Global study reveals surprising flexibility in mosquito feeding patterns

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In a global study, scientists have uncovered far greater diversity and flexibility in mosquito feeding patterns than previously thought, challenging long-held assumptions about how the disease-carrying insects select their hosts.

Published in *Global Ecology and Biogeography*, the findings highlight the pressing need to reconcile how we track and predict mosquito-driven disease transmission in a changing climate—which would have far-reaching implications for disease transmission.

Led by Dr. Konstans Wells, of Swansea University, the international research team conducted a comprehensive meta-analysis of more than 15,600 mosquito blood-meal records from studies using broad-spectrum molecular methods. These universal DNA techniques, which enable the identification of a wide range of host species, provide an unprecedented window into the feeding ecology of six of the world's most important mosquito species.

Dr. Wells said, "While it's well known that female mosquitoes show some innate preferences for particular hosts for taking their blood meals, what we found is that their actual feeding behavior is highly variable across regions.

"This plasticity means that environmental factors such as temperature and livestock density can influence which species mosquitoes feed on—adding complexity to how we predict the spread of mosquito-borne diseases."

Researchers found that Culex mosquitoes had the broadest host ranges, feeding on between 179 and 321 different species. In contrast, Aedes mosquitoes fed on 26 to 65 species, and Anopheles species had narrower ranges of 7 to 29 host species.

One of the inspirations for the study was an undergraduate dissertation project by Meshach Lee, then a student under the supervision of Dr. Wells. His early analysis suggested that the feeding of mosquitos on humans versus wildlife and livestock differed across regions.

Meshach said, "The diversity and variation in niche breadth was striking. What we've shown is that when robust molecular tools are used in a meta-analysis, we can get a much clearer and more nuanced picture of mosquito behavior."

Despite these insights, the researchers say it remains difficult to forecast feeding behavior.

Dr. Wells added, "To improve predictions, we need better standardization in how blood-meal studies are conducted and reported.

"Consistent molecular methods and clearer environmental data will go a long way in improving our understanding of how mosquitoes take their blood meals from different host species and what this means in terms of the transmission of harmful diseases such as malaria or dengue."

The study team also included Dr. Tamsyn Uren Webster, from Swansea, Dr. Richard O'Rorke, from Waipapa Taumata Rau—The University of Auckland, and Dr. Nicholas Clark, from the University of Queensland.

This is the first major study of what mosquitoes eat using new DNA methods and it shows how complicated the relationship is between insects that spread disease and the animals or people they infect, especially in a changing climate.

The authors hope their work will inform global health strategies and support more targeted mosquito surveillance, especially as mosquito-borne diseases remain a key concern under the UN Sustainable Development Goal for good health and well-being.

More information: Meshach Lee et al, Diversity and Plasticity in Mosquito Feeding Patterns: A Meta-Analysis of 'Universal' DNA Diet Studies, *Global Ecology and Biogeography* (2025). DOI:

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