Researchers investigate effect of environmental epigenetics on disease and evolution

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Washington State University researchers say environmental factors are having an underappreciated effect on the course of disease and evolution by prompting genetic mutations through epigenetics, a process by which genes are turned on and off independent of an organism's DNA sequence.

Their assertion is a dramatic shift in how we might think of disease and evolution's underlying biology and "changes how we think about where things come from," said Michael Skinner, founding director of the Center for Reproductive Biology in WSU's School of Biological Sciences.

Skinner and colleagues Carlos Guerrero-Bosagna and M. M. Haque present their findings in the latest issue of the journal *Epigenetics*.

"The ability of environmental factors to promote epigenetic inheritance that subsequently promotes genetic mutations is a significant advance in our understanding of how the environment impacts disease and evolution," they write.

Skinner is a pioneer in the field of epigenetics, which looks at the effect of changes in how genetic information is passed between generations even if DNA remains unchanged.

Earlier work by Skinner has found epigenetic effects from a host of environmental toxicants, connecting plastics, pesticides, fungicide, dioxin and hydrocarbons to diseases and abnormalities as many as three generations later.

His recent study exposed gestating female rats to the fungicide vinclozolin. Sperm in the first generation of male offspring showed epimutations, or alterations in the methyl groups that stick to DNA and affect its activation.

Third generation, or great-grand offspring, had increased genetic mutations, which the researchers saw in increased DNA structure changes known as copy-number variations. Multiple generations of control animals had no such variations.

This, said Skinner, suggests that environment has a more important role in mutations, disease and evolution than previously appreciated, and appears to be one of the main drivers of intergenerational changes, not simply a passive component. In short, Skinner and his colleagues say, the environment and epigenetics can drive genetics.

"There's not a type of genetic mutation known that's not potentially influenced by environmental epigenetic effects," Skinner said.

Provided by Washington State University