

# Unusual ultrasonic vocalization patterns in mice may be useful for modeling autism

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Scientists have found novel patterns of ultrasonic vocalizations in a genetic mouse model of autism, adding a unique element to the available mouse behaviors that capture components of the human disease, and representing a new step towards identifying causes and better treatments.

"Particularly intriguing are the unusual categories of vocalizations and the more frequent, loud harmonics evident in the BTBR T+ tf/J (BTBR) mouse model of autism, that may resemble the atypical vocalizations seen in some autistic infants," say study authors Jacqueline Crawley, PhD, of the National Institute of Mental Health and Maria Luisa Scattoni, PhD, of the Istituto Superiore di Sanita in Rome, Italy. Their study appears in the August 27 issue of the journal *PLoS ONE*.

Vocal communication in animals has been extensively documented for many species, including songbirds, whales, and dolphins. Adult rats emit ultrasonic vocalizations during aggression, mating, and play, and in response to some stressors. Separated infant mice and rats emit ultrasonic vocalizations which elicit pup retrieval to the nest by the parents, and licking and crouching behaviors by the mother, suggesting that these calls play an important role in social communication.

Abnormal reciprocal social interactions and communication deficits are the first two diagnostic symptoms of autism. BTBR, a commercially available inbred strain of genetically identical mice, displays unusually low levels of juvenile play and adult social interactions, relevant to the first diagnostic symptom, and repetitive self-grooming, relevant to the

third diagnostic symptom. "We hypothesize that ultrasonic vocalizations may be a measure of social communication in mice. Delayed, reduced, or unusual ultrasonic vocalizations in mice could offer a useful assay with reasonable face validity to the second diagnostic symptom of autism, impaired communication," the authors add.

In the new study, the researchers classified calls emitted by mouse pups when separated from their mothers and siblings into ten categories. BTBR pups called more loudly and more frequently, as compared to three other strains of mice commonly used in behavioral genetics. Moreover, BTBR pups emitted a large number of harmonics, a category that was rare in the other strains, and their call repertoire appeared more limited, suggesting an unusual pattern or a syllable deficit in BTBR.

The reduced vocal repertoire in BTBR mice may be analogous to atypical vocalizations in some infants and young children later diagnosed with autism. Instead of cooing and babbling, some young children may hum or grunt for extended periods, fail to add inflections into speech patterns, repeat "pop up" words out of context, squeal stereotypically, and laugh inappropriately. Others may be very irritable, cry for long periods of time, and be difficult to console. More crying in these babies may be similar to the higher number of separation calls in BTBR pups.

The next step in the research is to discover whether mice actually communicate meaningful information to each other using ultrasonic vocalizations. If so, an accurate analysis of ultrasonic emissions could provide a reliable test to model the second diagnostic symptom of autism, impaired communication, for use in identifying genetic and environmental causes of autism, and for evaluating proposed treatments.

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