

Helper bacteria halt and disarm mushroom pathogens by linearizing structurally diverse cyclolipopeptides.

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Abstract

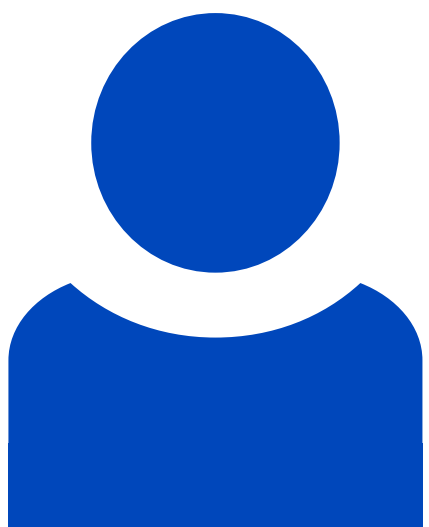
The bacterial pathogen *Pseudomonas tolaasii* severely damages white button mushrooms by secretion of the pore-forming toxin tolaasin, the main virulence factor of brown blotch disease. Yet, fungus-associated helper bacteria of the genus *Mycetocola* (*Mycetocola tolaasinivorans* and *Mycetocola lacteus*) may protect their host by an unknown detoxification mechanism. By a combination of metabolic profiling, imaging mass spectrometry, structure elucidation, and bioassays, we found that the helper bacteria inactivate tolaasin by linearizing the lipocyclopeptide. Furthermore, we found that *Mycetocola* spp. impair the dissemination of the pathogen by cleavage of the lactone ring of pseudodesmin. The role of pseudodesmin as a major swarming factor was corroborated by identification and inactivation of the corresponding biosynthetic gene cluster. Activity-guided fractionation of the *Mycetocola* proteome, matrix-assisted laser

desorption/ionization (MALDI) analyses, and heterologous enzyme production identified the lactonase responsible for toxin cleavage. We revealed an antivirulence strategy in the context of a tripartite interaction that has high ecological and agricultural relevance.

Involved units

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Leibniz-HKI-Authors



Ron Hermenau

[Details](#)



Christian Hertweck

[Details](#)



Anna Komor

[Details](#)



Susann Kugel

[Details](#)

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