USDA-ARS/
U.S. Wheat and Barley Scab Initiative
FY08 Final Performance Report (approx. May 08 – April 09)
July 15, 2009

Cover Page

PI:	James Pestka
Institution:	Michigan State University
Address:	Department of Food Science & Human Nutrition 234A GM Trout FSHN Bldg. East Lansing, MI 48824-1224
E-mail:	pestka@msu.edu
Phone:	517-353-1709
Fax:	517-353-8963
Fiscal Year:	2008
USDA-ARS Agreement ID:	59-0790-4-119
USDA-ARS Agreement Title:	Human Susceptibility to Trichothecene Mycotoxins.
FY08 USDA-ARS Award Amount:	$ 93,861

USWBSI Individual Project(s)

USWBSI Research Category*	Project Title	ARS Adjusted Award Amount
FSTU	Mechanisms and Biomarkers for Deoxynivalenol-Induced Growth Retardation.	$93,861
	Total Award Amount	**$ 93,861**

James V Pestka 7-8-2009

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
HWW-CP – Hard Winter Wheat Coordinated Project
VDHR – Variety Development & Uniform Nurseries – Sub categories are below:
SPR – Spring Wheat Region
NWW – Northern Winter Wheat Region
SWW – Southern Sinter Wheat Region

Project 1: *Mechanisms and Biomarkers for Deoxynivalenol-Induced Growth Retardation.*

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

During head blight of wheat and barley, deoxynivalenol (DON or "vomitoxin") and other trichothecene mycotoxins are elaborated that might adversely affect human health. One aspect related to trichothecene exposure and human health was addressed. Since DON can potentially cause adverse health effects in individuals who consume the infected grain, this mycotoxin DON is regulated in the U.S. at 1 ppm in finished food. Recently, the European Economic Union has established lower limits based on a limited number of rodent studies as well as the concern that children have greater sensitivity to DON. A pertinent question relates to *the true risks* presented to consumers and grain handlers posed by DON and other trichothecenes elicited during outbreaks of head blight. Our research is addressing this gap by understanding mechanism(s) as well as identifying sensitive and easily measured biomarkers of effect, which might be evaluated in grain consuming individuals.

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 1: We have determined that DON *dose-dependently* induces important suppressors of cytokine signaling in many tissues, and that DON-induction of hepatic SOCS3 mRNA and protein occurs later than cytokines induction.

Impact:
To our knowledge, this is the first report that a trichothecene can induce SOCS. It is possible that these *suppressors* can impair cytokine and growth factor signaling in DON-exposed animals. SOCS protein identification provides an additional sensitive index of DON effect that might be used to assess health impact in DON-exposed humans and animals.

Accomplishment 2: We have determined that chronic dietary DON exposure results in a suppression of circulating insulin-like growth factor 1 (IGF1) in mice. We also determined that IGF1 protein reduction was not preceded by IGF1 mRNA reduction. We have recently identified an additional protein IGFALS which appears to mediate IGF1 reduction.

Impact:
This is the first report that DON directly affects the growth hormone axis. Suppression of IGF1 and associated proteins offers markers that are responsive to dietary DON exposure. These markers are potentially useful in human evaluation of DON exposure.

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.

PUBLICATIONS

1. Amuzie, C.J., Shinozuka, J. and Pestka J.J. 2009. Induction of suppressors of cytokine signaling by the trichothecene deoxynivalenol in the mouse. Submitted to *Toxicological sciences*
2. Pestka J.J. and Amuzie, C.J. 2008. Tissue distribution and proinflammatory cytokine gene expression following acute oral exposure to deoxynivalenol: Comparison of weanling and adult mice. *Food and Chemical Toxicology*. Aug; 46(8):2826-2831.
3. Amuzie, C.J., Harkema, J.R. and Pestka J.J. 2008. Tissue distribution and proinflammatory cytokine induction by the trichothecene deoxynivalenol in the mouse: Comparison of nasal vs. oral exposure. *Toxicology* Jun 3;248(1):39-44.
4. Pestka J.J., Islam, Z. and Amuzie, C.J. 2008. Immunochemical assessment of deoxynivalenol tissue distribution following oral exposure in the mouse. *Toxicology Letters*, May 5;178(2):83-7.

ABSTRACTS AND PRESENTATIONS

1. Amuzie, C.J., and Pestka J.J. 2009. Trichothecene Deoxynivalenol impairs growth hormone signaling and suppresses insulin-like growth factor, acid-labile subunit in mice. Gordon Research Conferences on Mycotoxins and Phycotoxins, New London, NH.
2. Amuzie, C.J., Shinozuka, J., and Pestka J.J. 2009. SOCS3 and IGF1 are potential biomarkers of Deoxynivalenol-induced growth inhibition in the mouse. *Toxicologist* p. 13. Society of Toxicology Annual Meeting, Baltimore, MD (Oral Presentation)
3. Amuzie, C.J., Shinozuka, J., and Pestka J.J. 2008. Induction of SOCS and reduction of circulating insulin-like growth factor 1 (IGF-1) by mycotoxin Deoxynivalenol. 2008 Phi Zeta research day at Michigan State University. (Oral Presentation)
4. Amuzie, C.J., Islam, Z., Harkema, J.R. and Pestka J.J. 2008. Tissue Distribution of the Macrocyclic Trichothecene Satratoxin G Following Intranasal Instillation in the Mouse. *Toxicologist* p. 126. Society of Toxicology Annual Meeting, Seattle, WA (Oral Presentation)

If your FY08 USDA-ARS Grant contained a VDHR-related project, include below a list all germplasm or cultivars released with full or partial support of the USWBSI. List the release notice or publication. Briefly describe the level of FHB resistance. If this is not applicable (i.e. no VDHR-related project) to your FY08 grant, please insert 'Not Applicable' below.

Not applicable.