

Chemical warfare between leafcutter ant symbionts and a co-evolved pathogen.

Heine D, Holmes NA, Worsley SF, Santos ACA, Innocent TM, Scherlach K, Patrick EH, Yu DW, Murrell JC, Viera PC, Boomsma JJ, Hertweck C, Hutchings MI, Wilkinson B (2018) Chemical warfare between leafcutter ant symbionts and a co-evolved pathogen. *Nat Commun* 9(1), 2208.

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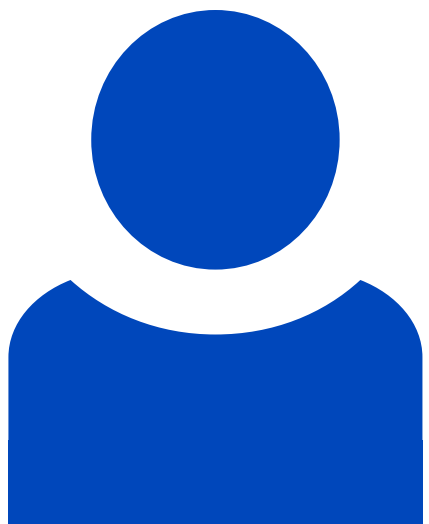
Abstract

Acromyrmex leafcutter ants form a mutually beneficial symbiosis with the fungus *Leucoagaricus gongylophorus* and with *Pseudonocardia* bacteria. Both are vertically transmitted and actively maintained by the ants. The fungus garden is manured with freshly cut leaves and provides the sole food for the ant larvae, while *Pseudonocardia* cultures are reared on the ant-cuticle and make antifungal metabolites to help protect the cultivar against disease. If left unchecked, specialized parasitic *Escovopsis* fungi can overrun the fungus garden and lead to colony collapse. We report that *Escovopsis* upregulates the production of two specialized metabolites when it infects the cultivar. These compounds inhibit *Pseudonocardia* and one, shearinine D, also reduces worker behavioral defenses and is ultimately lethal when it accumulates in ant tissues. Our results are consistent with an active evolutionary arms race between *Pseudonocardia* and *Escovopsis*, which modifies both bacterial and behavioral defenses such that colony collapse is unavoidable once *Escovopsis* infections escalate.

Beteiligte Forschungseinheiten

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doi: 10.1038/s41467-018-04520-1

PMID: 29880868