USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY10 Final Performance Report
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Cover Page

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Fiscal Year:	FY10
USDA-ARS Agreement ID:	NA
USDA-ARS Agreement Title:	Fungal Genes for DON Accumulation in Wheat.
FY10 USDA-ARS Award Amount:	$ 34,500

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Award Amount
PBG	Fungal Genes Involved in DON Accumulation in Wheat.	$ 34,500
	Total ARS Award Amount	**$ 34,500**

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Principal Investigator Date

* MGMT – FHB Management
FSTU – Food Safety, Toxicology, & Utilization of Mycotoxin-contaminated Grain
GDER – Gene Discovery & Engineering Resistance
PBG – Pathogen Biology & Genetics
BAR-CP – Barley Coordinated Project
DUR-CP – Durum Coordinated Project
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Soft Winter Wheat Region
SWW – Southern Soft Red Winter Wheat Region

Project 1: *Fungal Genes Involved in DON Accumulation in Wheat.*

1. **What major problem or issue is being resolved relevant to Fusarium head blight (scab) and how are you resolving it?**

   The pathogenic fungus *Fusarium graminearum* causes disease losses on wheat and barley crops world-wide and contaminates harvested grain with a compound known as DON, whose levels in grain are strictly regulated. In addition to factors reducing the impact of Fusarium head blight, novel methods for reduction of DON accumulation in grain are desirable. Currently, little is known about the pathogen factors that influence the accumulation of DON in plants. This study directly addresses the issue by identifying a gene responsive to DON accumulation in both wheat and barley.

2. **List the most important accomplishment and its impact (i.e. how is it being used) to minimize the threat of Fusarium head blight or to reduce mycotoxins. Complete both sections (repeat sections for each major accomplishment):**

   Accomplishment:

   Fungal growth conditions that induce the accumulation of DON in culture allow for the study the mechanisms of toxin production in great detail. We have tagged several proteins involved in toxin production with the fluorescent proteins GFP and RFP, and localized the site of toxin biosynthesis within the cell. The localization of these proteins suggests ways in which the cell sequesters toxic pathway intermediates and a mechanism for toxin export from the cell may be inferred from these results.

   Impact:

   Our studies supported by the USWBSI have resulted in the conclusion that the FHB pathogen is well adapted for producing vomitoxin, by precisely regulating the genes unique to toxin synthesis in order to promote toxin accumulation. We have now found, by labeling proteins for toxin synthesis with fluorescent proteins, that a gene for a cellular toxin "pump" results in a protein targeted to the periphery of the cell that to a limited extent is responsible for overcoming self poisoning by the toxin. Alteration of this component of the cellular "toxin factory" in the fungus reduces levels of vomitoxin in grain infected with that fungus. These results point out potential targets for control strategies designed to reduce toxin concentrations in the food supply.

Include below a list of the publications, presentations, peer-reviewed articles, and non-peer reviewed articles written about your work that resulted from all of the projects included in the grant. Please reference each item using an accepted journal format. If you need more space, continue the list on the next page.

Lysøe, E., Seong, K., and Kistler, H.C. 2011. The transcriptome of *Fusarium graminearum* during the infection of wheat. Molecular Plant-Microbe Interactions. In press.

Menke, J., Dong, Y., and Kistler, H.C. 201X. *Fusarium graminearum* Tri12p is involved in virulence to wheat and trichothecene accumulation. Molecular Microbiology (manuscript submitted).