Scientists identify neural basis for parasitic cowbird's secret password

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Five cowbirds in a nest. Credit: Mark Hauber

If you are raised by other species, then how do you know who you are?

Although heterospecific foster parents rear brood parasitic brown-headed cowbird chicks, juvenile cowbirds readily recognize and affiliate with other cowbirds. That's because they have a secret handshake or password. Specifically, the "password" hypothesis helps explain this paradox of species recognition: Social recognition processes in brood parasites are initiated by exposure to a password: in the case of cowbirds, a specific chatter call. A new study appearing in the *Journal of Experimental Biology* describes the neural basis for password-based species recognition in cowbirds.

Roughly 1% of bird species are obligate brood parasites. Female obligate brood parasites shirk parental care duties by laying their eggs in the nests of other females. This breeding strategy is extremely successful for the female parasite but raises questions, particularly with respect to species recognition. For instance, how does a juvenile bird that is not raised by familial members come to recognize its own species and avoid imprinting on the host species that cared for it from the day it hatched? One possibility is that young brood parasites use a password to identify conspecifics, and learning about species-specific signals occurs only after the password is used to find conspecifics.

Researchers have now demonstrated the neural basis for password-based species recognition in an obligate brood parasite. They showed that the auditory forebrain regions in cowbirds, which respond selectively to learned vocalizations, such as songs, also respond selectively to non-learned chatter. However, if the password is not used to locate other cowbirds, the young brood parasite will mis-imprint on its host species—a process manifested in the brain by elevated gene induction in response to the host's song.

A cowbird's egg stands out in a nest. Credit: Marie Read

"Our study reveals a neural basis for this password as well as a neural signature of mis-imprinting in young brood parasites that have prolonged exposure to host species songs," said Dr. Kathleen Lynch, lead author of the study and Assistant Professor of Biology at Hofstra University.

Dr. Mark Hauber, Professor of Psychology at Hunter College and the Graduate Center of the City University of New York (CUNY), who co-authored the article, first carried out behavioral experiments to find evidence for password-based species recognition. Dr. Hauber said, "After our discovery of the password as a behavioral mechanism in parasitic cowbirds over 15 years ago as a graduate student, it is

rewarding for me to be working on an NSF [National Science Foundation] grant to identify the neural basis of this behavior as a professor."

Unlike parental male songbirds, which usually learn to sing at a very young age by mimicking their fathers, parasitic cowbirds learn song in their second year and delay song production until their third year. "This study is interesting because the particular life history of brood parasitic songbirds such as the brown-headed cowbird requires song learning to proceed differently in this species than in most others," said Dr. Jill Soha, Associate Scholar at Duke University, who was not affiliated with the study. "Understanding the neural mechanisms that guide this type of song learning advances our knowledge not only of brood parasite ontogeny and evolution but also, through comparative study, our understanding of the neural mechanisms underlying song learning in general."

A Brown-headed Cowbird. Credit: Marie Read

Dr. Lynch and her colleagues have revealed novel insights into the neural basis of species recognition in cowbirds, which dovetail with known behavioral responses and advance our understanding of social recognition in brood parasites.

More information: A neural basis for password-based species recognition in an avian brood parasite *Journal of Experimental Biology* 2017 : doi: 10.1242/jeb.158600 , jeb.biologists.org/content/ear … 017/04/12/jeb.158600

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