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**Research Category: GDER** **Duration of Award: 1 Year**

**Project Title: RNA-Interference Targeting of Fungal Genes for Enhancing FHB Resistance.**

## PROJECT 1 ABSTRACT

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*Fusarium* head blight (FHB) is a damaging disease of small grains. *F. graminearum* is the principal causal agent of FHB in North America. The long-term goal of USWBSI-funded research in the PI and co-PI's group is to develop strategies for engineering disease resistance in wheat (*Triticum aestivum*). *F. graminearum* genes/mechanisms that are essential for fungal growth and/or pathogenicity provide targets for engineering disease resistance in plants. We propose to utilize host-induced gene silencing (HIGS) to interfere with the accumulation of transcripts of effector genes in *F. graminearum*. This work will test the hypothesis that HIGS of fungal effector-encoding genes will adversely impact pathogenicity and thus promote resistance against *F. graminearum* in transgenic wheat. The specific objectives that will be pursued are:

1. Host-induced silencing of *F. graminearum FGL1* effector gene to enhance disease resistance.
2. Fungal *nahG* gene as a target for host-induced silencing to engineer resistance to *F. graminearum.*

Under objective 1, HIGS will be used to silence expression of *F. graminearum FGL1* gene, which encodes an effector that is secreted into the host and is essential for fungal pathogenicity. Under objective 2, HIGS will be used to silence expression of a secreted salicylate hydroxylase-encoding *F. graminearum NahG* gene, which is likely involved in the degradation of salicylic acid (SA) an important signaling molecule in defense against FHB. Wheat and the model plant *Arabidopsis thaliana* will be used for HIGS, which will be mediated by expression in the host plant of double stranded RNA corresponding to the target fungal genes. Experiments in Arabidopsis will expedite testing of this strategy to control *F. graminearum* infection. The successful completion of this work will provide new strategy and targets for engineering FHB resistance in wheat that in the future could also be extended to barley. Transgenic wheat generated as a result of this work will provide germplasms for transferring resistance to elite cultivars.

The proposed project is relevant to the GDER initiative of 'Promoting the development of effective FHB resistance and/or reduced mycotoxin accumulation through transgenic strategies.' The proposed approach is also relevant to the PBG initiative to 'develop new strategies for reducing impact of FHB disease and mycotoxin contamination in barley and wheat, with a focus on pathogen genes and responses, including specific host target genes.' Our approach, and the genes and mechanisms that we are targeting for enhancing FHB resistance, complement the activity of other USWBSI-sponsored projects.