Yeast byproduct inhibits white-nose syndrome fungus in lab experiments

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University of Illinois researchers have discovered a naturally occurring compound that inhibits the growth of the fungus that causes white-nose syndrome in bats. This infected little brown bat was observed in a mine in Vermont. Credit: Moriarty Marvin, U.S. Fish and Wildlife Service

A microbe found in caves produces a compound that inhibits *Pseudogymnoascus destructans*, the fungus that causes white-nose syndrome in bats, researchers report in the journal *Mycopathologia*. The finding could lead to treatments that kill the fungus while minimizing disruption to cave ecosystems, the researchers say.

The yeast *Candida albicans* produces the compound: trans, trans-farnesol.

Candida species are already present in caves where bats hibernate and have been isolated from the bodies of healthy, hibernating bats, said University of Illinois graduate student Daniel Raudabaugh, who conducted the study with Illinois Natural History Survey mycologist Andrew Miller. This suggests that tt-farnesol is unlikely to harm bats or damage cave ecosystems, Raudabaugh said.

"We're looking for a microbe that's already associated with bats, that lives in the cave environment and is not a problem for people or other cave life," he said.

C. albicans is a common resident of human intestines and is found in many other species. The yeast uses tt-farnesol for "quorum-sensing" - at high concentrations, the compound inhibits the growth of fungal projections called mycelia, causing *Candida* to revert from its invasive form to a more benign, yeast-like state. The compound also disrupts the process by which some bacteria form slimy biofilms that aid in their ability to infect and damage other cells.

"This chemical is known to inhibit other fungi, so we wanted to see if this would inhibit the fungus that causes white-nose syndrome in bats," Raudabaugh said.

"Several million bats have died of white-nose syndrome in the U.S., but

European bats appear to survive the infection better," Miller said. "It is possible that the microbial makeup of European caves plays a role in bat survival there."

Raudabaugh first tested different concentrations of tt-farnesol against the white-nose fungus and found that, at the right concentrations, it effectively inhibited it.

"There are *Candida* species that already produce this concentration of tt-farnesol, which inhibits *P. destructans* at biologically produced concentrations," Raudabaugh said.

Further work must be done to search caves for *Candida* populations that produce tt-farnesol at effective concentrations.

"Inoculating hibernating bats with these microbes to use tt-farnesol as a control agent could increase the bats' chances of surviving the infection," Raudabaugh said.

The researchers also discovered that several other *Pseudogymnoascus* species are less sensitive to tt-farnesol. This suggests the compound could target the white-nose fungus specifically without disrupting other components of the cave ecosystem, Raudabaugh said.

"The goal is to preserve as many of the natural species as possible while eradicating *P. destructans*," he said. "That is the hope. And so far, it looks promising."

Provided by University of Illinois at Urbana-Champaign

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