Evolutionary history is a predictor of diversity of parasites in a species

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The evolutionary history, body size and geographic range of an animal species are predictors for the diversity of parasites—or disease—that species carries, according to University of Georgia researchers.

In a study published in the *International Journal of Organic Evolution*, they looked at one group—mammalian carnivores—to find how parasite diversity changes based on the biology of the host species, the animal carrier of the parasites.

"If you're a carnivore and you have a very broad geography, you're exposed to a number of habitats, climates, other species. You're going to pick up more parasites," said study co-author John Gittleman, dean of the Odum School of Ecology and UGA Foundation Professor in Ecology.

The study helps narrow down specific factors that influence more disease or less disease throughout the world, he said. Researchers use this and other similar studies to find how the diseases in these species relate to emerging diseases in humans.

"Global trends in emerging infectious diseases are important to spot-61 percent of all the diseases in humans came from animals or plants first," Gittleman said. "So if we figure out how diseases originate and spread in nonhumans first, that will allow us to manage most of the nasty diseases in us."

Gittleman and other researchers found that a carnivore's phylogenetic distinctiveness, or how distantly related it is to other species in terms of shared evolutionary history—which can be determined based upon similarities and differences in their physical or genetic characteristics—is a good predictor for the number of parasite species infecting a particular animal species.

"This is extremely important because the majority of parasite diversity has not been documented, and new parasites pop up all the time," said the study's lead author, Shan Huang, a postdoctoral research associate with the University of Chicago who conducted the research while a doctoral student at UGA.

Understanding and predicting parasite occurrence is important for wildlife management, and there have been numerous examples of parasites causing severe population declines in certain species, according to Huang.

Based on the study's findings, "the parasite diversity might be more tightly linked to host evolution than previously appreciated," Huang said.

"What's unusual about this work is most studies looking at disease and parasites do not take into account evolution over long time frames as reflected in an evolutionary tree," Gittleman said.

The study was able to narrow down two factors that were strong predictors of parasite diversity: a species' body size, measured as average adult body mass, and geographic range size, based on published species distribution maps.

By studying parasite diversity, Huang and Gittleman are able to understand the mechanisms underlying the patterns of biodiversity, which is a crucial element in sustaining healthy ecosystems.

"For reasons regarding animal conservation and public health, we want to be able to predict parasite occurrences, and our study provides useful insights for that," Huang said.

Gittleman agreed, explaining, "It's important to understand why so we can manage those species and their disease but also learn how those diseases may carry over to us."

More information: "Parasite diversity declines with host evolutionary distinctiveness: A global analysis of carnivores" is available at onlinelibrary.wiley.com/doi/10.1111/evo.12611/epdf

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