

# The Health Consequences of Air Pollution

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## Pollution and the Cardiovascular System

**\*The signature physiologic consequence of air pollution is the same as cigarette smoke: a low grade arterial inflammation, arteriolar narrowing, and vascular prothrombotic changes. As with cigarette smoke the effect can be almost immediate and chronic exposure to even low concentrations of pollution are associated with significant arteriolar narrowing.**

**\*Air pollution causes average blood pressure to increase within minutes. All organs are affected.**

**\*Rates of heart attacks and strokes increase with air pollution and are the primary cause for increased community mortality rates. Those rates increase within hours after exposure and stay elevated for as long as 30 days after the exposure has ended.**

**\*Particulate pollution concentrations typical of the Wasatch Front increase mortality rates about 10% according to the formula recommended by the American Heart Association published in May, 2010. That means between 1,000 and 2,000 Utahns die prematurely every year due to our air pollution.**

**\*Mortality plotted against air pollution concentrations shows no safe threshold, even at low levels, well below EPA national ambient air quality standards (NAAQS). Furthermore this curve is not linear. The steepest part of the curve is at low doses, i.e. small air pollution reductions have even greater public health benefit when the concentrations are already low. A Dutch study demonstrated risks for cardiopulmonary mortality even at what are considered 'background' levels of particulate pollution.**

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## **Pollution and the Brain**

- \* The systemic inflammation caused by air pollution also affects the brain**
- \* Air pollution components reach the brain and can penetrate deeply into the parenchyma**
- \* Many of the compounds adsorbed to particulate matter are neurotoxic**
- \* Air pollution causes CNS oxidative stress, neuroinflammation, neuronal damage, cortical stress measured by EEG, enhancement of Alzheimer type-abnormal filamentous proteins, BBB changes, and cerebrovascular damage. Many of these changes can be found in children and young adults.**
- \* Greater air pollution exposure is associated with lower intelligence and poorer motor function in children, decreased cognition in adults, higher rates of strokes, multiple sclerosis, autism, Parkinson's and other neurodegenerative diseases.**

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## **Pollution and Chromosomal/Fetal Development**

**\* Pregnant women exposed to more air pollution give birth to babies with significantly more chromosomal aberrations and epigenetic changes which can be passed on to multiple subsequent generations.**

**\* Exposure even to brief episodes of pollution at critical stages in the development of the human embryo can cause a person to experience an increased likelihood of multiple chronic diseases including those of the heart, lungs, immune system and brain and even obesity, diabetes and cancer.**

**\* Air pollution breathed by a pregnant mother causes epigenetic changes in the womb, which is associated with higher rates of asthma and decreased lung function in those children 5 years later.**

**\* Exposure to intermittent air pollution is associated with sperm DNA damage and consequent increase in the rates of male infertility, miscarriages and other**

## adverse reproductive outcomes.

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Epigenetics and environmental chemicals

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<http://www.newsweek.com/2010/10/30/how-your-experiences-change-your-sperm-and-eggs.html>

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## **Pollution and the Lung**

- \* **Air pollution permanently inhibits lung growth in children.**
- \* **Brief exposure to ozone and particulate matter reduce lung function even in young healthy adults and the reduction can last for a week after the pollution exposure is over.**
- \* **Air pollution causes lung cancer.**
- \* **Long term ozone exposure causes an increase in overall mortality in addition to that from particulate matter. Most of the mortality is respiratory.**
- \* **Air pollution exacerbates virtually all pulmonary diseases and likely plays a causative role in reactive airways disease.**
- \* **Air pollution is associated with increased rates of hospitalization and death from respiratory diseases from neonates to the elderly**
- \* **The correlation between the above health outcomes and ozone are still found at concentrations between one half and one third the current EPA NAAQS**

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### **Pollution and Birth Outcomes**

**\* Air pollution causes morphologic changes in the placenta, inhibiting blood transfer to the fetus**

**\* Pregnant women exposed to more air pollution have multiple adverse pregnancy outcomes including pre-eclampsia, intrauterine growth retardation, premature births, low birth wt. syndrome and neonates with smaller head circumference**

**\*Air pollution is associated with higher rates of birth defects including neural tube and cardiac birth defects**

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### Miscellaneous Health Consequences

**\*Air pollution is associated with higher rates of breast cancer, lung cancer, childhood leukemia, diabetes, immune suppression, bacterial infections, lupus, juvenile arthritis, infant mortality, sleep apnea, and suicide**

**\*Air pollution causes systemic oxidative stress, cytotoxicity, and penetrates intracellular structures**

**\* Air pollution accelerates the aging process and shortens the lengths of telomeres**

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