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Abstract:
Discusses research being done on the importance of oxytocin gene in forming social memories. Reference to study conducted by Jim Winslow et al published in the July 2000 issue of the `Nature Genetics' journal; Olfactory systems of rodents; Findings of the study.

OXYTOCIN GENE NECESSARY FOR SOCIAL MEMORY

2000 JUL 8 - (NewsRx.com) -- What if you could find your way home, but couldn't recognize anyone when you got them?

Reporting in the July issue of Nature Genetics, scientists at the Center for Behavioral Neuroscience at the Yerkes Primate Center have discovered in mouse studies that the oxytocin gene is necessary for forming ***social*** memories, allowing you to recognize an individual you've seen before.

The gene has no apparent influence on spatial or other types of memory.

The study demonstrates that social memory has a neural basis distinct from other forms of memory, and someday could provide a therapeutic target for a variety of psychiatric illnesses.

The study's author, Jim Winslow, PhD, associate research professor of psychobiology at Yerkes, says the ability to recognize those we have met before is the first step in the process of developing an affiliative relationship. "Without this fundamental ability, even your own mother would remain a stranger," he says. It is thought that such a defect could play a role in autism and schizophrenia, which are characterized by a sense of social disconnection and isolation.

The gene in question codes for the brain hormone oxytocin (OT), which is present in all mammals, including humans. This neuropeptide has long been associated in many species with a range of social behaviors, including parental care (such as nursing and parturition), pair bonding, and mate-guarding. In humans, oxytocin peaks during ejaculation. To date, there have been no studies in humans on the role of OT in pair bonding, though studies in monkeys show that increased transmission of the peptide does increase social interaction.

Winslow's team made its discovery with the help of a transgenic or "knockout" mouse, engineered to lack the gene for oxytocin. In the study, knockout mice were compared with normal mice in tests for social and non-social memory.

Rodents depend largely on olfactory cues to "know" the world around them. They have two olfactory systems: a primary one for food and other non-social scents that help them navigate their environment, and an ancillary system to detect social scents in the form of pheromones, the odors released to provide social information such as sexual readiness or territorial prerogative. A normal male mouse will follow its nose to vigorously investigate a stranger until the stranger becomes familiar, usually within about five minutes. At that point the investigation tapers off significantly and other types of social behavior - such as mounting or fighting or just being friends - commence. When a new female is introduced, interest and olfactory investigation return to previous levels.

By contrast, the researchers found that the knockout mice, which lack the gene for oxytocin, failed to recognize mice with whom they had previously interacted. They continued their robust olfactory investigation as though they had never seen the mice before, although they should have been familiar. "The knockout mice clearly showed a social memory deficit," says Winslow.

To be sure the problem didn't lie with generally impaired olfactory functioning, Winslow's team tested the animals' all-important sense of smell with various food-foraging tasks. The normal and transgenic mice both were able to find buffed food as quickly as food placed clearly in view - suggesting they could find the hidden food through their sense of smell. Both rapidly became "familiar" with scented foods, such as lemon and chocolate, and recognized when a scent was changed, showing that olfactory function was not measurably influenced by the lack of oxytocin.

In addition, the scientists tested the spatial memory of the mice using a water maze task, to see if other forms of memory were also impaired due to the lack of oxytocin. Transgenic mice were every bit as adept at finding their way around the maze as were normal mice, demonstrating that spatial memory was intact.

Winslow et al. were successful in restoring social memory formation by treating the knockout mice with oxytocin. In these mice, social amnesia disappeared. Like the normal

mice, they again showed the characteristic decline in time spent investigating familiar females, and recovered interest when a new female entered the cage.

Virtually all forms of psychopathology, which include some of man's most debilitating clinical disorders, are characterized by abnormal social attachments. Yet very little is known about the normal process of bond formation. This work helps lay the groundwork for defining the neural basis of attachment and identifying potential pharmacological targets in the brain for future therapies.