

# Do parasites evolve to exploit gender differences in hosts?

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Some disease-causing parasites are known to favor one sex over the other in their host species, and such differences between the sexes have generally been attributed to differences in immune responses or behavior. But in a new article, published February 28 in the magazine section of the online, open-access journal *PLoS Biology*, David Duneau from Cornell University and Dieter Ebert from the University of Basel now propose that all sorts of characteristics that differ between the sexes of the host species can influence a parasite's adaptation.

These characteristics, such as morphology, physiology, behavior, diet and life history traits can, in fact, pose very different challenges and opportunities to the [parasites](#), and may result in the parasite adapting more to one host sex than the other. Sex-specific [adaptations](#) in parasites may also occur when parasites routinely encounter one host sex more frequently than another. Parasites that adapt to male or female hosts may help explain why we find differences in parasite prevalence and disease expression in the different sexes.

"Our ideas may help explain the widespread phenomenon of host sex-biased parasitism and disease expression," said Duneau. "We suggest a new perspective on host-parasite interactions, taking parasite evolution into account."

The paper outlines different scenarios in parasite evolution that might lead to sex-specific disease. These include 'sex-specific adaptations,' with subpopulations of the parasites having fixed but distinct adaptations

to females or males; or 'single sex specialization,' where the parasite is specifically adapted to only one host sex; and finally 'plastic sex-specific disease expression,' where the parasite can vary its response depending on whether it finds itself in a male or female host.

However, there are very few documented examples of parasite adaptation to host sex and, to the authors' knowledge, there is no example of a host sex-specific [dimorphism](#). There are only a few examples of parasites being adapted to only one sex, such as a mite that infects only females of its [host species](#)—the bat *Myotis daubentoni*.

The authors argue that more research is now required to study how sex differences affect the evolution of parasites and the diseases they carry. Host sex is a key factor in studies in medicine and disease control, and if parasites adapt differently to the sexes then there is a strong argument, for example, that both sexes need to be included equally in clinical trials—currently an important concern in medicine.

In humans, there are well documented host-sex differences in parasite prevalence and infection symptoms, as well as prevention and treatment of infection. Further research in a range of organisms may reveal why the effects of vaccines can be sex-specific; how parasites are distributed among hosts and why parasites can be locally adapted to certain host [sexes](#).

**More information:** Duneau D, Ebert D (2012) Host Sexual Dimorphism and Parasite Adaptation. *PLoS Biol* 10(2): e1001271. [doi:10.1371/journal.pbio.1001271](https://doi.org/10.1371/journal.pbio.1001271)

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