Project Abstract

Project Title:	Signal recognition by GPCRs during plant infection in *Fusarium graminearum*	
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The heterotrimeric G-proteins and G protein coupled receptors (GPCRs) are well conserved in fungal pathogens to activate downstream intracellular signaling pathways. In comparison with saprophytic fungi, GPCRs are expanded in plant pathogenic fungi, likely for recognizing specific plant signals at different infection stages. However, no plant compounds have been identified as possible signals (ligands) recognized by fungal GPCRs in plant pathogens. In a previous study, six GPCR genes were found to be important for plant infection. The *giv1* mutant that has the most significant reduction in virulence is defective in infection cushion formation and stimulation of Gpmk1 phosphorylation by compounds in wheat floral tissues. The other five GIV genes are closed related and they all have *in planta* specific upregulation, suggestion overlapping functions among GIV2-GIV6 during plant infection.

The goal of this study is to further characterize the roles of GIV GPCRs in fungal pathogenesis and develop approaches to identify plant compounds (ligands) recognized by these receptors. Objective 1 aims to characterize the functional relationships among the six GIV genes. The double-sextuple *giv* mutants will be generated and characterized for their defects in plant infection and MAPK or PKA activation in response to anther extract. Objective 2 will screen for anther compounds that are stimulatory to Gpmk1 activation via GIV1. Besides directly assaying Gpmk1 phosphorylation in the wild type and *giv1* mutant, we will use *FST12*-GFP and *TRI5* as its downstream reporters to isolate fractions of anther extracts with compounds recognized by GIV1 to activate Gpmk1. Objective 3 will develop a yeast reporter system to screen for anther compounds recognized by GIV1 and other GIV GPCRs. Yeast strains expressing the chimeric GIV-Ste2 allele will be generated and assayed for the effects of anther extract on the expression of two reporter genes (LacZ and GFP).

Overall, results from proposed experiments will determine the functional relationship among the GIV genes. Fractions of wheat anther containing compounds recognized by GIV1 or other GIVs isolated in this study can be used for further purification and identification of their ligands. Better understanding of the roles of GIV and other GPCRs in ligand recognition and signaling during *F. graminearum* infection may lead to better disease control strategies in the future. Proposed study fits the research priority of PBG on identifying important genes, proteins or small molecules produced during the plant-fungal interaction that may be used to develop FHB resistance or to reduce DON contamination.