MedicalXpress

Effects of environmental toxicants reach down through generations

March 2 2012

A Washington State University researcher has demonstrated that a variety of environmental toxicants can have negative effects on not just an exposed animal but the next three generations of its offspring.

The animal's DNA sequence remains unchanged, but the compounds change the way genes turn on and off—the epigenetic effect studied at length by WSU molecular biologist Michael Skinner and expanded on in the current issue of the online journal *PLoS ONE*.

While Skinner's earlier research has shown similar effects from a pesticide and fungicide, this is the first to show a greater variety of toxicants—including jet fuel, dioxin, plastics, and the pesticides DEET and permethrin—promoting epigenetic disease across generations.

"We didn't expect them all to have transgenerational effects, but all of them did," Skinner told the technology website Gizmodo. "I thought hydrocarbon would be negative but it was positive too."

This tells researchers that the ability to promote transgenerational disease is "not simply a unique aspect for a unique compound" but a characteristic of many environmental compounds.

The field opens new ground in the study of how diseases develop. While toxicologists generally focus on animals exposed to a compound, Skinner's work further demonstrates that diseases can also stem from older, ancestral exposures that are then mediated through epigenetic

changes in sperm.

The work also points the way to identify and diagnose exposures through the use of specific epigenetic molecular markers.

"In the future we might be able to use these epigenetic biomarkers to determine your ancestral and personnel exposure early in life, and to predict your susceptibility to get a disease later in life," Skinner says.

The study was funded by the U.S. Army to study pollutants that troops might be exposed to. Skinner and his colleagues exposed pregnant female rats to relatively high but non-lethal amounts of the compounds and tracked changes in three generations of offspring. The researchers saw females reaching puberty earlier, increased rates in the decay and death of sperm cells, and lower numbers of ovarian follicles that later become eggs. Future studies can use the molecular tools for risk assessment analysis.

More information: The paper, "Transgenerational Actions of Environmental Compounds on Reproductive Disease and Identification of Epigenetic Biomarkers of Ancestral Exposures," can be found at www.plosone.org/article/info%3Adoi%2F10.1371%2Fjournal.pone.0031901

Provided by Washington State University