Executive Summary

DON Occurrence in Grains: A North American Perspective

In agricultural commodities, the occurrence of deoxynivalenol (DON), a mycotoxin produced by *Fusarium* species affecting cereal grains, has been reported all over the world, with levels varying amongst grain type and years of production. The grain supply chain including growers, buyers, and end users have effectively managed DON with strategies to control this issue systematically. The safety of consumers is ensured with these management strategies.

The principal health risks of DON are associated with acute dietary exposure, which is caused by intake of large amounts of DON within a short time frame. To date there is no evidence of occurrence of adverse human health outcomes in North America associated with acute dietary intake of DON. The chronic effects of dietary intake of DON include weight gain suppression, anorexia, and altered nutritional efficiency. DON is water soluble which allows it to become rapidly cleared in vivo.

Current global regulations, better crop management techniques, improved tolerance of crops to Fusarium Head Blight (FHB) and the advancement of milling practices have considerably reduced the number of acute incidences of DON-related illnesses. The US-FDA continues to recognize an advisory limit of 1 mg/kg on finished food products containing wheat and wheat by-products; a level that remains protective for the USA population and USA export markets. The same is true for advisory levels on finished grain established by regulatory agencies elsewhere.

The occurrence of DON in North America does not appear to be different than reported around the world. Sporadically, levels of DON in grains (wheat, maize, and barley) can be much higher than usual in certain years due to more severe *Fusarium* infection. Cool and wet conditions during specific developmental stages of grains (e.g., wheat flowering) promote *Fusarium* infection, although wet conditions at harvest can lead to secondary *Fusarium* infection and DON production as well. Other factors influencing the levels of DON in agricultural crops include the growing region and its climate, besides the wheat class.

The management of FHB and consequently DON in grains is a complex problem with numerous component methods. Each method, such as using crop rotation, tillage, cultivar resistance, fungicides, biological control agents, and optimized spray technologies, provides some benefit, and using multiple approaches is the most efficient way for the grower to manage this problem.

The data presented suggest that as grain moves along the chain, its quality is improved by the application of management strategies such as blending, cleaning, and selecting. These management strategies are particularly important for grain aggregated for pounding or hammer milling or otherwise not undergoing extractive processing. These strategies allow not only for the improvement of the quality of the grain, but also its safety, by managing the presence of DON. Indeed, numerous studies with the major grains, including wheat, corn, and oats, have shown that DON in whole grains is mainly redistributed during processing, into the bran and germ fractions rather than endosperm. The flour fraction (from the endosperm) destined for human consumption typically contains 10 to 20 times lower

DON levels than those observed in the bran or germ fractions, which are mostly used for animal feed. The technology or equipment used in each mill affects the recovery and segregation of DON in each fraction. Therefore, it would be plausible to adopt different standards or regulatory limits for different milled fractions of grains instead of applying a single level for the whole grain. That is, if action levels are to be endorsed, they should be endorsed for (i) flour and other milling fractions intended for direct human consumption, and (ii) bran, germ, and other fractions intended for feeding to various animal populations.

Maximum Limits (MLs) should be adequately protective of health yet also practically achievable so that trade disruptions do not occur. MLs should be based upon the dietary patterns of impacted populations. Since unprocessed raw grains are not typically consumed in that form and contribute minimally to dietary exposure from the finished food product (after processing), setting MLs for unprocessed raw grain will not significantly change the health outcomes.

In the grain supply chain, current practices for managing risks of DON content in grain include: 1) sourcing from locations with less incidence of DON; 2) including contract limits and discounts for excessive DON; 3) segregating wheat in storage; 4) selectively testing and/or cleaning to assure contract performance; and 5) where appropriate, use of cleaning and/or scouring to remove kernels with excessive DON content. Through these processes, North American domestic mills effectively and efficiently control the incidence of excessive DON in their products. Any additional restrictions would increase costs and risks to mills not only in North America but also internationally, and divert grain suitable for human consumption into waste or animal feed streams.

More restrictive interventions on DON content would have numerous impacts. Importantly, there would be increased costs and risks, related to executing any further restrictions. A more strict management, including the monitoring of grain along the handling chain for DON, would require resources for proper sampling and analytical testing. It would lead to an increase of the risks to growers discouraging them from growing crops susceptible to FHB, and cause changes at the processor level that will also impact grain to be exported. All of these would add costs to the grain handling chain. Improvements in management of DON at the farm, elevator, and processor level have shown that any regulatory limits would more efficiently safeguard public health if applied on the finished product, rather than on unprocessed raw grains.