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Subthalamic nucleus deep brain stimulation for the treatment of addiction: Frequency matters

Baunez C
Aix-Marseille University, France

The key features of addiction are the motivation for the substance of abuse, the escalated drug intake, the compulsive seeking and taking of the drug, often followed by periods of abstinence that most of the time leads to relapse. The neural mechanisms involved in the transition to addiction remain to be elucidated, as well as the key factors determining why some individuals are vulnerable to addiction while others can pursue drug use in a recreational manner. Using rat models of these various features of addiction, we have shown that the subthalamic nucleus (STN) can be a critical cerebral structure in which electrophysiological activity could serve as a marker of drug craving, or predictive marker of vulnerability to compulsive use. We have also shown that applying deep brain stimulation into the STN can have therapeutic effects on some features of addiction in a frequency manner. Our results lead to suggest that STN DBS could serve as a surgical strategy to treat addiction and before translation to human drug users; we have developed a non-human primate of drug consumption to validate our hypothesis.

cbesoz@aol.com