

Dioxin causes disease and reproductive problems across generations

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Since the 1960s, when the defoliant Agent Orange was widely used in Vietnam, military, industry and environmental groups have debated the toxicity of its main ingredient, the chemical dioxin, and how it should be regulated.

But even if all the dioxin were eliminated from the planet, Washington State University researchers say its legacy will live on in the way it turns genes on and off in the descendants of people exposed over the past half century.

Writing in the journal [PLoS ONE](#), biologist Michael Skinner and members of his lab say dioxin administered to pregnant rats resulted in a variety of reproductive problems and disease in subsequent generations. The first generation of rats had prostate disease, polycystic ovarian disease and fewer ovarian follicles, the structures that contain eggs. To the surprise of Skinner and his colleagues, the third generation had even more dramatic incidences of ovarian disease and, in males, kidney disease.

"Therefore, it is not just the individuals exposed, but potentially the great-grandchildren that may experience increased adult-onset [disease susceptibility](#)," says Skinner.

Skinner is a professor of [reproductive biology](#) and environmental epigenetics - the process in which environmental factors affect how genes are turned on and off in the offspring of an exposed animal, even

though its [DNA sequences](#) remain unchanged. In this year alone, Skinner and colleagues have published studies finding epigenetic diseases promoted by jet fuel and other hydrocarbon mixtures, plastics, pesticides and fungicides, as well as dioxin.

The field of epigenetics opens new ground in the study of how diseases and reproductive problems develop. While toxicologists generally focus on animals exposed to a compound, work in Skinner's lab further demonstrates that diseases can also stem from older, ancestral exposures that are then mediated through [epigenetic changes](#) in sperm.

More information: The study, "Dioxin (TCDD) Induces Epigenetic Transgenerational Inheritance of Adult Onset Disease and Sperm Epimutations," is available at dx.plos.org/10.1371/journal.pone.0046249

Provided by Washington State University

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