

## Death cap mushroom's unusual sex life may be key to its rapid spread

### Fungus mates with itself, obviating need for a partner



- 2 FEB 2023
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Some death cap mushrooms can sexually reproduce without needing a mate—something that might explain their rapid spread along the West Coast of the United States. [Email](#)

True to its name, the death cap is one of the world's most lethal mushrooms. Each year in the United States, it kills one or two people and sickens many more, mostly those who mistake it for something edible. Its numbers also seem to be increasing; over the past few decades, the species has swept across North America, becoming particularly widespread along the West Coast, and it shows little sign of stopping.

Now, scientists think they've found an explanation for how the fungus has taken over the area so fast. A new preprint reveals the Californian death cap reproduces by fertilizing itself rather than waiting for a mate—an unusual sort of sexual reproduction in mushrooms that's rarely been observed outside the lab.

The research doesn't prove the fungus' uncommon sex life is behind its spread, but some scientists say the team's evidence is intriguing. The study "is very neat and well carried out," says Sheng Sun, a microbiologist at Duke University Medical Center who was not involved in the work.

Like related fungi, the death cap (*Amanita phalloides*) normally reproduces bisexually—the spindly underground structures of two separate individuals fuse, and then produce aboveground mushrooms

containing DNA from both individuals. That's still what happens in Europe, where the species is originally from. When Anne Pringle, a mycologist and death cap expert at the University of Wisconsin, Madison, sequenced DNA from mushrooms across the continent, she and her colleagues found they contained two sets of genetic material—one from each parent.

But death caps in California, where the mushrooms popped up for the first time in the early 20th century, seem to be doing something rather different. DNA from these mushrooms contained just one set of genetic material, [indicating that each had arisen from a single individual](#), the team reports this week on the preprint server bioRxiv.

The findings suggest that rather than having to find a mate to fuse with, the Californian version of *A. phalloides* can simply self-fertilize, or “do it on its own,” Pringle says. How it's doing that isn't quite clear. The team proposes the death caps somehow bypass genetic controls that ensure mushrooms are made only after two individuals have fused.

The study offers one of few examples of “unisexual reproduction” observed so far in wild mushrooms, although there are more and more examples from lab-based studies. Sun and Duke mycologist Joseph Heitman have described unisexual reproduction in [detail](#) in the single-celled fungus [Cryptococcus](#), and researchers in Germany recently documented it in an [edible](#) species.

An ability to reproduce unisexually can offer an advantage, particularly in new habitats where potential mates might be scarce, Pringle says. It might therefore help explain the death caps' rapid spread along the West Coast of the United States, the team argues.

That makes sense, says Jesús Peña, a mycologist at Harvey Mudd College, although he'd like to see more data. “I think they're building up a very good case.”

It's not clear whether other North American death cap populations—some of which might have been independently introduced from Europe—can also reproduce unisexually. The researchers tried to collect additional mushrooms in New Jersey and New York, where the fungus is spreading less quickly, but they didn't find evidence of self-fertilization. Reproducing exclusively with oneself may be harmful in the long term, as it can limit genetic diversity—one reason that mycologists think it isn't more common, Sun explains.

Pringle says a next question is whether other invasive species of fungi are using similar strategies out in the wild. Fungi are less studied compared with plants and animals, she notes, and mushrooms likely harbor many more weird types of reproduction than have been discovered so far.