Endosymbiont-dependent host reproduction maintains bacterial-fungal mutualism.

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Abstract

Bacterial endosymbionts play essential roles for many organisms, and thus specialized mechanisms have evolved during evolution that guarantee the persistence of the symbiosis during or after host reproduction. The rice seedling blight fungus Rhizopus microsporus represents a unique example of a mutualistic life form in which a fungus harbors endobacteria (Burkholderia sp.) for the production of a phytotoxin. Here we report the unexpected observation that in the absence of endosymbionts, the host is not capable of vegetative reproduction. Formation of sporangia and spores is restored only upon reintroduction of endobacteria. To monitor this process, we succeeded in GFP labeling cultured endosymbionts. We also established a laserbeam transformation technique for the first controlled introduction of bacteria into fungi to observe their migration to the tips of the aseptate hyphae. The persistence of this fungal-bacterial mutualism through symbiont-dependent sporulation is intriguing from an evolutionary point of view and implies that the symbiont produces factors that are essential for the fungal life cycle. Reproduction of the host has become totally dependent on endofungal bacteria, which in return

provide a highly potent toxin for defending the habitat and accessing nutrients from decaying plants. This scenario clearly highlights the significance for a controlled maintenance of this fungal-bacterial symbiotic relationship.

Beteiligte Forschungseinheiten

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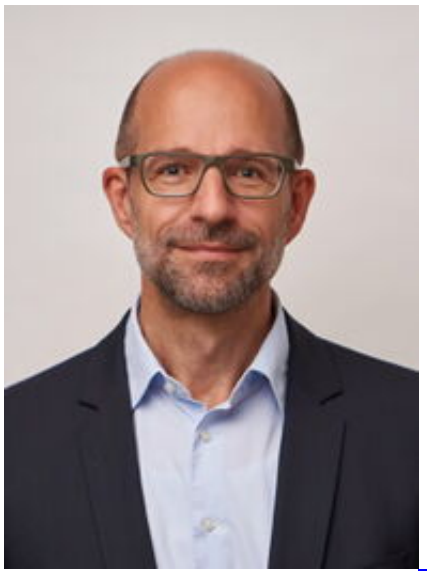

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