

Nicotine withdrawal traced to very specific group of brain cells

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Nicotine withdrawal might take over your body, but it doesn't take over your brain. The symptoms of nicotine withdrawal are driven by a very specific group of neurons within a very specific brain region, according to a report in *Current Biology*, a Cell Press publication, on November 14. Although caution is warranted, the researchers say, the findings in mice suggest that therapies directed at this group of neurons might one day help people quit smoking.

"We were surprised to find that one population of neurons within a single brain region could actually control physical [nicotine withdrawal](#) behaviors," says Andrew Tapper of the Brudnick Neuropsychiatric Research Institute at the University of Massachusetts Medical School.

Tapper and his colleagues first obtained mice addicted to nicotine by delivering the drug to mice in their water for a period of 6 weeks. Then they took the nicotine away. The mice started scratching and shaking in the way a dog does when it is wet. Close examination of the animals' brains revealed abnormally increased activity in neurons within a single region known as the interpeduncular nucleus.

When the researchers artificially activated those neurons with light, animals showed behaviors that looked like nicotine withdrawal, whether they had been exposed to the drug or not. The reverse was also true: treatments that lowered activity in those [neurons](#) alleviated nicotine withdrawal symptoms.

That the interpeduncular nucleus might play such a role in withdrawal from nicotine makes sense because the region receives connections from other areas of the brain involved in nicotine use and response, as well as feelings of anxiety. The interpeduncular nucleus is also densely packed with [nicotinic acetylcholine receptors](#) that are the molecular targets of nicotine.

It is much less clear whether the findings related to nicotine will be relevant to other forms of addiction, but there are some hints that they may.

"Smoking is highly prevalent in people with other substance-use disorders, suggesting a potential interaction between nicotine and other drugs of abuse," Tapper says. "In addition, naturally occurring mutations in genes encoding the nicotinic receptor subunits that are found in the interpeduncular nucleus have been associated with drug and alcohol dependence."

More information: *Current Biology*, Zhao-Shea et al.: "Activation of GABAergic neurons in the interpeduncular nucleus triggers physical nicotine withdrawal symptoms." [dx.doi.org/10.1016/j.cub.2013.09.041](https://doi.org/10.1016/j.cub.2013.09.041)

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