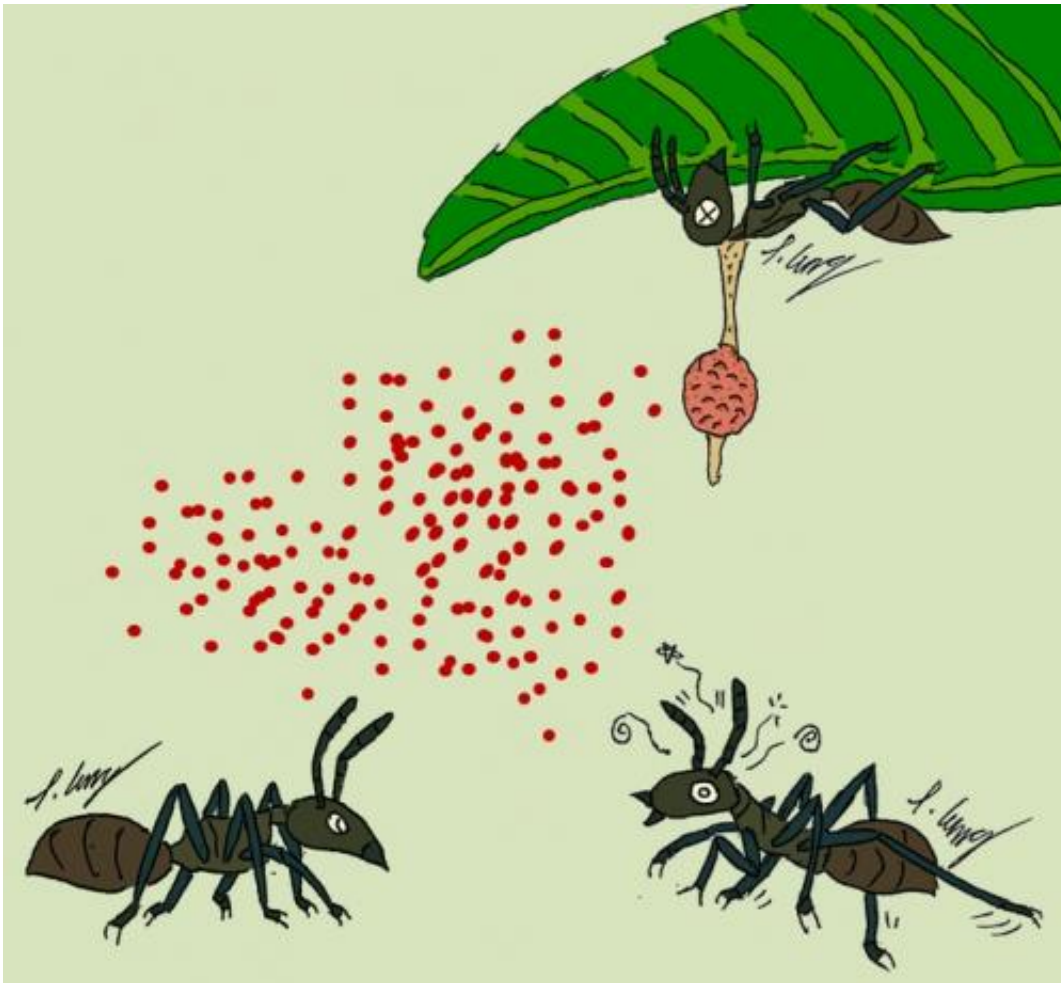


# Meet the enemy of killer fungus that turns ants into zombies

December 23 2013, by Tommy Leung

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When microbes cause ants to become zombies. Credit: Tommy Leung

One of most famous fungi in the world is the "[zombie ant fungus](#)". It

takes over the mind of an ant, causing it to climb up a branch and cling to the underside of a leaf before mummification. Once locked in place, the mushroom-like fruiting body of the cordyceps sprouts from the ant and eventually releases its spores.

This ant-killing [fungus](#) goes by the scientific name *Ophiocordyceps unilateralis* and its modus operandi has made it something of a celebrity – inspiring an episode of [The X files](#), the video game [The Last of Us](#) and even a [Pokémon character](#).

This fame might make it seem there is just one fungus that can create such a nightmare. But in fact there are [many species of them](#), and zombifying ants is not their only speciality.

In just the *Ophiocordyceps* genus there are more than 100 species. Many insects can fall under their spell – beetles, caterpillars, cicada and dragonflies are all fair game. There is fossil evidence indicating that this has been going on for [more than 40m years](#). But while these fungi are master body-snatchers, they don't always get everything to themselves. Sometimes two of these fungi can infect the same ant.

Last month scientists in Japan studying these fungi started noticing that some zombified ants were afflicted with [two distinct forms](#) of cordyceps fungi. Both fungi were found sprouting from dead ants that had their mandibles clamped tightly around a branch in the typical zombie-ant pose. One [fungus species](#), *O. pulvinata*, produces a bulbous fruiting body that juts from the back of the ant's head. The other, *O. sessilis*, covers the ant's body in spiny fruiting bodies.

There is nothing peculiar about that as cordyceps come in many different shapes, but what stood out was that they also noticed *O. sessilis* is only ever found in ants that are also infected with *O. pulvinata*. Rather than a case of a pair of fungi cozily sharing the same host, the scientists

suggested that *O. sessilis* is actually a parasite of *O. pulvinata* itself.

This is an example of hyperparasitism – whereby a parasite itself becomes infected by a parasite. Jonathan Swift was on to something in his oft-misquoted poem:

*"So, naturalists observe, a flea  
Hath smaller fleas that on him prey  
And these have smaller fleas to bite 'em  
And so proceed ad infinitum."*

The behaviour is observed in other parasites. For instance, parasitic barnacles that castrate crabs can in turn be infected with their own castrating parasite and salmon lice are sometimes infected with microsporidian parasites.

Switching hosts from an insect to another fungi (or vice versa) seems to be [fairly common](#) among cordyceps fungi. And there may be an evolutionary reason for this adaptation.

The microscopic spores of a fungus get inside the insect by puncturing their tough exoskeleton. This is done by secreting enzymes that dissolve chitin, which happens to be the same material that makes up the cell wall of fungi. So any fungus able to chew through an insect's exoskeleton is already equipped to attack other fungi.

But apart from enemies within the cordyceps, the zombie ant fungus also faces threats from other types of hyperparasitic fungi. After the cordyceps has moved the zombified ant into the ideal position, the spore-producing fruiting body punches through the host's exoskeletal shell and takes at least two weeks to reach maturity. During that time, it is vulnerable to spores of other types of fungi that specialise in [taking over cordyceps](#), covering it in a dense white mould and rendering it sterile.

Usually the enemy of an enemy is a friend, but that is of no consequence for a zombified ant. To these [fungi](#) the ant is but a stage upon which they play out their lives and conflicts, as they have been doing for millions of years.

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