How young mice phone home: Study gives clue to how mothers' brains screen for baby calls

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A new study gives a clue to how mother mice' brains screen for baby calls. Credit: The Liu lab

Emory University researchers have identified a surprising mechanism in the brains of mother mice that focuses their awareness on the calls of baby mice. Their study, published June 11 in *Neuron*, found that the high-frequency sounds of mice pups stand out in a mother's auditory cortex

by inhibiting the activity of neurons more attuned to lower frequency sounds.

"Previous research has focused on how the excitation of neurons can detect or interpret sounds, but this study shows the key role that inhibition may play in real situations," said Robert Liu, assistant professor of biology and senior author of the study.

In 2007, Liu and colleagues were the first to demonstrate that the behavioral context in which communication sounds are heard affects the brain's ability to detect, discriminate and respond to them. Specifically, the researchers found that the auditory neurons of female mice that had given birth were better at detecting and discriminating vocalizations from mice pups than auditory neurons in virgin females.

Experiments on awake mice

While that experiment was done with anesthetized mice, the current study by Liu's lab is the first to record the activity of neurons in the auditory cortex of awake mice. Both female mice that had given birth and virgin female mice with no experience caring for mice pups were used in the study.

When exposed to the high-frequency whistles of mice pups, which fall into the 60 to 80 kilohertz range, a large area of neurons in the auditory cortex of the mother mice was more strongly inhibited than in the virgin mice. The pattern of excitation of neurons was similar, however, for both the mothers and virgins.

"Something different is happening in the mothers' brains when they are processing the same sound, and this difference is consistent," Liu said. "The inhibition of neurons appears to be enhancing the contrast in the sound of mice pups, so they stand out more in the acoustic

environment."

Showing neural plasticity

Liu's research focuses on how the brain evolves to process sounds in the natural environment. "By understanding normal functioning of the auditory processes in the brain, then we can begin to understand what is breaking down in disease situations, such as following a stroke or brain lesion," he said.

Until recently, it had been widely assumed that the auditory cortex acted simply as a static filter, and that areas downstream in the brain did the complex task of learning to parse meaning from sounds.

"What our experiments help demonstrate is that even at this relatively early stage of cortical sound processing, responses are dynamic," Liu said. "The auditory cortex has plasticity, so that sounds that become behaviorally relevant to us can get optimized."

More research is needed, he added, to determine whether the changes in the brains of mother mice is due to hormonal shifts, the behavioral experience of caring for pups, or both.

Source: Emory University (news : web)

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