Characterization of cells in the ventral tegmental area activated by abused drugs

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Generally, activation of the mesolimbic dopaminergic system, which projects from the ventral tegmental area (VTA) to the nucleus accumbens (N.Acc.), plays an important role in the development of psychological dependence on drugs of abuse. Medium spiny neurons in the N.Acc., which include dopamine D₁ receptors and mostly project to the VTA, are likely to be associated with relapse in drug abuse. Abused drugs have been classified as "uppers" and "downers," and it is believed that they cause drug addiction via different networks. In this study, we characterized cells in the VTA that are activated by abused drugs. In cFos-EGFP-Rp110a (cFos-TRAP) mice, drug-activated cells and non-activated cells were analyzed by FACS. As a result, most of the neurons in the VTA that were activated by the administration of either morphine or EtOH expressed tyrosine hydroxylase, dopamine transporter and mTOR. These results suggest that abused drugs may selectively activate dopaminergic neurons containing mTOR in the VTA. We are currently trying to identify the neurons that are activated by methylphenidate, benzodiazepines and other abused drugs to elucidate a common mechanism of drug addiction. This approach may help us understand the complex mechanism of psychological dependence on abused drugs.