risk of term low birth weight in infants born to women living close to heavily traveled roadways. This was after controlling for measures of socioeconomic status and several other known risk factors for low birth weight and preterm birth, such as maternal age, race, and prenatal care.

The researchers found higher risks for women whose third trimester fell during the autumn and winter months. Women whose third trimester fell during the fall/winter months and who were in the highest DWTd quintile had an estimated 39% greater risk of giving birth to a term low birth weight infant and a 24% greater risk of having a preterm low birth weight infant, compared to women in the lowest DWTd quintile.

The researchers say these findings correlate with stagnant air conditions and higher pollution levels typically found during the winter months in the Los Angeles basin. These weather and pollution conditions are regrettably similar to those experienced each winter here in Salt Lake City. The biological mechanisms whereby air pollution may cause adverse birth outcomes remains to be determined.

## ***From The News***

### **School Children and Diesel Bus Emissions**

- Sources: 1. *Environmental Health Perspectives* 2002; 110: 103-122.  
2. NRDC Coalition for Clean Air. No breathing in the aisles: diesel exhaust inside school buses. New York: January 2001.  
3. *Boston Globe*, 16 Feb 2003

Millions of children are exposed to unhealthy levels of air pollution as they travel to and from school in aging diesel busses- some of the dirtiest vehicles on the road. Diesel particulate pollution is known to aggravate asthma and chronic bronchitis as well as increase the risk of developing heart disease and lung cancer. In light of several recent studies corroborating the link between diesel particulate exposure and adverse health effects, the city of Boston recently began a program to protect its students by retrofitting school buses with new filtration systems that eliminate 90 percent of diesel emissions. The Boston project, funded by a grant from the US EPA, is one of the largest national projects thus far designed to reduce childhood exposure to diesel bus emissions. Many cities have also incorporated natural gas-powered school busses into their fleets, which emit one-tenth the soot of their diesel counterparts.

## **Environmental Justice and Air pollution**

Source: [\*New Haven Register\*](#), 05 Feb 2003

A coalition of activists in Connecticut are urging passage of a bill to protect the state's low-income and minority citizens from bearing the brunt of pollution problems. In Connecticut and throughout the nation, power plants, incinerators, transfer stations and other heavily polluting facilities are disproportionately likely to be located in the state's poor and minority neighborhoods. New Haven, home to many such neighborhoods, has three times the national rate of asthma, which can be caused or exacerbated by air pollution. If the bill backed by the coalition is signed into law, Connecticut would be required to develop an environmental justice action plan that would assess the human and environmental health impacts of state programs, policies, and activities on poor and minority communities.

## **U Runs \$1.49 Million Urban Airshed Study**

Source: Adapted from University of Utah media announcements: [www.utah.edu](http://www.utah.edu)

To better understand the complex factors contributing to air pollution in the Salt Lake valley, University of Utah researchers and students have undertaken a \$1.49 million effort to study the complicated Salt Lake Valley airshed as an ecosystem. They will develop a computer simulation to help government officials examine ways to improve the city's air quality.

The computer simulation will incorporate data on population growth, land use, vehicle miles traveled in the valley, various emission-reducing federal and state laws and policies, ongoing air pollution data, and new measurements of three kinds of emissions that enter the airshed: water vapor, volatile organic compounds and carbon dioxide.

Atmospheric scientists, ecologists, urban planners and social scientists are among those involved in the multidisciplinary Salt Lake Valley Airshed Project, which began Sept. 1, 2002 and will last until spring of 2005 with \$1.49 million from the National Science Foundation. The project includes faculty from the University of Utah Health Sciences Center and the Colleges of Science, Engineering, Humanities, Mines and Earth Sciences, and Social and Behavioral Sciences.

## ***New Books of Interest***

*When Smoke Ran Like Water: Tales of Environmental Deception and the Battle against Pollution.* Written by Devra Davis, Ph.D., M.P.H. Professor of Public Policy at Carnegie Mellon University and Senior Advisor to the World Health Organization. Perseus Books, 2002.

*Life Support: The Environment and Human Health.* Edited by Michael McCally, M.D., Ph.D. Professor, Department of Public Health and Preventive Medicine at Oregon Health Sciences University. MIT Press, 2002.

*Questions, Comments or Suggestions?*

Contact us at [utahspsr@yahoo.com](mailto:utahspsr@yahoo.com)

