

Treacherous correlation in the brain from smoking

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Smoking harms nearly every organ in the body and causes many diseases. Credit: CDC/Debora Cartagena

Out with the cigarette pack, put a cigarette in the mouth and light up. That is a well-known action for a smoker and, at the same time, behavior which has a stronger connection to actual drug dependency than was previously believed, research at the Sahlgrenska Academy has revealed.

"In the future we hope that this can contribute towards the development of pharmacological tools to help those who are dependent," says Amir Lotfi Moghaddam, thesis defendant in addiction biology at the Institute of Neuroscience and Physiology.

In his pre-clinical thesis he has employed tests on rats in order to research factors which can be decisive in, for example, a party smoker becoming an habitual smoker. In addition to nicotine he has studied amphetamines. Both agents are centrally stimulating but have different molecular mechanisms.

The studies show that the part of the [brain](#) which can be connected to target-oriented behavior, such as handling cigarettes, is disturbed by substances such as nicotine and amphetamines. These disturbances are then transferred and established in regions of the brain which are of importance for establishing habits and drugs dependency.

The one thing thus triggers another and even though the enjoyment value of a drug is decreased for the individual the habitual part of the brain continues to be active.

"At a late stage of dependency you often hear from smokers who say that they don't actually derive much pleasure from smoking. They know that it is bad for them but they are unable to do anything about it. The habit is too strong to break," Amir Lotfi Moghaddam points out.

These processes run in parallel in different sections in a part of the brain known as the striatum, in both humans and rats. In the studies in question, the animals are subjected to daily doses of nicotine for fifteen days, or of amphetamines for five days.

The rats then underwent a series of behavioral tests, molecular-biological measurements and examinations of brain activity.

"The interesting aspect is that when we give animals nicotine or amphetamines during a short period of time, we are directly able to ascertain changes in that part of the striatum that controls target-oriented behavior, while changes in the section connected to establishing habits occur later, when the drugs have passed out of the system," says Amir Lotfi Moghaddam.

"It is important to stress that the discoveries have been made on rats and that more studies are needed, but we believe that these changes are important with regard to the transition from recreational use to habitual use," he says in conclusion.

Provided by University of Gothenburg

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