



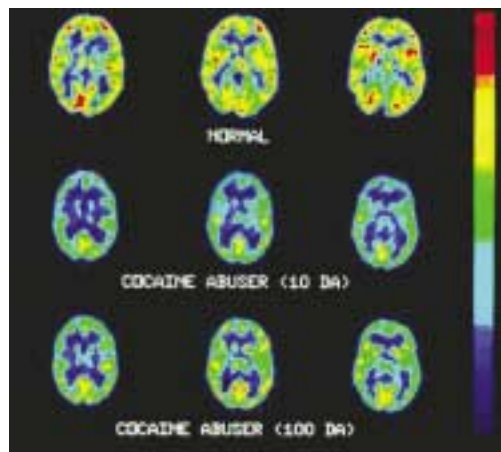
The Effect of Cocaine Abuse on the Brain: Can Cocaine Addiction Be Treated?

Cocaine is a powerfully addictive stimulant that directly affects the brain. It is made from the coca plant and causes a short-lived high that is immediately followed by opposite, intense feelings of depression, edginess, and a craving for more of the drug. Cocaine addiction may result in psychosis and addicts experience effects similar to those of schizophrenics such as paranoia, auditory hallucinations, and delusions, which may result in violent behavior. Doron Ravid, course supervisor of the Open University course, "Physiology of Behavior," doctoral researcher in Bar-Ilan University, is presently engaging in research on the effect of cocaine abuse on the brain, also addressing the question – Can cocaine addiction be treated?

"Cocaine use in Israel is on the rise," according to Doron Ravid. At present, there is no known cure for cocaine addiction. Ravid, as a service to the community, has participated in educational films on drug abuse directed to high school and college students, and produced by The Ministry of Education and the Association for Prevention of Drug Addiction and his research sheds light on the lasting and devastating effects of cocaine on the brain and hopes for future solutions.

Cocaine acts on the brain reward system which controls movement, emotional response, and ability to experience pleasure and pain. Brain researchers have found that one of the chemicals found in the reward region of the brain, and which plays a major role in addiction, is dopamine. Dopamine is a neurotransmitter, a chemical that carries messages from one nerve cell to another and is associated with body movement, awareness, judgment, motivation, and pleasure. Dopamine flows from neurons into the synapses, or spaces between neurons, to form a temporary link that serves to transmit signals between neurons. Dopamine moves from the synaptic gap back inside the

neuron by attaching to "transporter" molecules on the neuron's surface.



Cocaine use, comparative PET brain scans

Dopamine activity is known to control urges to begin and to repeat acts that are necessary for survival such as eating, drinking, and engaging in sex. Satisfying these urges results in pleasure or gratification. Once these urges have been satisfied, the body's normal response is satiety or "that's enough." Repeated cocaine use, however, turns off this normal satiety response so that users continue craving and drug seeking behavior. This short-circuiting of the satiety response could explain why cocaine abusers binge even in the face of powerful negative side effects.

Based on this widely-held theory, that cocaine-induced euphoria is precipitated by blocking the normal flow of dopamine in the brain, Doron Ravid has been experimenting with a substance that seems to reduce the craving for cocaine in rats. The study involved cocaine-addicted rats, trained that pushing a pedal would expose them to cocaine. Pressing the pedal results in injecting the cocaine into the vein. When injected with the alternate substance, they exhibited a significant decrease in the demand for cocaine. Since the substance is not a drug, but rather a natural substance produced by the body, and one approved for use in clinical studies by the FDA, a group of researchers from Bar-Ilan University have now begun clinical trials with a group of cocaine addicts.

"The study is in a very early stage," cautions Doron Ravid, "but if the tests on humans are as successful as the laboratory results, we may have an answer to the search for a treatment."

Doron Ravid's research, partially funded by a research grant of the Open University Research Authority, is held in the Brain Research Center of Bar-Ilan University within Ravid's doctorate under supervision of Dr. Gal Yadid from the Neuropharmacology Unit. Doron Ravid holds a Bachelor's degree in Psychology from the Open University and a Master's Degree in Psychobiology from Tel Aviv University (with honors) and is participating in the honors president's program of the Bar-Ilan doctoral fellowship of excellence.