

Unraveling the mysteries of the maternal brain: Odors influence the response to sounds

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Motherhood is associated with the acquisition of a host of new behaviors that must be driven, at least in part, by alterations in brain function. Now, new research published by Cell Press in the October 20 issue of the journal *Neuron* provides intriguing insight into how neural changes associated with the integration of odors and sounds underlie a 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 senior study author, Dr. Adi Mizrahi, from the Edmond and Lily Safra Center for [Brain Sciences](#) at the Hebrew University of Jerusalem. "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."

Dr. Mizrahi and colleagues examined whether the primary auditory cortex, the 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 a known site of neuronal plasticity, meaning that it undergoes structural and functional changes in response to [sensory input](#) from the environment.

In their study, the researchers exposed naïve mice that had not interacted with pups, naïve mice that had experienced interaction with pups and lactating mother mice to pup odors and monitored both spontaneous and sound-evoked activity of neurons in the auditory cortex. The odors triggered dramatic changes in auditory processing only in the females that had interacted with pups, and 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 co-occurring with stimulus specific plasticity to pup distress calls," concludes Dr. Mizrahi. "These processes help to explain how changes in neocortical networks facilitate efficient detection of pups by their caring mothers."

Provided by Cell Press

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