PI: Steven Qian **PI's E-mail: steven.qian@ndsu.edu**

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Research Category: **FSTU-R** **Duration of Award: 1 Year**

Project Title: PH/GBA3-Dependent Stability of D3G's Glycosidic Bond and the Potential Risk to Human Health.

PROJECT 1 ABSTRACT

(1 Page Limit)

Deoxynivalenol (DON) is a mycotoxin that can be formed in cereal-based products infected by Fusarium head blight. DON belongs to the trichothecene family, members of which contain an epoxide ring which might react with many biomolecules, including DNA, RNA, and proteins, thus threatening human and animal health. Many plants can metabolize DON. For example, DON can be conjugated with sugars in plants to produce less toxic or even nontoxic products, *e.g.*, deoxynivalenol-3-β-D-glucoside (D3G). Such plant glucose-conjugation could also be responsible for decreasing the toxic activity of DON found in agricultural products consumed by humans and animals. However, under certain conditions the glycosidic bond of D3G might simply be cleaved, deconjugating D3G back to DON during human digestion (in the very acidic stomach environment) and metabolism (via beta-glucosidase enzyme GBAs). Our **long-term research objectives** are: (1) to apply our expertise in chemistry and toxicology to develop appropriate approaches (*e.g.* HPLC, LC/MS/MS, and other pharmacology/ molecular biology techniques) to determine the levels of DON and D3G in agricultural products and to determine the rate of D3G deconjugation and relative concentration of D3G *vs*. DON during human digestion and metabolism, (2) to determine the toxic effects and mechanisms of D3G and DON (and other related metabolites) in humans, and (3) ultimately, to provide safety guidelines for levels of D3G in agricultural products intended for human and animal consumption. There **are three specific aims** in this study: (1) to survey D3G and DON level from samples of barley, durum wheat and hard red spring (HRS) wheat, (2) to validate pH-dependent and GBA-catalyzed hydrolysis of D3G, and (3) to characterize metabolic products of D3G in human parietal and hepatocyte cells.

Due to the delay of USWBSI Year 2013 award, we have just set down the sub account for our project in NDSU. We are now conducting the experiments for Aims 2-3. In addition, although the delay we have still very actively been conducting the Aim 1 study, e.g. survey D3D and DON for barley samples from researchers in our state. So far, approximately 100 samples (from 2011 or early) and 50 samples (from 2012) have been analyzed for DON and DON-3-glucoside from my lab by collaborating with colleagues, such as Drs. Paul Schwarz and Senay Simsek. The results of this study sever the starting point for our lab to investigate the toxic effects of DON, D3G, and other DON metabolites on human health.