

Urban Air Pollution Linked to Birth Defects for First Time; UCLA Research Links Two Pollutants to Increased Risk of Heart Defects

Exposure to two common air pollutants may increase the chance that a pregnant woman will give birth to a child with certain heart defects, according to a UCLA study that provides the first compelling evidence that air pollution may play a role in causing some birth defects.

Pregnant Los Angeles-area women living in regions with higher levels of ozone and carbon monoxide pollution were as much as three times as likely to give birth to children who suffered from serious heart defects, according to a study published in the Jan. 1 edition of the American Journal of Epidemiology.

Researchers from the UCLA School of Public Health and the California Birth Defects Monitoring Program found the risk for the birth defects increased among women exposed to elevated amounts of the pollutants in the second month of their pregnancy, a period when the heart and other organs begin developing.

"The greater a woman's exposure to one of these two pollutants in the critical second month of pregnancy, the greater the chance that her child would have one of these serious cardiac birth defects," said Beate Ritz, a UCLA epidemiologist who headed the study. "More research needs to be done, but these results present the first compelling evidence that air pollution may play a role in causing some birth defects."

Researchers conducted the study by matching extensive air pollution monitoring information collected by regional air-quality officials with information from the California Birth Defects Monitoring Program, a state agency that collects comprehensive information about structural birth defects in partnership with the March of Dimes Birth Defects Foundation.

"The birth defects registry is an exquisite investigational tool. Because of this resource we are able to intensify the search for causes of birth defects," said John A. Harris, chief of the California Birth Defects Monitoring Program. "One in 33 babies in the United States is born with a serious birth defect and is the leading cause of infant death — this kind of research is not a luxury. Studies like this one on air pollution give us critical leads to follow-up with further research."

Ritz said she was surprised that the study found an effect at the pollution levels researchers studied.

"These findings show that there are more health problems caused by air pollution than solely asthma and other respiratory illnesses," Ritz said. "There seems to be something in the air that can harm developing fetuses."

The study also suggests that despite significant decrease in urban air pollution nationally, there may be pollution problems that are not yet understood.

"There has been a big reduction in the levels of criteria air pollutants like ozone and carbon monoxide over the years," Ritz said. "But there still may be air toxics and fine particles or other secondary pollutants that occur alongside carbon monoxide and ozone, but which we don't measure routinely or know about, and those things may pose health risks we don't yet understand."

Researchers analyzed information collected by the California Birth Defects Monitoring Program on more than 9,000 babies born from 1987 to 1993 in Los Angeles, Orange, San Bernardino and Riverside counties. Using measurements made regularly at 30 locations by the South Coast Air Quality Management District, which manages air quality in the four-county region, researchers compared air quality near the homes of cases to air quality in the neighborhoods of children born healthy.

Pregnant women who were exposed to increased levels of ozone and carbon monoxide faced an elevated risk of having a child with conotruncal heart defects, pulmonary artery/valve defects and aortic artery/valve defects. This group of heart defects occurs 1.76 times per 1,000 births, with about 935 cases in California each year. Many of these babies face open-heart surgery before age one.

For women living in the areas with the highest levels of carbon monoxide and ozone, the risk tripled when compared to women who lived in areas of the air basin with the cleanest air. Among women who lived in areas with moderately higher pollution levels, the risk of birth defects doubled.

"We're not sure carbon monoxide is the culprit because it could be just a marker for something else in tailpipe exhaust," said Gary Shaw of the California Birth Defects Monitoring Program and a co-author of the study. "The fact that certain heart defects are turning up in the second month of pregnancy when hearts are being formed suggests something serious may be happening. The dose-response aspect of this study certainly strengthens the findings and underscores the need for additional research. Unlike other health factors like diet or lifestyle, a pregnant woman has almost no control over the quality of air she breathes — we need answers."

Researchers did not find a link between birth defects and exposure to nitrogen dioxide and larger-sized particulate matter — other air pollutants that are commonly found in the South Coast Air Basin and other urban regions. However, the monitoring network for particulate matter is less extensive than for other pollutants and no monitoring is done for very small particulates, which are often found alongside carbon monoxide. The study also

found no correlation between exposure to air pollution and other common birth defects such as cleft palates.

While the study focused on the Los Angeles urban region, the findings have implications for most urban areas in the nation, particularly ones where vehicle traffic plays an important part in forming air pollution, Ritz said. Carbon monoxide is primarily released in tailpipe emissions, while ozone pollution is formed in the atmosphere from pollutants released by both vehicles and industrial sources.

A number of recent studies conducted by Ritz and other researchers have suggested that air pollution can have harmful effects on pregnancy, including causing premature delivery and low birth weight. But researchers had not been able to examine whether there is a link between air pollution and birth defects because they lacked the resources to do such a study.

“You cannot do this type of scientific research unless you have a surveillance system that collects this type of high-quality information,” Ritz said. “Unless we collect extensive air pollution monitoring information and details about birth defects we cannot learn about these types of health effects.”

While the study is the first rigorous effort to demonstrate a link between air pollution and birth defects, the findings do have limitations, Ritz said.

Researchers were only able to estimate mothers' exposures to routinely measured air pollutants. They relied on air pollution concentrations collected at the air quality monitoring station nearest a mother's home, which could be as far as 10 miles away. Also, they were unable to evaluate other potential risk factors for birth defects, including maternal smoking, occupational exposures, vitamin supplement use, diet and obesity.

Future studies need to address these limitations, as well as examine whether it is the routinely measured pollutants or other potentially harmful substances in air pollution that are responsible for the birth defects, Ritz said.

“There may be some other chemical culprit in tailpipe emissions, which we can't identify at this time, that is causing the problem,” Ritz said. “Since carbon monoxide is released in motor vehicle exhaust along with these other pollutants that we don't measure, these other pollutants also may be important.”

Researchers at the Southern California Particle Center are working to identify the chemical components of the microscopic soot that is contained in vehicle tailpipe emissions. The UCLA School of Public Health-based center, one of four major particulate centers funded by federal officials, has identified compounds that researchers suspect could affect human health.

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