Project Abstract

Project Title:	**Haplotype-Informed Prediction of FHB Resistance in US Wheat Breeding Programs**	
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This project will leverage bioinformatics data storage and imputation tools, capable of very high imputation accuracy, to construct a wheat PHG database generating a dense catalog of variants across the wheat genome in FHB resistant lines and adapted wheat varieties. These variants will be used to develop a genomic selection (GS) model for FHB resistance, to identify novel FHB resistant haplotypes/QTLs, and to develop diagnostic markers for these QTLs.

Objectives & Outcomes:

1- Build a GS model for FHB resistance for HWW using field-generated phenotypic data
2- Test/optimize the GS model on two sets of breeding lines from Kansas and the Great Plains region. This will give HWW breeders information for early selection in their breeding programs.
3- Expand the diversity of PHG database by incorporating soft and spring wheat germplasm. This will increase the diversity within the database to better inform imputation of breeding materials across the entire United States for a larger community impact.
4- Map novel FHB-resistance QTLs using BLUPs by GWAS and develop diagnostic markers for FHB resistance QTLs for use in breeding programs. This will provide breeders with genomic tools for selecting FHB resistant wheat cultivars.

Wheat exome capture of FHB resistant and adapted wheat cultivars with various levels of FHB resistance will populate a customized PHG database, capable of imputing lower coverage sequenced breeding lines with high accuracy across the wheat genome. The variants from all FHB phenotyped lines will be used to optimize a GS model of FHB resistance, and tested on a subset of the adapted lines from across the Great Plains. Using the phenotypic data, we will employ a linear mixed-model association study to identify novel FHB resistance QTLs. SNP markers closely linked to these QTLs will be developed into diagnostic markers capable of informing breeders of FHB-related QTLs present in their breeding programs.