Paternal mice bond with their offspring through the power of touch

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New research from neuroscientist Samuel Weiss, PhD, director of the Hotchkiss Brain Institute at the Faculty of Medicine, shows that paternal mice that physically interact with their babies grow new brain cells and form lasting memories of their babies. The study is published on-line this week in *Nature Neuroscience*.

Weiss and his team find that when paternal mice interact with their newborn babies, new brain cells develop in the olfactory bulb, the part of the brain responsible for sense of smell, and in the hippocampus, which is responsible for memory. Weeks after the fathers are separated from their babies they still demonstrate that bond and are able to distinguish their offspring from unrelated mice. If fathers are prevented from physical interactions with their babies, no new neurons or memories are formed and they cannot recognize their offspring.

Previous research has shown that adult humans also have the capacity to generate new brain cells in the olfactory bulb and the hippocampus and that human fathers exhibit more affection and attachment and fewer ignoring behaviors toward children whose smell they can identify.

"What we have found has implications for long-term mental health," says Weiss. "Our work shows that social interactions foster healthy brains and healthy brains foster positive social interactions, demonstrating a positive feedback loop. Our findings support the idea that physical interactions between fathers and their offspring may be a critical component for developing healthy relationships and a healthy

society."

"These findings are important because this study significantly advances the understanding of paternal-offspring recognition and associated changes in the paternal brain. An area not as well understood in science as is the relationship between mothers and their children," says Dr. Pierre-Marie Lledo, head of the Perception and Memory unit at the Pasteur Institute in Paris. "This paper demonstrates that newborn adult neurons are important for maintaining good social interactions," he says.

In normal mice, the hormone prolactin is produced in adult males in response to physical interaction with their offspring. This research illustrates that prolactin is essential to the generation of new brain cells and memory. Paternal mice without prolactin signaling fail to generate more neurons when they physically interact with their offspring and, therefore, cannot recognize those babies when they become adults.

Dr. Tracey Shors of Rutgers University says this study shows some of the most exciting data so far reported about the function of neurogenesis in the adult brain.

"Weiss and colleagues show that more new neurons are generated in the male rodent in response to physical contact with his own offspring," says the Professor in the Department of Psychology and Center for Collaborative Neuroscience. "The group goes on to demonstrate that these responses are mediated by the presence of prolactin, a peptide hormone most often associated with nursing mothers. In light of these findings, one can see how new neurons may have evolved to be involved in mechanisms of learning and memory," she says.

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