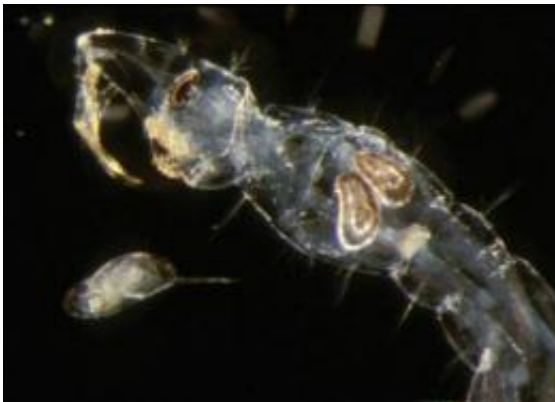


Scientists uncover an unhealthy herds hypothesis

June 23 2011



The predatory phantom midge larva, *Chaoborus*, hunts down the small aquatic crustacean, *Daphnia dentifera*. Credit: Alan J. Tessier

Biologists worldwide subscribe to the healthy herds hypothesis, the idea that predators can keep packs of prey healthy by removing the weak and the sick. This reduces the chance disease will wipe out the whole herd, but could it be that predators can also make prey populations more susceptible to other predators or even parasites? Biologists at the Georgia Institute of Technology have discovered at least one animal whose defenses against a predator make it a good target for one opportunistic parasite. The research appears online in the journal *Functional Ecology*.

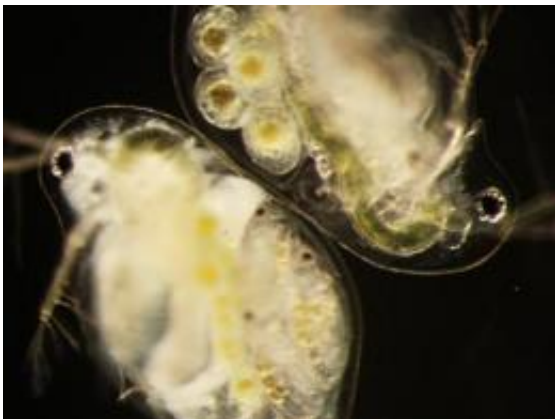
"We found that strategies that prey use to defend themselves against [predators](#) can increase their susceptibility to infection by parasites," said

Meghan Duffy, assistant professor in Georgia Tech's School of Biology.

Duffy, along with colleagues at the University of Illinois at Urbana-Champaign and Indiana University, took a look at a small aquatic crustacean, *Daphnia dentifera*, a [water flea](#) known to be an important part of freshwater ecosystems. They exposed the crustacean to chemicals emitted by one of its predators, a phantom midge larva known as *Chaoborus*, known to feed on it. When the *Daphnia* detected those chemicals it grew larger, making it harder for its predator to get its mouth around it.

"Unfortunately for the *Daphnia*, this defense against predation makes them more vulnerable to parasitism," said Duffy.

That's because while growing larger keeps *Daphnia* safe from *Chaoborus*, it actually makes it more susceptible to a virulent yeast parasite, known as *Metschnikowia*. When *Daphnia* senses a threat from its predator and grows larger, it ends up consuming more of these parasitic yeasts than it does when normal size. When the yeast infects the crustacean, it kills it, causing the dead animal to release yeast spores as it decomposes. The larger the host, the more [spores](#) it releases back into the water to prey on other [Daphnia](#).



This image shows an aquatic crustacean, *Daphnia dentifera*, that's infected with the yeast parasite *Metschnikowia* (on the left) next to one that's not infected (on the right). The parasite, looking like small puffs of cotton, can be seen under the eye and along its back. Credit: Meghan Duffy/Georgia Tech

"Since they need to grow larger to defend themselves against the predator but the opposite to defend against the parasite, they're sort of stuck between a rock and a hard place," she added.

Duffy reasons that this occurs because the predators are common year-round, while the parasites are more episodic in nature, with their populations expanding in epidemics only in the fall and not even yearly. This results in long periods of predation in the absence of the parasite, which probably explains why they respond so strongly to defend themselves against the predator even though it decreases their defenses against the [yeast](#), she added.

"While some have argued for increasing predator densities to control disease, our results suggest that it is important to consider the indirect effects of predators, such as the one we found in which trying to avoid one enemy increases the hosts vulnerability to another," said Duffy.

Provided by Georgia Institute of Technology

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