

Addiction: Insights from Parkinson's disease

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A new comprehensive review by researchers at the Montreal Neurological Institute (MNI), McGill University and the University of Cambridge, England provides vital insights into the neurological basis of addiction by investigating Parkinson's disease patients, who in some instances develop various addictions when undergoing medical treatment. The review, published in this week's (February 25) issue of the scientific journal *Neuron*, illustrates that persistently elevated levels of dopamine in the brain promote the development and maintenance of addictive behaviours.

Addiction is a complex health and societal problem that can destroy lives and damage communities. Brain imaging studies have shown that addiction severely alters brain areas critical to decision-making, learning and memory, and behavior control. In order to learn how to control or manage the disorder, it is necessary to understand the underlying biological mechanisms. Researchers have turned to Parkinson's disease to study addiction, successfully using one disease to learn about another. Although seemingly very different, dopamine plays a role in both disorders and some of the same systems in the brain are affected. Parkinson's disease is often thought as just affecting movement but, it also consists of cognitive, behavioural and mood symptoms, which are now being recognized as a major source of disability.

Dopamine is a neurotransmitter, or chemical messenger in the brain that is involved in brain processes that control movement, emotional response and the ability to experience pleasure, reward and pain. Parkinson's patients lack dopamine and are often treated with dopamine agonists,

medication that mimics dopamine action.

"In some instances Parkinson's disease (PD) patients become addicted to their own medication, or develop behavioural addictions such as pathological gambling, compulsive shopping or hypersexuality," says Dr. Alain Dagher, neurologist at the MNI and co-author of the review.

"This is surprising because PD patients typically have a very low incidence of drug abuse and display a personality type that is the opposite of the typical addictive personality. These rare, addictive syndromes, which appear to result from excessive dopaminergic treatment, illustrate the link between dopamine, personality and addiction."

PD patients treated with dopamine agonists had an incidence of pathological gambling as high as 8% compared to less than 1% in the general population. In PD patients who develop addictive disorders, the problems started soon after starting dopaminergic therapy and stopped after treatment was discontinued. It was found that adjusting the dosage and combination of medication resolved the addictive symptoms, while maintaining the same motor benefit.

The phenomenon of addiction induced by dopamine medications can also tell us something about vulnerability to addiction in the general population. Not everyone is equally vulnerable, and it now appears that the propensity to become addicted is in part hereditary. Many of the genes implicated in addiction appear to affect brain levels of dopamine.

Studies show that that dopamine acts in an area of the brain known as the ventral striatum, which receives input from other areas such as the hippocampus and amygdala. It may be through this region that dopamine promotes addictive behaviours.

Source: McGill University

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