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Language protein differs in males, females

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Male rat pups have more of a specific brain protein associated with language development than females, according to a study published February 20 in *The Journal of Neuroscience*. The study also found sex differences in the brain protein in a small group of children. The findings may shed light on sex differences in communication in animals and language acquisition in people.

Sex differences in early language acquisition and development in children are well documented—on average, girls tend to speak earlier and with greater complexity than boys of the same age. However, scientists continue to debate the origin and significance of such differences. Previous studies showed the Foxp2 protein plays an important role in speech and language development in humans and vocal communication in birds and other mammals.

In the current study, J. Michael Bowers, PhD, Margaret McCarthy, PhD, and colleagues at the University of Maryland School of Medicine examined whether sex differences in the expression of the Foxp2 protein in the developing brain might underlie communication differences between the sexes.

The researchers analyzed the levels of Foxp2 protein in the brains of four-day-old female and male rats and compared the ultrasonic distress calls made by the animals when separated from their mothers and siblings. Compared with females, males had more of the protein in brain areas associated with cognition, emotion, and vocalization. They also made more noise than females—producing nearly double the total

vocalizations over the five-minute separation period—and were preferentially retrieved and returned to the nest first by the mother.

When the researchers reduced levels of the Foxp2 protein in the male pups and increased it in female pups, they reversed the sex difference in the distress calls, causing males to sound like females and the females like males. This change led the mother to reverse her behavior as well, preferentially retrieving the females over the males.

"This study is one of the first to report a sex difference in the expression of a language-associated protein in humans or animals," McCarthy said. "The findings raise the possibility that sex differences in brain and behavior are more pervasive and established earlier than previously appreciated."

The researchers extended their findings to humans in a preliminary study of Foxp2 protein in a small group of children. Unlike the rats, in which Foxp2 protein was elevated in males, they found that in humans, the girls had more of the Foxp2 protein in the cortex—a brain region associated with language—than age-matched boys.

"At first glance, one might conclude that the findings in rats don't generalize to humans, but the higher levels of Foxp2 expression are found in the more communicative sex in each species," noted Cheryl Sisk, who studies sex differences at Michigan State University and was not involved with the study.

Provided by Society for Neuroscience

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