

# Is chemical exposure in mothers, babies, linked to poor vaccine response?

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Early life exposures to toxic chemicals such as PCBs and DDT dampen an infant's response to the tuberculosis vaccine, according to a new study from the University of Rochester Environmental Health Sciences Center.

The significance of the study extends far beyond TB vaccine responses and exposures to these two chemicals, said Todd Jusko, Ph.D., an assistant professor in the UR Departments of Environmental Medicine and Public Health Sciences, who led the study. "There are thousands of pollutants similar to PCBs and DDT with unknown health implications," he said. "Our work provides a foundation for how these types of chemicals affect the developing immune system in infants around the world."

The two primary chemicals studied in the UR paper—polychlorinated biphenyls (PCBs) and DDE, the main breakdown product of the insecticide DDT—are among the world's most persistent pollutants. (Persistent pollutants are not easily degraded and thus remain a health threat long after they are banned.)

PCBs were used in manufacturing and in consumer products in the United States until their ban in 1979. Despite this, nearly all people have detectable concentrations in their blood, even those who live in unindustrialized areas around the globe. DDT, although banned in the U.S., is still used in some countries to control malaria spread by mosquitos.

The UR study was published in the journal *Environmental Health Perspectives*. Researchers analyzed [blood samples](#) and immune responses from 516 healthy mother-infant pairs living in an area of eastern Slovakia that's heavily contaminated with [environmental toxins](#). The [tuberculosis vaccine](#) was given to each baby within four days after birth.

Jusko and senior author B. Paige Lawrence, Ph.D., a UR professor and expert in how [chemical](#) insults influence the immune system, then measured the babies' antibody responses to the vaccine six months later.

Data showed that harmful chemicals were detected in more than 99 percent of the blood samples. But infants who had the highest concentrations of PCBs and other chemicals in their blood tended to have the lowest antibodies for fighting TB. In fact, babies whose PCB concentrations ranked in the 75th percentile had 37 percent lower antibodies for the TB vaccine, compared to babies with PCB concentrations in the 25th percentile.

DDE was not as strongly associated as PCBs with a reduction in vaccine antibody levels, but its presence also substantially reduced the infant response to the TB vaccine; infants with exposures to both chemicals fared the worst, the study said.

Like other persistent chemicals, PCBs and DDE cross the placenta and are readily passed from mother to child through breastfeeding. Development of a robust immune system is a complex and intricate process in early life, the UR authors noted, and therefore even small changes can lead to long-term dysfunction.

Tuberculosis is a major infectious disease killer worldwide, impacting nearly 10 million people in 2014. Scientists have debated for years why response to the TB vaccine is variable, and the effect of environmental toxins on the developing [immune system](#) is often overlooked as a

possible reason. The UR study reinforces this idea by showing that common pollutants reduce the response to an important global [vaccine](#), Lawrence said.

Provided by University of Rochester Medical Center

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