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PRESS RELEASE (2025/11/18)

Parasitic matricide, ants chemically compel host workers to kill their own queen

Researchers detail a parasitic strategy, first observed in a blog post, where an invading ant queen uses a chemical spray to compel host workers into killing their own mother

Fukuoka, Japan—In the ruthless world of parasitic ants, taking over a host colony is a matter of life and death. The conventional understanding has been that an invading queen must physically fight and kill the resident queen to seize control. However, a new study published in *Current Biology* details a more sinister strategy: a parasitic ant queen that chemically manipulates the host colony's workers into executing their own mother.

"The initial discovery was made by my friend Taku Shimada, the first author of the paper, who has been passionate about ants since childhood and runs a popular blog called 'AntRoom.' He observed the colony infiltration and posted about it in 2021," explains Assistant Professor Keizo Takasuka of Kyushu University's Faculty of Science, the corresponding author on the paper. "I found the post three years later and was so astonished. I thought it was a very valuable discovery that deserved to be documented as academic knowledge."

The chemical manipulation was documented in two distantly related species of parasitic ants and their hosts: *Lasius orientalis*, which infiltrates the nests of *Lasius flavus*; and *Lasius umbratus*, which invades the colonies of *Lasius japonicus*.

"The parasitic behavior of the latter species of ants was discovered by Yuji Tanaka, who is the second author of this study. He is another enthusiastic amateur of ants and followed the same observational methods established by Shimada," explains Takasuka.

In the case of *Lasius orientalis*, the parasite sprayed the host colony queen repeatedly, about 15 times over 20 hours. This slowly agitated the host workers, who began attacking their queen, eventually mutilating and killing her after four days.

The *Lasius umbratus* queen, however, used only two targeted sprays. This was enough to incite an immediate and fatal attack from the host workers, who proceeded to dismember their queen. In both cases, after the matricide, the host workers accepted the parasitic queen, who soon began laying her own eggs to be cared for by the orphaned colony.

The researchers suggest this fluid was formic acid, a well-known defensive compound used by many ant species to deter predators or as a warning signal to fellow nestmates. In this context, it appears to act as a deceptive social signal.

"In both cases, the host and parasite belong to the same genus, so they both have formic acid and recognize it as a danger signal," states Takasuka. "We believe that when their queen is suddenly covered in a large amount of this chemical, the workers perceive their own

mother as a colony-threatening crisis which triggers their aggressive defensive behavior."

To get close enough to perform this manipulation, the parasite must first bypass the colony's guards. The researchers replicated this step in their experiments through a process called host-odor pre-acquisition.

"Direct infiltration would fail because the workers would immediately perceive the intruder and attack her," continues Takasuka. "To achieve this, the parasitic queen was housed with a few host workers and cocoons. After just one night, she acquired the host colony's specific scent, providing a chemical camouflage that was essential for her to get past the initial defenses."

Interestingly, even though these two parasitic ant species are not close relatives, they share the same genus that is known to have two discrete origins of social parasitism. Takasuka explains that these behaviors are an example of convergent evolution, where similar traits develop independently between unrelated species.

"My own research focuses on how parasitoid wasps manipulate the behavior of spiders, so I know that in the natural world, parasitic organisms utilize many various and interesting strategies to infect their hosts," concludes Takasuka. "This discovery in ants is another fascinating example. I am interested in investigating these different host-killing strategies to understand the evolutionary pressures that drive them."

A full video showing the ants and their behavior can be found here.

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For more information about this research, see "Socially parasitic ant queens chemically induce queen-matricide in host workers," Taku Shimada, Yuji Tanaka, Keizo Takasuka, *Current Biology*, https://doi.org/10.1016/j.cub.2025.09.037

About Kyushu University

Founded in 1911, Kyushu University is one of Japan's leading research-oriented institutions of higher education, consistently ranking as one of the top ten Japanese universities in the Times Higher Education World University Rankings and the QS World Rankings. Located in Fukuoka, on the island of Kyushu—the most southwestern of Japan's four main islands—Kyushu U sits in a coastal metropolis frequently ranked among the world's most livable cities and historically known as Japan's gateway to Asia. Its multiple campuses are home to around 19,000 students and 8,000 faculty and staff. Through its VISION 2030, Kyushu U will "drive social change with integrative knowledge." By fusing the spectrum of knowledge, from the humanities and arts to engineering and medical sciences, Kyushu U will strengthen its research in the key areas of decarbonization, medicine and health, and environment and food, to tackle society's most pressing issues.

(Written by Science Communicator Intern, Ken Eguchi)

Fig. 1. Researchers report on a behavioral phenomenon where parasitic ants trick a host colony into killing its own queen. In this photo, the parasitic ant queen Lasius orientalis (left) infiltrates the nest of Lasius flavus and approaches their queen (right). The parasite will then spray the host queen and trick the colony into attacking their own mother. Once the host queen is dispatched, the parasitic queen will take over.

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