Genomic hitchhikers in birds shed light on evolution of viruses

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The genomes of birds are riddled with DNA sequences from viruses, according to a study to be published on October 16 in *mBio*, the online open-access journal of the American Society for Microbiology. Analysis of these viral sequences, known as endogenous retroviruses (ERVs), can provide insights into how both hosts and viruses have evolved over the eons.

"We examined the evolution of avian retroviruses on the basis of their fossil remnants in the three avian genomes that have been completely sequenced," write the authors from Johns Hopkins University and Uppsala University, Sweden. The authors go on to say their analyses of ERVs in chicken, turkey, and zebra finch genomes reveal that birds were a hotbed of viral evolution early in their history.

All genomes are cobbled together works-in-progress. Scientists have long known that the human genome, for example, is not all human: like most every other genome studied to date, a good chunk of the DNA we call "human" is actually made up of proviruses, sequences that retroviruses have deposited there to take advantage of the cell's ability to copy DNA and translate that DNA into working proteins. These proviruses can either be inherited in the DNA we get from our parents (endogenous retroviruses), or they can be picked up during our lifetime (exogenous retroviruses).

The study reveals that millions of years ago birds were host to many different kinds of ERVs, serving as a kind of melting pot: a meeting and

mingling place where viruses recombined and shared genetic information.

Unlike early studies of ERVs in chickens, which studied selected segments of the genome and uncovered only alpha-retroviruses, this study used complete genome sequences and found a great diversity of viral sequences in bird genomes, representing the same major groups as those of mammals, but exhibiting more diversity. Most of the ERVs in birds were distinct from those found in other animals, probably indicating that the viruses did not move much between different kinds of hosts.

"We conclude that avian retroviral evolution differs from that of other vertebrates," write the researchers. "Avian retroviruses seem to have evolved rather independently from the rest of the retroviruses over the last 150 million years."

Stepher Goff of Columbia University, who was not involved in the research but edited the article for *mBio*®, says genome-level studies like this are a boon to virologists.

"This paper is filling a big gap in our understanding of these viruses," says Goff. "This is something that needed to be done, and advancing sequencing technology made it easy to do."

Provided by American Society for Microbiology

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