

Transmitting future asthma by smoking today

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Asthma is a serious public health problem. An estimated 300 million people worldwide suffer from this sometimes deadly lung disease, a number expected to increase to 400 million by 2025. One well-established risk factor for asthma is having a mother who smoked during her pregnancy. However, researchers recently discovered that smoking can have a lasting legacy. When animal mothers are exposed to nicotine during pregnancy—a proxy for smoking—their grandchildren were also at an increased risk of asthma, even though they were never exposed to nicotine themselves.

Wondering if this dangerous heritage might extend even farther down the family line, Virender K. Rehan and his colleagues at Los Angeles Biomedical Research Institute at Harbor-UCLA Medical Center (LA BioMed) exposed pregnant rats to nicotine. They then tested an additional generation—the mothers' great-grand-rats—for signs of asthma. Their results suggest that this group of rats is also at an increased risk of this condition, bearing the brunt of [nicotine exposure](#) three generations in the past.

The article is entitled "Perinatal Nicotine-Induced Transgenerational Asthma." It appears in the Articles in Press section of the *American Journal of Physiology-Lung Cellular and Molecular Physiology*, published by the American Physiological Society. It is available [online](#).

Methodology

The researchers separated pregnant rats into two groups. One group received a dose of nicotine injected under their skin daily—a model for smoking in humans—starting when they were 6 days pregnant until 21 days after they gave birth. Their pups were allowed to breastfeed as much as they wanted until they weaned at 3 weeks old. Another group of pregnant rats received only a placebo injected under their skin for the same time period. The researchers used rat pups from these pregnancies to breed subsequent generations of rats. When they reached the third generation born from the original rat moms—their great-grandchildren—they performed a series of tests on these animals to look for signs of asthma. They exposed these animals to a lung irritant to see how much it narrowed their airways, a test similar to one used to diagnose asthma in people. They also tested how the animals' windpipes responded to a chemical that caused them to contract, another indicator of asthma. No rats except for the pregnant moms were ever directly exposed to nicotine.

Results

The study authors found that the great-grandchildren of the rat mothers exposed to nicotine were significantly more likely to have signs of asthma on the lung and windpipe tests compared to those descended from mothers who received the placebo. Those great-grandchildren of the [nicotine](#)-exposed moms had lungs that narrowed more easily when exposed to an asthma provocative challenge and windpipes that contracted more readily.

Importance of the Findings

These findings suggest that smoking may have effects that reverberate through generations, particularly by influencing asthma risk, the authors say. Though they're not yet sure why, they suggest that smoking may

influence which genes are turned on or off in offspring, including genes in their sperm and eggs. These effects can be passed down from parents to offspring over and over, upping [asthma](#) risk for subsequent generations.

Provided by American Physiological Society

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