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Project Title: Initial Interactions of *Fusarium graminearum* with Wheat and Barley.

PROJECT 2 ABSTRACT

(1 Page Limit)

We are focusing our efforts on identifying genes and interactions that result in fungal ingress into wheat and barley. These processes should be the targets for fungal elimination, as once the fungus has begun to colonize the plant, it is much harder to get rid of. In this proposal, we investigate the role that silicon (Si) and its derivatives play in host interactions with *Fusarium graminearum.* We have identified two important stages of the life cycle that are influenced by the presence of specific host cells that accumulate silica: the "silica cells" associated with nodes support perithecium development; and the trichomes (also called phytoliths) that support fungal penetration. We have recently generated knockout strains for three genes encoding major intrinsic proteins (MIP) in *F. graminearum.* There is evidence that these proteins are the transporters of Si into plants and they may be key sensors of Si for the fungus as well. Our objectives are to (1) Test ability of *F. graminearum* wild-type and MIP mutants to grow on silica in culture and its effect on differentiation. (2) Test the influence of Si levels in barley florets on the pathogenicity and perithecium development of *F. graminearum.* (3) Perform transcriptomics under high and low Si conditions both in culture and on barley florets. (4) Knockout genes identified in (3) as having the largest change in expression associated with presence of Si to determine how the fungus senses Si and how Si affects pathogenicity. The first two objectives can be performed simultaneously, and will establish conditions for the third objective. The fourth objective will be accomplished following analysis of transcriptomics. This project will determine how Si influences the infection of hosts by *F. graminearum* and the sporulation in association with silica cells on crop residues. This information will influence decisions to amend soil with Si, and can be used in a transgenic context to affect both host and pathogen to reduce both fungal infection and sporulation on crop debris.