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Dioxin Exposure Causes Transgenerational Health Effects

A new study, funded in part by NIEHS, found that dioxin affects not only the health of an exposed rat, but also unexposed descendants through a mechanism of epigenetic transgenerational inheritance.

The [study](#) was conducted in the laboratory of [Michael Skinner, Ph.D.](#), a professor in the Center for Reproductive Biology in the Department of Biological Sciences at Washington State University (WSU) who designed the [study](#). Co-authors included assistant research professor Mohan Manikkam, Ph.D., research technician Rebecca Tracey, and postdoctoral researcher Carlos Guerrero-Bosagna, Ph.D.

“Although not designed for risk assessment, these results have implications for the human populations that are exposed to dioxin and are experiencing declines in fertility and increases in adult onset disease, with a potential to transmit them to later generations,” the authors concluded.

Dangers of dioxin last for decades after initial exposure

Dioxin, 2,3,7,8-tetrachlorodibenzo[p]dioxin (TCDD), is a chemical compound that constitutes part of the Agent Orange herbicide used as a defoliant in the Vietnam War. According to research cited in the study, exposure is estimated to have caused 400,000 deaths and 500,000 birth defects. Dioxin has also been released from industrial accidents, leading to human exposures. Due to its extremely long half-life of up to 10 years in humans, dioxin may still affect pregnancies occurring even 20 years after exposure.

In the Skinner group’s experiments, exposure to dioxin caused changes in the DNA methylation patterns of sperm that were transmitted across generations, in an imprinted-like manner, to affect the health of multiple generations of descendants. The grandchildren of exposed rats showed dioxin-induced effects ranging from polycystic ovarian disease to kidney disease. The work raises the serious concern that even if toxic chemicals, such as dioxin, were completely removed from the environment, they could continue to cause disease for multiple generations.

READ MORE: <http://www.niehs.nih.gov/news/newsletter/2012/11/science-dioxin/index.htm>