Using genetic sequencing to determine if bird and mammal brains work the same

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A team of researchers from the Howard Hughes Medical Institute, the University of California–San Francisco and the University of Texas has used genetic sequencing to compare the brains of birds and mammals.

They've published their results in the journal *Science*. Maria Antonietta Tosches with Columbia University, has published a Perspectives piece in the same journal issue outlining the work by the team and where she believes future research in the field is going.

Scientists and laypeople alike have noticed that some birds appear to think and reason similarly to some mammals. This has raised the question of whether brain processing in birds is similar to that of mammal brains, despite dramatic differences in brain structure.

As Tosches points out, the parts of the bird brain involved in learning have been found to be a collection of nuclei called the dorsal ventricular ridge (DVR). In mammals, learning is generally associated with the neocortex. Notably, in mammals, the neurons in the neocortex are found in layers, while there is no layering in the DVR. In this new effort, the researchers sought to find out if the neurons that make up the neocortex in mammals resemble those of the DVR in birds—some similarities would suggest they arose from a common ancestor and thus the possibility of similar types of brain processing.

To find out if the brain cells were similar, the researchers conducted single-cell sequencing of neurons from the DVRs of two species of finches and the neocortex of lab mice and then compared them. They found that while there were similar genes involved in both types of neurons, expression was regulated by different groups of transcription factors. The researchers suggest this difference indicates that the DVR and the neocortex likely evolved from different types of ancestral brain types, and it thus appears unlikely that birds and mammals learn in the same ways. They also found a surprise—the neurons that made up the part of the DVR involved with singing in the songbirds were of a type not found in the neocortex, which suggests the process of singing by birds is likely very different from vocalizations in mammals.

More information: Bradley M. Colquitt et al. Cellular transcriptomics reveals evolutionary identities of songbird vocal circuits, *Science* (2021). DOI: 10.1126/science.abd9704

Maria Antonietta Tosches. Different origins for similar brain circuits, *Science* (2021). DOI: 10.1126/science.abf9551