MS09-2-7 X-ray structure of AvrLm1 effector from Leptosphaeria maculans in complex with the Mitogen Activated protein Kinase MPK9 from Brassica napus and their interaction
#MS09-2-7

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Abstract
Fungi are the most devastating pathogens of plants, including crops of major economic importance. Host invasion relies on effectors, key elements of pathogenesis, which modulate plant immunity and facilitate infection. Fungal effectors are typically small proteins with no or only weak homologs in databases, and known motifs are absent from their sequences. Their function in pathogenesis is also mostly unknown. Effectors have a dual role in microbe-plant interactions, both targeting plant components and being targeted by resistance (R) proteins and then termed avirulence (AVR) proteins. The 3D structure of several fungal and oomycete avirulence effectors have been reported and have been provided key advances in the understanding of plant-pathogen interactions (Boutemy L.S. et al 2011; Blondeau K. et al 2015; Ma L. et al 2018). In this study, we purified, characterized and determined the 3D structure of the AvrLm1 / MPK9 complex. We solved the X-ray structure by molecular replacement using an AlphaFold 3D model for the effector. The crystal structure at 3.9Å resolution reveled a ß-barrel fold never observed before in other effectors from L. maculans and provides insight into recognition of the MAP protein kinase MPK9. The structure of AvrLm1 revealed a structural homologue called SnTox3, which is a K2PP-like protein. From the comparison of both structures and biochemical experiments we concluded that AvrLm1 is synthesized as a pre-pro protein and that the pro-domain can be cleaved in vitro by the Kex2 protease. Finally, we determined quantitatively the interaction between AvrLm1 and MPK9 by ITC.

References
Ma, Lisong et al. “Leptosphaeria maculans Effector Protein AvrLm1 Modulates Plant Immunity by Enhancing MAP Kinase 9 Phosphorylation.” iScience vol. 3 (2018): 177-191. doi:10.1016/j.isci.2018.04.015