



Center for Behavioral Health Studies

Stimulant Drugs Limit Rats' Brain Response to Experience

New experiences can literally grow our brains. As we are introduced to new situations, our brain cells sprout new fibers and form new synapses. In a recent study, the scientists looked at what happens when drug exposure precedes exposures to new, more stimulating environments.

These new communication networks enrich our ability in responding to life experiences. This growth process is called structural plasticity. According to new National Institute on Drug Abuse (NIDA) research, amphetamine and cocaine also stimulate structural plasticity. In rats, they found the use of stimulant drug induced growth appears to reduce the potential for subsequent experience driven growth.

Researchers found in these animals that repeated exposure to stimulant drugs limits the ability of later experiences to promote reorganization of synaptic connections in some brain regions.

Similarly, in humans, some of the behavioral and cognitive changes resulting from new experiences may be limited by prior

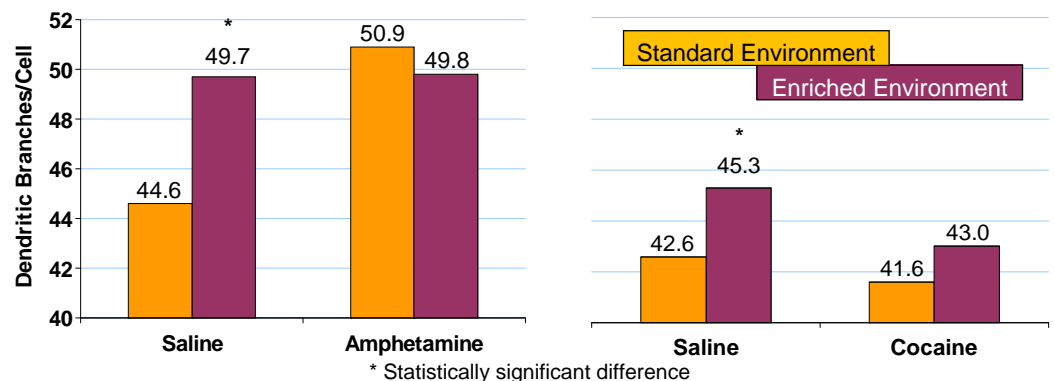
exposure to drugs. This drug triggered mechanism may well contribute to the persistent behavioral and cognitive deficits associated with drug abuse and addiction.

The influence of cocaine and amphetamine affect the growth of dendrites filaments that grow out of brain cells and act as collectors of messages incoming from other cells. There is an intense proliferation of dendrite branches and spines (shorter projections that terminate in synapses) when rats are put into challenging environments. (Please see Exhibit below).

In both animals and people, such growth is thought to be an important part of normal learning by transforming experience and associations into changes in brain circuitry.

This research suggests an alternative explanation for some of the cognitive and behavioral deficits associated with drug abuse. Results suggest that some behavioral or psychological deficits resulting from drug abuse may be caused by drugs impairing the ability of some brain regions to make the changes that enable us to learn and profit from our experiences.

Stimulant Drugs Inhibit Brain Cell Growth In Response to Environment



Summary

Drugs' destructive cognitive deficits have important implications for treatment, says Mona Sumner, Chief Operations Officer of Rimrock Foundation. "We need to take into account the possibility that the cognitive capacity of drug abusers may be impaired, which requires their treatment must accommodate these impairments.

Ms. Sumner adds that NIDA's research does have a hopeful side, "This study examined synaptic structure and indi-

cates that exposure to drugs alters the effects of subsequent environmental experience. This opens up the possibility that the exposure to enriching the treatment environment might counter the subsequent effect of drugs."

The main lesson of these findings suggests that "the brain appears to have a limited amount of plasticity which, in turn, limits an individual's ability to adapt to a changing environment.

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