

## Brain-damaged smokers provide clues to anatomy of addiction: study

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Smokers with a damaged insula – a region in the brain linked to emotion and feelings – quit smoking easily and immediately, according to a study in the Jan. 26 issue of the journal *Science*. The study provides direct evidence of smoking's grip on the brain.

It also raises the possibility that other addictive behaviors may have an equally strong hold on neural circuits for pleasure.

The senior authors of the study are Antoine Bechara and Hanna Damasio, both faculty in the year-old Brain and Creativity Institute at the University of Southern California, in collaboration with graduate students Nasir Naqvi, who was first author on the study, and David Rudrauf, both from the University of Iowa.

"This is the first study of its kind to use brain lesions to study a drug addiction in humans," Naqvi said.

In the 1990s, Antonio Damasio proposed the insula, a small island enclosed by the cerebral cortex, as a "platform for feelings and emotion." The *Science* study shows that the pleasure of smoking appears to rest on this platform.

"It's really intriguing to think that disrupting this region breaks the pleasure feelings associated with smoking," said Damasio, director of the institute and holder of the David Dornsife Chair in Neuroscience at USC.

"It is immediate. It's not that they smoke less. They don't smoke, period."

The finding raises the question of whether damage to the insula also could cause a person to quit other addictive behaviors. Can a brain lesion cure someone of their bad habits?

The answer is not yet known, Bechara said, but he suggested the phenomenon could be "generalizable" with respect to alcohol abuse, overeating and other addictions.

The discovery of the insula's role in addiction opens new directions for therapies, Bechara said, including possible drugs targeted to a region that "no one paid attention to."

"There is a lot of potential for pharmacological developments," Bechara said.

Any treatment would need to preserve the beneficial functions of the insula. But Bechara noted that the region appears to be involved specifically in "learned behaviors" rather than the fundamental drives necessary for survival. As a result, it might be possible to target one without disrupting the other.

Hanna Damasio, co-director of the institute and holder of the Dana Dornsife Chair in Neuroscience, also stressed the difference between habitual and instinctive behaviors.

"Because the insula is now recognized as a key structure in processes of emotion and feeling, the fact that insular damage breaks down a learned habit such as smoking, demonstrates a powerful link between habit and emotion or feeling," she said.

The finding that one small region could be the Achilles' heel of smoking addiction is especially surprising, given the brain-wide effects of nicotine on the nervous system.

The study considered smokers with damage that did not include the insula, but the likelihood of disrupting the smoking addiction was many times greater when the insula was involved.

Source: University of Southern California

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