Motherhood is associated with the acquisition of a host of new behaviors that are driven, at least in part, by alterations in brain function, research shows.

By JUDY SIEGEL-ITZKOVICH, Jerusalem Post

Mothering behavior towards care of newborns ? at least in mice and apparently in humans ? has long been recognized as instinctive, but now research at the Hebrew University of Jerusalem has shown that motherhood is associated with the acquisition of a host of new behaviors that are driven, at least in part, by alterations in brain function.

The research, by Prof. Adi Mizrahi of HU’s Silberman Institute of Life Sciences and the Edmond and Lily Safra Center for Brain Sciences has just been published in the journal Neuron. It provides insight into how neural changes integrating odors and sounds lie behind a mouse mother's ability to recognize and respond to distress calls from her pups.
"We know that distinct brain changes are linked with motherhood, but the impact of these changes on sensory processing and the emergence of maternal behaviors are largely unknown," explains Mizrahi. "In mice, olfactory and auditory cues play a major role in the communication between a mother and her pups. Therefore, we hypothesized that there may be some interaction between olfactory and auditory processing so that pup odors might modulate the way pup calls are processed in the mother's brain."

Mizrahi and his post-doctoral student Dr. Lior Cohen examined whether the primary auditory cortex, a brain region that is involved in the recognition of sounds, might serve as an early processing region for integration of pup odors and pup calls. The primary auditory cortex is known as a site that undergoes functional changes in response to sensory input from the environment.

In their study, the researchers exposed mice to pup odors; some were regular mice; others had experienced interaction with their pups; and the rest were lactating mice that had given birth. They monitored both spontaneous and sound-evoked activity of neurons in the auditory cortex. The odors were found to have triggered dramatic changes in auditory processing only in the females that had interacted with pups, while the lactating mothers were the most sensitive to pup sounds. The olfactory-auditory integration appeared in lactating mothers shortly after they had given birth and had a particularly strong effect on the detection of pup distress calls. Taken together, the findings suggest that motherhood is associated with a previously undescribed form of multisensory processing in the auditory cortex.

"We have shown that motherhood is associated with a rapid and robust appearance of olfactory-auditory integration in the primary auditory cortex occurring along with stimulus-specific adaptation to pup distress calls," says Mizrahi. "These processes help to explain how changes in neocortical networks facilitate efficient detection of pups by their caring mothers."

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