

# Birth defects linked to coal and pesticides

July 20 2011, by Deborah Braconnier

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(Medical Xpress) -- According to a new study published in the *Proceedings of the National Academy of Sciences*, pregnant mothers who are exposed to pesticides and smoke are as much as four times more likely to give birth to infants with serious birth defects.

The researchers, led by Tong Zhu from the State Key Joint Laboratory for Environmental Simulation and [Pollution Control](#) at Beijing University, looked at 80 infants and aborted fetuses that had brain and spinal cord defects. They discovered that the mother's placentas contained high amounts of chemicals in comparison to placentas from babies born without [birth defects](#).

The researchers detected significantly high levels of synthetic pesticides including DDT, hexachlorocyclohexane (HCH) and endosulfan as well as polycyclic aromatic hydrocarbons (PAHs) from inhaled coal smoke.

Neural tube defects, or NTDs, are brain and [spinal cord](#) defects with the most common of them occurring when the spinal column does not close during the first trimester and results in nerve damage and paralysis. They are common and can occur in one of every 1000 live births in the United States.

Zhu and his team examined fetuses from four rural counties in northern Shanxi province. Here, NTDs occur at a much higher rate of 14 out of 1000 births. The researchers determined that the placentas with higher than average levels of [pesticides](#) were 3 times more likely to give birth to an infant with NTDs while those with levels of PAH above the average

597 nano-grams per gram of lipid were 4.5 times more likely. In placentas with the highest levels of PAH, the risk increased to over 11 times.

These defects have been linked to a deficiency in folic acid, though environmental pollutants have been thought to play a role as well. Until this study however, there had been no direct evidence.

The researchers believe the exposure to PAHs is coming from indoor coal stoves and passive smoking and advise women to avoid these when pregnant.

Zhu and his team plan to explore these results in more detail and look at the genes of both the mothers and the infants to see if there may be a possible genetic abnormality that could be compounding the risk.

**More information:** Association of selected persistent organic pollutants in the placenta with the risk of neural tube defects, *PNAS*, Published online before print July 18, 2011, [doi: 10.1073/pnas.1105209108](https://doi.org/10.1073/pnas.1105209108)

## Abstract

Persistent organic pollutants (POPs) have been associated with a wide range of adverse health effects. Our case–control study was performed to explore the association between placental levels of selected POPs and risks for neural tube defects (NTDs) in a Chinese population with a high prevalence of NTDs. Cases included 80 fetuses or newborns with NTDs, whereas the controls were 50 healthy, nonmalformed newborn infants. Placental concentrations of polycyclic aromatic hydrocarbons (PAHs), organochlorine pesticides, polychlorinated biphenyls, and polybrominated diphenyl ethers were analyzed by gas chromatography–mass spectrometry. The medians of PAHs, o,p'-isomers of dichlorodiphenyltrichloroethane (DDT) and metabolites,

$\alpha$ - and  $\gamma$ -hexachlorocyclohexane (HCH), and  $\alpha$ -endosulfan were significantly higher in case placentas than in controls. PAH concentrations above the median were associated with a 4.52-fold [95% confidence interval (CI), 2.10–9.74] increased risk for any NTDs, and 5.84- (95% CI, 2.28–14.96) and 3.71-fold (95% CI, 1.57–8.79) increased risks for anencephaly and spina bifida, respectively. A dose–response relationship was observed between PAH levels and the risk of NTDs, with odds ratios for the second, third, and fourth quartiles, compared with the first, of 1.77- (95% CI, 0.66–4.76), 3.83- (95% CI, 1.37–10.75), and 11.67-fold (95% CI, 3.28–41.49), respectively. A dose–response relationship was observed for anencephaly and spina bifida subtypes. Similar results were observed for o,p'-DDT and metabolites,  $\alpha$ -HCH,  $\gamma$ -HCH, and  $\alpha$ -endosulfan, whereas no dose–response relationship was observed for the last two pollutants. Elevated placental concentrations of PAHs, o,p'-DDT and metabolites, and  $\alpha$ -HCH were associated with increased risks of NTDs in this population.

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