



Mosquitoes collect multiple malaria doses over successive blood meals

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Infection with more than one strain of malaria could make mosquitoes more susceptible to a second infection, finds a study published in *PLoS Pathogens*.



Anopheles stephensi mosquito feeding on a host's blood.
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Not only can individual mosquitoes accumulate infections from multiple blood feeds, but existing malaria infection makes them more susceptible to a second infection, the scientists have found.

Infections also reach higher densities when another strain is already present.

"So far as we are aware," say the authors, "our experiments provide the first conclusive evidence that mosquitoes are capable of accumulating multiple infections over successive blood meals."

Laura Pollitt, PhD, from the UK's University of Edinburgh, and colleagues in the US, have been interested in interactions between malaria parasites and their insect hosts such as the mosquito.

The researchers had a number of questions:

- Whether and how mosquitoes can be infected with different *Plasmodium* strains
- How such heterogeneous parasites interact in the insects
- Whether such interactions affect transmission of malaria to vertebrate hosts

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Heavily infected mosquitoes survive

To reach their findings, the researchers set up cages of female *Anopheles* mosquitoes and allowed them at defined times to feed on mice infected with two different *Plasmodium* strains.

The researchers looked into how the presence of a co-infecting strain affected parasites that enter the vector first and second, and whether co-infection impacted mosquito survival.

They found that mosquitoes can accumulate mixed strain malaria infections after feeding on multiple hosts. The team also found that parasites have a better chance of setting up a secondary infection if another *Plasmodium* strain is already present in a mosquito.

The presence of the primary infection facilitated replication of the secondary infection - while the first infection developed as normal.

The result of this was that doubly infected mosquitoes with substantially higher parasite loads. However, the large parasite numbers do not appear to kill the insects.

The researchers predict that because it is expected that mosquitoes carrying more parasites are more likely to transmit malaria to vertebrates, including humans, mosquitoes taking multiple infective bites might disproportionately contribute to malaria transmission.

"If the facilitation we have demonstrated here", the authors say, "occurs in natural transmission settings to humans, there could be significant epidemiological consequences.

"Control measures reducing prevalence in the vertebrate host, and therefore reducing the likelihood of mosquitoes taking multiple infective feeds, could disproportionately reduce transmission of individual strains.

"By increasing the proportion of infectious mosquitoes with mixed strain infections, it is also likely that the facilitation reported here will increase the rates of mixed infections in vertebrate hosts, which could have implications for infection virulence and the spread of drug-resistant strains."

Written by [Markus MacGill](#)

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References

[Existing infection facilitates establishment and density of malaria parasites in their mosquito vector](#), Laura Pollitt et al., *PLoS Pathogens*, doi: 10.1371/journal.ppat.1005003, published online 16 July 2015.