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, Vieria 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.

Details

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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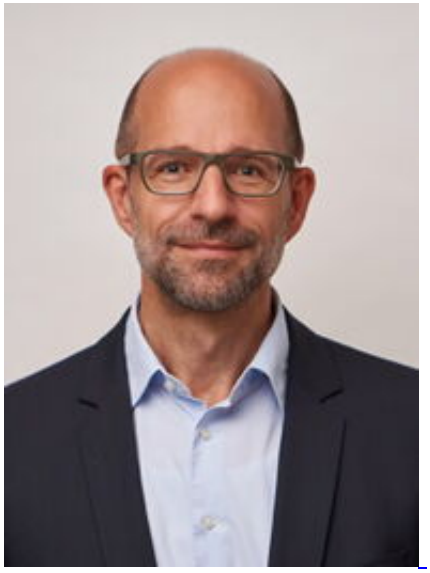

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