A mother's touch: Study shows maternal stimuli can improve cognitive function, stress resilience

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(PhysOrg.com) -- UCI child neurologist and neuroscientist Dr. Tallie Z. Baram has found that maternal care and other sensory input triggers activity in a baby's developing brain that improves cognitive function and builds resilience to stress.

For an infant, a mother’s touch provides a feeling of security, comfort and love. But research at UC Irvine is showing that it does much more.

UCI child neurologist and neuroscientist Dr. Tallie Z. Baram has found that caressing and other sensory input triggers activity in a baby’s developing brain that improves cognitive function and builds resilience to stress.

The finding contributes to growing knowledge about epigenetics, the study of how environmental factors can reprogram the expression of genes.

In a study published earlier this year in *The Journal of Neuroscience*, Baram and colleagues identified how sensory stimuli from maternal care can modify genes that control a key messenger of stress called corticotropin-releasing hormone.

In earlier work, Baram helped discover that excessive amounts of CRH in the brain's primary learning and memory center led to the disintegration of dendritic spines, branchlike structures on neurons. Dendritic spines facilitate the sending and receiving of messages among brain cells and the collection and storage of memories.

"Communication among brain cells is the foundation of cognitive processes such as learning and memory," says Baram, the Danette Shepard Chair in Neurological Sciences. "In several brain disorders where learning and similar thought processes are abnormal, dendritic spines have been found to be reduced in density or poorly developed.

"Because an infant's brain is still building connections in these communication zones, large blasts or long-term amounts of stress can permanently limit full development, increasing the risk of anxiety, depression and dementia later in life."

Her most recent study describes for the first time the cellular pathways of the epigenetic process by which maternal care reduces the expression of CRH in the hypothalamus. Detecting sensory input, DNA in brain cells in this stress-sensitive region activates a neuron-restrictive silencer factor, which limits CRH. Without the interference of excess stresstriggered CRH, neural dendrites in the hippocampus can fully develop, which leads to stress resilience.

“What’s noteworthy about this study is that it reveals that brain structure is influenced by the environment early in life, and especially by maternal care,” says Baram, whose research on early-life factors in neural development has fundamentally altered the understanding of disorders such as epilepsy.

“There has been a belief that the brain is hardwired — that once it’s established, it’s that way for life,” she says. “But we’re seeing that the brain is actually ‘softwired’ — that changes in stimuli alter the wiring — and that it’s not predestined to be a certain way. I find this fascinating.”

Provided by UC Irvine