

DOPAMINE IS SUFFICIENT TO INDUCE ADDICTION

Vincent Pascoli & Christian Lüscher

University of Geneva, Switzerland

Addictive drugs increase the dopamine concentration in the ventral striatum (VS) through distinct mechanisms. Optogenetic stimulation of dopamine neurons reproduces this common feature. When channelrhodopsin is expressed in the VTA of DAT-Cre mice, the lever pressing for laser stimulation is strongly reinforced. Such DA neuron self-stimulation resembles intravenous self-administration of addictive drugs. After weeks of withdrawal a light cue triggers a strong seeking behaviour, a recognized model for relapse. Just as with cocaine, some animals persevere even when laser self stimulation is paired with a light, aversive electric shock. In parallel cellular adaptations, such as synaptic plasticity in the VS and changes in neuronal excitability in the cortex, are observed both in mice self-administering cocaine and mice self-stimulating VTA dopamine neurons.

Optogenetic dopamine neuron self-stimulation therefore represents a powerful model to study addiction in rodents. Future research aiming at understanding the individual vulnerability towards addiction may benefit from this model.

