NEWS

Female hormone gives male finches keen ear for song

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An infusion of estrogen increases activity in the brains of young male zebra finches when they hear their own or others' songs. The unpublished results, presented yesterday at the **2015 Society for Neuroscience annual meeting** in Chicago, suggest a role for the birds in modeling links between sex hormones, language learning and the brain's processing of sound.

Songbirds such as zebra finches learn to sing by listening to other birds of their species, just as children learn to talk by listening to their parents and caregivers. This parallel has caused zebra finches to emerge as a model for understanding social learning, **especially language learning**.

In the new study, researchers infused 17beta-estradiol, a form of estrogen produced in the brain, into the caudomedial nidopallium (NCM) of anesthetized zebra finches. The NCM is the region in the bird brain that processes sound. All 21 of the birds used in the study are males, which is usual in this type of investigation: Only males sing learned courtship songs.

With the NCM bathed in the hormone, the researchers placed an electrode in the region and recorded neuronal activity while the birds listened to six types of sounds: their own song, their own song played backward, the songs of two other zebra finches, the song of a different species of finch and white noise.

Estrogen increases the firing of neurons in the right hemisphere's NCM when the birds listen to their own or other zebra finches' songs, suggesting a link between the sex hormone and the brain's response to social sounds. "It seems to be pretty consistently elevated in the right hemisphere," says Dan Vahaba, a graduate student in **Luke Remage-Healey**'s lab at the University of Massachusetts Amherst, who presented the work.

Uneven effect:

Curiously, however, estrogen does not have a consistent effect on activity in the NCM in the left hemisphere. In some birds, the hormone increases nerve firing, but in others it actually appears to dampen the brain's response to zebra finch song. Vahaba says the reason for this difference isn't yet clear.

Another surprise: The effect of the hormone doesn't depend on the bird's age. The birds used in the study were 41 to 95 days old, around the critical period for song-learning in zebra finches.

Vahaba says he expected that young birds that are still consolidating their song knowledge would be more affected by the hormone. "I thought it would be a beautiful age-dependent relationship," he says. "It's always fun to be wrong and find something you didn't expect."

The results are preliminary, but research in this area could eventually help illuminate language difficulties and sex differences in autism. Individuals with the disorder have language and communication impairments, and also show abnormalities in how their brains process sound. Autism is diagnosed more frequently in boys than in girls, suggesting **a role for sex hormones** in the condition. But how these disparate observations might relate to each other is unknown.

In the past several years, researchers have investigated links between autism-related genes such as **CNTNAP2 and song-learning** in zebra finches. They have probed the effects on the birds of oxytocin and vasopressin, two other hormones implicated in autism[1].The new study suggests sex hormones should be on the list of autism-related factors to explore in the birds.

"It does give promise for these guys being a good model for the effects of sex hormones on experience-dependent learning," Vahaba says.

*For more reports from the 2015 Society for Neuroscience annual meeting, please **click here**.*

REFERENCES:

1. Kelly A.M. and J.L. Goodson *Front. Behav. Neurosci*. **8**, 55 (2014) **PubMed**