DRUG ABUSE

The Mechanism of Drug Action in the Brain

Whenever a person uses a drug and the effect it produces is somehow pleasant, this effect gets a rewarding quality for that person. As experimental research by behavioral psychologists has demonstrated, all behaviors that are reinforced by a reward have a tendency to be repeated and learned. Successive repetitions, besides fixing the reward-producing behaviors, also fix all previously indifferent stimuli, sensations, and situations, eventually associated with those behaviors. Seeing particular places or persons, hearing specific musics, etc, for instance, triggers in drug users the craving for their preferred drug.

Using Positron Emission Tomography (PET) Dr. Edythe D. London and her colleagues at the Addiction Research Center, in Baltimore, obtained images showing that in cocaine-users, cues associated with the use of the drug sparked an increase in the metabolism of glucose in brain areas that are associated with memory and learning (lateral pre-frontal cortex, amygdala, and cerebellum).

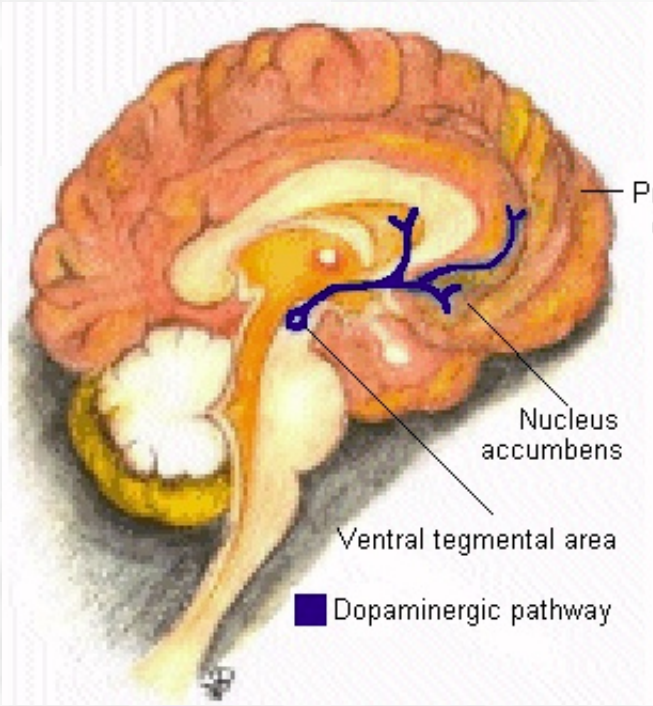

Illustration: Jurema Sampaio
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Up to now, is far from complete our knowledge about the cerebral, chemical and structural changes that underlie reward and act as reinforcers for different behaviors, including that of drug use. Nevertheless, recent researches point to a chain of reactions, involving several neurotransmitters, leading to the release of the neurotransmitter dopamine in a brain region called nucleus accumbens. This nucleus receives projections from dopaminergic cells located in the ventral tegmental area and it is a convergence site for stimuli coming from the amygdala, hippocampus, entorrhinal area, anterior cingulate area, and part of the temporal lobe (the so-called limbic system). From this nucleus efferent projections reach for the septus, hypothalamus, anterior cingulate area, and the frontal lobes. Due to its afferent and efferent connections the nucleus accumbens plays an important role in the regulation of emotion, motivation, and cognition.

Robinson and Kolb found that repeated administration of amphetamine produces morphologic changes lasting more than a month in neurons in the nucleus accumbens and prefrontal cortex in rats. The exposure to amphetamines produced an increase in the length of dendrites, in the density of dendritic spines, and in the number of branched spines on the medium spiny neurons of the nucleus accumbens, and similar effects on the apical dendrites of layer III pyramidal neurons in the prefrontal cortex.

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