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Rice blast effectors secreted in planta:
Untangling secretory mechanisms for differential localization

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Slatyer seminar room R.N. Robertson Building (Bldg. 46), Linnaeus Way, ANU

Rice blast caused by the fungus *Magnaporthe oryzae* remains as a threat to global food security. This pathogen infects other important cereal crops such as wheat, barley and millet, as well as turf grasses. In addition to economical importance, rice blast is a model pathosystem for difficult to study biotrophic fungi and fungal-plant interactions. Pathogens secrete effector proteins into host tissue to suppress immunity and cause disease. Pathogenic bacteria have evolved several distinct secretion systems to target specific effector proteins during pathogenesis, but it was not previously known if fungal pathogens require different secretory mechanisms. We have determined that *M. oryzae* secretes cytoplasmic effectors targeted for delivery inside rice cells and apoplastic effectors targeted to the extracellular space. Cytoplasmic effectors preferentially accumulate in the biotrophic interfacial complex (BIC), an *in planta* structure first located in front of the tip of the initially filamentous invasive hypha and then remaining sub-apically beside the first differentiated bulbous invasive hypha cell. In contrast, apoplastic effectors remain in the extracellular compartment uniformly surrounding the invasive hypha inside the invaded cell. Disruption of the conventional ER-Golgi secretion pathway by Brefeldin A treatment blocked secretion of apoplastic effectors, but not secretion of cytoplasmic effectors. Pathogen mutants that failed to express exocyst components or a t-SNARE were defective in secretion of cytoplasmic effectors and in pathogenicity. By contrast, secretion of apoplastic effectors was not impaired in these mutants. We propose a model for the distinct secretory mechanisms that the rice blast fungus has evolved for targeting cytoplasmic and apoplastic effectors to achieve tissue invasion.

Presented by

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