

Supplemental feeding of wildlife can affect their risk of disease

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House finches that aggregate at bird feeders have been affected by a bacterial eye disease in recent decades. Credit: Andy Davis/UGA

Supplemental feeding of wildlife can increase the spread of some infectious diseases and decrease the spread of others. A new study by University of Georgia ecologists finds that the outcome depends on the type of pathogen and the source of food.

The findings, published in the journal *Ecology Letters*, have implications for human health and [wildlife conservation](#), and contain practical suggestions for wildlife disease management and a roadmap for future study.

Supplemental feeding—when people provide [food](#) to wildlife—is growing more common. As people move into previously undeveloped areas and habitat is lost to development or agriculture, wildlife ecology changes. Natural sources of food often decrease, and new abundant sources, provided by people, appear. Sometimes these are intentional, like backyard bird feeders or winter feeding stations for an elk herd in a national park; sometimes they're accidental, like landfills or poorly secured garbage cans. The resulting changes in behavior and nutrition can affect how diseases impact wildlife.

"We knew of studies of supplemental feeding showing both increases and decreases in parasitism and disease, but no one had synthesized them," said Daniel Becker, a doctoral student in the Odum School of Ecology and the study's lead author. "We wanted to know if there was an overall net tendency, and we wanted to know what could explain the different responses."

The researchers pulled together over 20 published studies of supplemental wildlife feeding and infectious disease to understand trends in infection patterns and to create predictive models of pathogen transmission.

"We found that there are several different mechanisms at work," Becker said.



House finches that aggregate at bird feeders have been affected by a bacterial eye disease in recent decades. Credit: Andy Davis/UGA

With pathogens like bacteria or viruses that are spread by close contact, [food sources](#) that attract large numbers of animals can encourage transmission, including transmission from one species to another—even to humans. This is suggested with the spread of Nipah virus in Malaysia, where infected fruit bats are attracted to fruit trees planted by farmers, bringing them into contact with livestock and people.

Even when the food provided is very nutritious—and therefore

potentially able to improve an animal's immune function—in most cases that is not enough to overcome the exposure risk of being in the midst of a large group with frequent aggressive contacts over resources. In many cases, the food is not nutritious enough to help and can even impair animals' immune defenses.

An example of this is when tourists in the Bahamas feed rock iguanas grapes, which are not part of their natural diet. Their overall condition is impaired and levels of infection by hookworms are higher.

For diseases caused by parasites such as tapeworms and flukes that require multiple hosts to complete their life cycles, however, the results suggest a different process. Animals that glean food from a landfill or garbage can are less likely to be exposed to such parasites, reducing their levels of disease. When foxes, for instance, find their food at a landfill instead of hunting for small rodents, which are commonly infected with worms, they are less likely to become infected themselves.

Knowing what happens in different contexts could help wildlife enthusiasts and managers minimize the risk of disease if they choose to supplement wildlife diets.

"For intentional feeding sources like bird feeders, we expect parasites like bacteria and viruses to increase, so spacing these resources apart can help reduce the high contact rates driving transmission," Becker said. "And cleaning feeders periodically can help limit the buildup of infectious stages in the environment that occurs when lots of animals become more sedentary."

Improving the nutritional content of the food being provided is another strategy that could help boost wildlife immune function and allow them to better resist infection, and supplemental food sources could also be used to distribute vaccines or treatment, Becker said.

The authors also provided a roadmap for future research, including collaborating with existing citizen science networks to gather data.

"We need field experiments, we need long-term observational studies, and we need to develop models focusing on environmentally transmitted parasites like worms; those are areas where we're lacking information," Becker said. "This is an issue that's not going away, so we need to understand it."

"For a lot of people, feeding animals provides a crucial connection to nature, increases their appreciation of wildlife and presents opportunities for outreach and education," said study co-author Sonia Altizer, the UGA Athletic Association Professor of Ecology and Odum School associate dean. "We don't want to suggest that all feeding of wildlife should be avoided, but we do need to find ways to minimize the risks for human and [wildlife](#) health."

More information: "Linking anthropogenic resources to wildlife–pathogen dynamics: a review and meta-analysis." *Ecology Letters*. doi: 10.1111/ele.12428

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