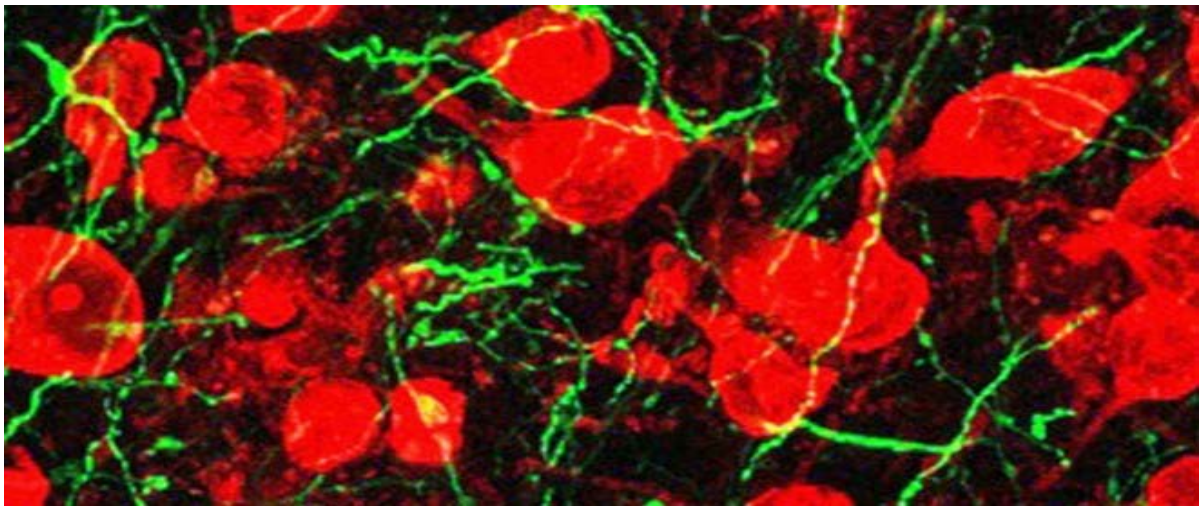
Laser throws light on addiction



Nerve cells in the brain region known as the nucleus accumbens, in red, receive input from amygdala fibers, in green. In a study at the University of North Carolina Chapel Hill, stimulating these nerve fibers with laser light produces a rewarding effect in mice. The finding may lead to advances in treating addiction and other behavioral dsorders.

SUNCOAST NEWS STAFF REPORT
Published: July 6, 2011

Using an emerging technique in which light stimulates or inhibits nerve cells that have been altered at the genetic level, researchers at the University of North Carolina Chapel Hills have been able to alter the reward-seeking behavior in lab mice.

The results could one day lead to treatment for neuropsychiatric disorders such as addiction and Parkinson's disease.

The UNC team published a report on their work June 29 on the online version of the journal Nature.

Garret D. Stuber, assistant professor in the departments of cell and molecular physiology, psychiatry and the Neuroscience Center in UNC School of Medicine, and his collaborators have been using the technique known as optogenetics to study how the transfer of nerve impulse between regions of the brain can affect behavior such as reward seeking.

In their research, Stuber and his colleagues introduced light-sensitive protein molecules known as opsins into a specific type of nerve cell in the brains of lab mice. Then depending on the type of opsin molecule used, the scientists could either stimulate or inhibit at the gene level a molecular process associated with nerve signal transfer by shining laser light on the opsin.

Optogenetics, developed early last decade, gives researchers they speed and precision they need to explore in real time neurological processes in a living system such as the brains of mammals such as mice and, potentially, humans.

Brains have many regions cell types and nerve connections jammed into a compact space, so finding which is involved in a particular neurological process is hard. With optogenetics, Stuber

said, "Our ability to perform this level of sophistication in neural circuit manipulation will likely to lead to the discovery of molecular players perturbed during neuropsychiatric illnesses."

In their initial experiments, the UNC researchers used the optogenetic technique to deliver a reward to mice each time they stuck their nose into a hole in its cage. The mice who had received opsin quickly learned they would receive the reward stimulation if they nose-poked. Mice that had not been altered with the protein didn't.

The nerve signal was traveling between areas of the mouse brain known as the nucleus accumbens and the amygdala.

The researchers then switched to an opsin that inhibited a nerve impulse transfer instead of stimulated. After training mice to go for a pleasurable experience, licking sugar water, after a light went on in their cages, they introduced the inhibiting opsin into the brains of the mice and they no longer drank the sugar water when the light shined. The trained mice who didn't receive the opsin went right on licking in response to the light in the cage.

Stuber and his colleagues hope optogenetics could one day provide an alternative to the late-stage Parkinson's disease treatment in which electrodes implanted deep in the brain constantly delivered electrical stimuli that help control the disease's symptoms.

"But there is quite a bit of work to be done before we get to that point," Stuber said.

The UNC research was funded by the Brain & Behavior Research Fund; ABMRF/ The Foundation for Alcohol Research; the Foundation of Hope; and the National Institute on Drug Abuse

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