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# Fetuses more vulnerable to some environmental contaminants penetrating into cord blood

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Toxic environmental contaminants are increasingly known to cause a number of severe health problems, in particular on fetuses, including heart failure, low cognitive ability, delayed development, and neurobehavioral disorders.

A new research featured in the *Environmental Science and Technology* published by the American Chemical Society suggests that the fetus is more vulnerable to some pollutants with certain properties because they penetrate further into the feto-maternal system. The research found that distributions of pollutants and the mechanisms of distributions vary depending on each pollutant's physicochemical characteristics.

Led by Dr. Yoon-Seok Chang, a professor of the School of Environmental Science and Engineering at Pohang University of Science and Technology (POSTECH), Korea, the research team analyzed a series of persistent organic pollutants (POPs) and heavy metals in the samples of cord blood, maternal blood, maternal urine, and placenta from new-born babies and their mothers. The contaminants include mercury, lead, cadmium, dioxins (PCDD/Fs, PBDD/Fs), dioxin-like compounds (PCNs, PCBs), and brominated flame retardant (PBDEs).

By looking into the concentration levels of toxins in each part of the feto-maternal system, Chang and the researchers have confirmed that all pollutants in the mother's blood are transported to the fetus through the

placenta and cord blood.

Despite the fact that most of the contaminants are slightly filtered when passing through the placental barrier, all heavy metals seem to easily pass through the barrier. Lead is hardly affected, and mercury accumulates even more in the fetal blood than the maternal blood due to its binding affinity to fetal proteins. PBDEs are similarly detected higher in the cord blood due to its unique distribution mechanisms strongly associated with the thyroid hormone, deduced by the researchers.

The study has also brought much deserved attention to the prenatal exposure to POP candidates, of which no previous studies seriously considered, as PCNs and PBDD/Fs are detected in the cord blood for the first time. PCNs and PBDD/Fs' dioxin-like structure and growing discharge into the environment are worthy of public concern.

"When environmental contaminants are accumulated in a pregnant mother, the fetus is also directly exposed to them, meaning the adverse effects of POPs and heavy metals last generation after generation," says Chang, the leader of this study. While planning on follow-up research for more comprehensive understanding of the distribution, interrelation, and health effects of various contaminants, Chang has emphasized efforts to reduce human exposure to and discharge of environmental contaminants.

Titled "Partitioning Behavior of Heavy Metals and Persistent Organic Pollutants among Feto-Maternal Bloods and Tissues," this study was supported by the National Research Foundation, Korea, and by the Environmental Health Action Program of the Korea Ministry of Environment.

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