

## **Researchers find soaring variety of malaria parasites in bats**

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The cyclops roundleaf bat (*Hipposideros cyclops*), a species found in the forests of equatorial Africa, is shown here with its malaria parasite *Plasmodium cyclopsi* (inset). Credit: ©Natalie Weber



Researchers have discovered a surprising diversity of malaria parasites in West African bats as well as new evidence of evolutionary jumps to rodent hosts. Led by scientists at the American Museum of Natural History, the Max Planck Institute for Infection Biology, and the Museum für Naturkunde, Berlin, the new study reveals that two bat-infecting parasites are closely related to parasites in rodents that are commonly used to model human malaria in laboratory studies. The results will be published this week in the *Proceedings of the National Academy of Sciences*.

"Bats, which are important reservoir hosts for many pathogens, particularly viruses, have been hosts to malaria parasites for more than a century," said coauthor Susan Perkins, an associate curator in the Museum's Division of Invertebrate Zoology. "Understanding the evolution of malaria parasites in bats and other animals, and how they fit into the tree of life, is key to understanding this important human disease."

Malaria is caused by a handful of species of parasites in the genus *Plasmodium* through the bite of mosquitos and remains a widespread vector-borne infectious disease, sickening almost half a billion people every year around the planet. Experimental research on drugs, immunology, and the development of malaria is typically done on related *Plasmodium* species that infect rodents, including laboratory-reared mice. The parasites' natural hosts are African thicket rats that use shrubs and trees as habitat.

To further investigate how bats fit into this picture, the researchers surveyed more than 250 bats in remote forest ecosystems in Liberia, Guinea, and Cote d'Ivoire in Western Africa. They found a vast diversity of malaria parasites that included not just the *Plasmodium* species, but also members of three other genera. The DNA from several genes of the bat parasites was sequenced at the Museum's Sackler Institute for



Comparative Genomics, resulting in the most comprehensive evolutionary tree of life for malaria parasites of bats to date.



This Peter's dwarf epauletted fruit bat (*Micropteropus pusillus*) is shown with the *Hepatocystis malaria* parasite (inset). Credit: ©Juliane Schaer

The authors report that two parasites, *Plasmodium voltaicum* and *Plasmodium cyclopsi*, show patterns of evolutionary jumps from the rodent lineage into bats and then likely a reverse jump, with a bat parasite re-infecting rodent hosts. The authors suggest that the bat hosts,



which roost in trees, may have been exposed to the same mosquito vectors that transfer the parasites between the tree-dwelling rodent hosts.

"It is unknown what the physiological effects of the parasites are on the bats, but the high diversity of parasites as well as the high proportion of individuals that are infected with the <u>parasites</u> suggest that this may be yet another example of the unusually high tolerance of these flying mammals for pathogens," said co-author Juliane Schaer, a researcher at the Max Planck Institute for Infection Biology and the Museum für Naturkunde, Berlin. "Other work has suggested that the evolution of flight may have triggered parallel strengthening of the immune system of bats and may explain why they are able to host viruses such as Ebola, rabies, and the recently discovered Middle East Respiratory System (MERS) virus, which are highly pathogenic to other mammals, including humans."

**More information:** High diversity of West African bat malaria parasites and a tight link with rodent Plasmodium taxa, <u>www.pnas.org/cgi/doi/10.1073/pnas.1311016110</u>

## Provided by American Museum of Natural History

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