New data suggests nicotine while pregnant alters genes

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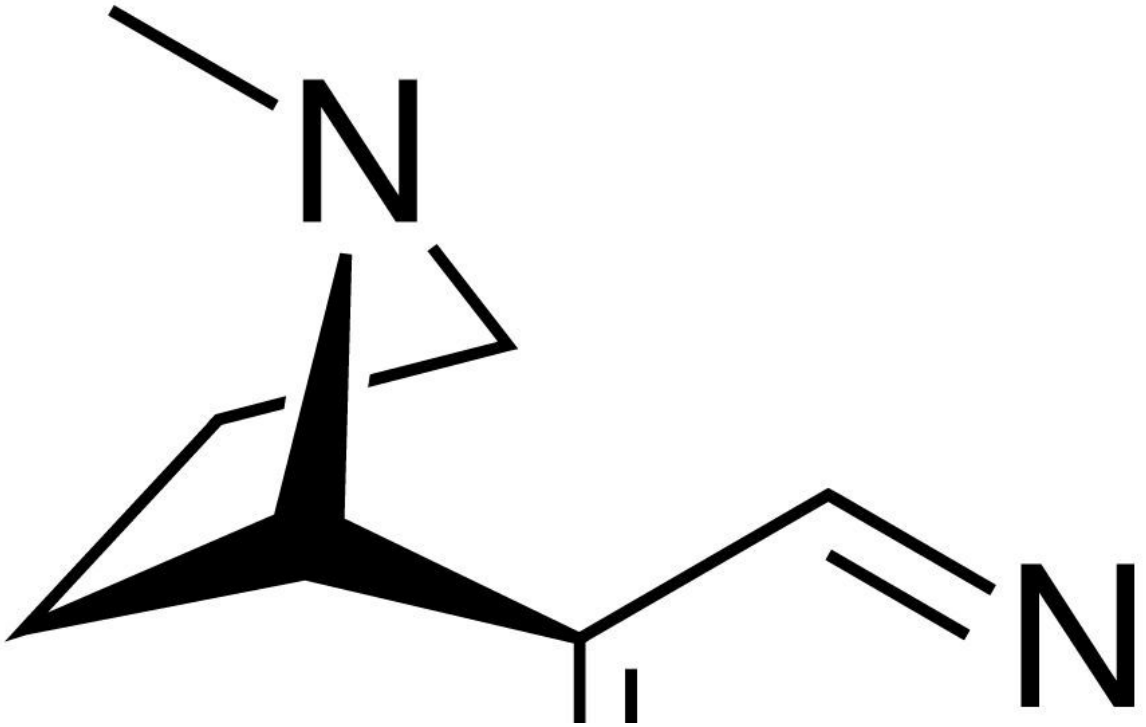

Nicotine, alternate molecular skeletal 2D rendering showing the 3D conformation of its ring at lowest energy in actual space. Credit: Public Domain

The Akay Lab biomedical research team at the University of Houston is reporting in the journal Nature *Scientific Reports* that a possible cure for addiction may be found by following the pathways of significantly altered dopamine neurons in newborns who were chronically exposed to

nicotine in utero. The findings of the altered neurons come from recordings of dopamine and non-dopamine neurons in the brain's addiction center, called the ventral tegmental area (VTA), following chronic nicotine exposure during pregnancy.

Metin Akay, John S. Dunn Endowed Chair Professor of Biomedical Engineering and department chair, and his research team noted that the dopamine neurons, in response to nicotine exposure during pregnancy, were significantly activated, allowing the release of unusually high levels of dopamine in the prefrontal cortex.

Active dopamine, known as the "feel good" hormone, might seem a good thing at first glance. It's a neurotransmitter that carries information between neurons and regulates emotional responses. It allows us to see rewards and encourages action that will lead to reward, but since it contributes to those feelings of pleasure and reward, it also plays a part in addiction.

"The impacted dopamine can result in babies being born addicted to nicotine, but once we understand which genes are altered, which gene regulator networks are altered and which gene pathways are altered, we can develop targeted medication that could eliminate addiction in offspring," said Akay.

Exposure to nicotine during pregnancy through maternal smoking or nicotine replacement therapy is associated with adverse birth outcomes as well as several cognitive and neurobehavioral deficits.

The Akay lab previously published work indicating that dopamine neurons in the VTA are very likely involved in nicotine addiction. Their current work speaks to the very nature of health itself, exploring how the dopamine of nicotine-exposed offspring alters gene expression, a fundamental building block of health. Many diseases are caused by a

change in the DNA of a single gene.

More information: Renee F. Keller et al, Comparison between dopaminergic and non-dopaminergic neurons in the VTA following chronic nicotine exposure during pregnancy, *Scientific Reports* (2019). DOI: 10.1038/s41598-018-37098-1

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