



Vomitoxin (DON) fact sheet

“Mycotoxins” are natural chemicals produced by certain fungi, many that produce molds. Mycotoxins can affect human or animal health if they consume contaminated food or feed. There are currently 400 to 500 known mycotoxins, each produced by a different mold.

A. What is “vomitoxin”?

1. Common name for deoxynivalenol (DON)

2. Produced by *Fusarium* and *Gibberella* fungi

- a. *Fusarium graminearum* is most notable for DON production
 - i. Responsible for head blight or “scab” disease of wheat
 - ii. Responsible for “red ear rot” in corn
- b. Molds can proliferate before harvest, but continue to grow postharvest

B. Vomitoxin (DON) advisory levels

1. Advisory levels differ from action levels

- a. Provide an adequate margin of safety to protect human and animal health
- b. Grain and products exceeding advisory levels are not subject to reporting or seizure
- c. Guidance for rations based on maximum amount of infected grain or grain products as percentage of total ration

C. Conditions favoring vomitoxin production

1. Mycotoxins may or may not be present if visible molds are present

- a. Absence of visible mold does not guarantee absence of mycotoxins



Figure 1. Ears with *Fusarium* ear rot have white to purple mold visible on kernels.(cornmycotoxins.com)

| Table 2. FDA advisory levels for vomitoxin (DON) in various commodities | |
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| GRAINS and GRAIN PRODUCTS intended for: | Advisory level¹ (mg/kg or ppm) |
| Beef or feedlot cattle, older than 4 months | 10 (11.4) |
| Dairy cattle, older than 4 months | 10 (11.4) |
| Swine | 5 (5.7) |
| Chickens | 10 (11.4) |
| All other animals | 5 (5.7) |
| DISTILLERS GRAIN, BREWERS GRAINS, GLUTEN FEEDS, and GLUTEN MEAL intended for: | Advisory level¹ (mg/kg or ppm) |
| Beef cattle, older than 4 months | 30 (34) |
| Dairy cattle, older than 4 months | 30 (34) |
| TOTAL RATION² intended for: | Advisory level¹ (mg/kg or ppm) |
| Beef or feedlot cattle, older than 4 months | 10 (11.4) |
| Dairy cattle, older than 4 months | 5 (5.7) |
| Swine | 1 (1.1) |
| Chickens | 5 (5.7) |
| All other animals | 2 (2.3) |
| WHEAT and WHEAT PRODUCTS intended for human consumption: | Advisory level¹ (mg/kg or ppm) |
| Grain | n/a |
| Finished products (e.g., flour, bran, germ) | 1 (1.1) |

¹Advisory levels given on both 88% dry matter basis and 100% dry matter basis (in parentheses).
²Total ration includes grains, all grain by-products including distillers and brewers grains, hay, silage, and roughage.

2. *Fusarium* molds

- a. Are associated with ear rots and stalk rots
- b. Develop under wide range of environmental conditions
- c. Can infect seedlings and developing kernels
 - i. Affected kernels may appear purple, tan, or brown
 - ii. Visible mold appears white to pink or salmon-colored
- d. Wheat
 - i. Excessive moisture at flowering and early grainfill stages
 - ii. Warm, wet weather at harvest
- e. Corn
 - i. Cool, wet growing season
 - 1) Also, dry conditions in midseason followed by wet weather
 - ii. Insect or hail damage to ears

- iii. Warm, wet weather at harvest
- iv. Infection usually has minimal effect on yield

3. *Gibberella* molds

- a. Responsible for *Gibberella* ear rot
 - i. Pinkish mold; usually begins at ear tip
- b. Produces both DON and zearalenone
- c. Overwinters on corn and small grain residue
 - i. Produces spores
 - ii. Can infect soybean roots
- d. Spores infect corn during silking
- e. More prevalent when:
 - i. rotation is continuous corn
 - ii. wheat is affected by *Fusarium* head blight
 - iii. cool, wet weather occurs during early silking
 - iv. fall rains delay harvest



Figure 2. Corn ears with *Gibberella* ear rot.
(cornmycotoxins.com)

D. Vomitoxin effects

1. Mycotoxins can interact to produce symptoms different or more severe than expected

- a. Pure DON added to diets, does not have as much toxicity as do feeds contaminated with DON
- b. Due to the presence of multiple mycotoxins in naturally contaminated feeds?
- c. Fusaric acid interacts with DON to cause vomiting effects
 - i. Was originally attributed to DON alone
- d. Resulted in use of I name “vomitoxin” for DON

2. Processing can reduce, but not eliminate DON

- a. e.g. contaminated wheat grain processed into flour

3. Swine disorders

- a. Over 0.6 to 1.0 ppm in total ration dry matter
 - i. Feed refusals
 - ii. Reduced growth, weight loss,
 - iii. Sometimes diarrhea
- b. 15 ppm or above
 - i. Vomiting
 - ii. Reproductive failure

- iii. Death

4. Dairy cattle disorders

- a. Generally associated with poor performance
- b. 1.5-2.5 ppm in total ration dry matter or possibly lower
 - i. Off-feed
 - ii. Ketosis
 - iii. Altered rumen fermentation
 - iv. Displaced abomasum
 - v. Distinct milk decrease
 - vi. Sometimes diarrhea

E. Sampling and analysis for vomitoxin

1. Survey fields before harvest

- a. From dent through to harvest, check five to ten field locations
- b. Target areas with plants that appear most stressed.
- c. Peel back the husks of 10 ears at each location and inspect for mold

2. Suggested sampling procedures

- a. Standing grain: Collect 25 ears or heads at random throughout the field
- b. Grain cart/truck: Take multiple probes for a composite 10 lb. sample
- c. Moving grain stream: Take a composite 10-lb sample consisting of 12 to 20 subsamples from the grain stream
- d. Keep samples cool, but do not freeze
- e. Ship promptly, early in the week, to avoid weekend delays

3. Analytical methods

- a. Immunoassay test kits: screening, provide yes/no answer
- b. Immunoassay with reader: can test several mycotoxins; provides quantitative data
- c. Chromatography: can test all mycotoxins; provides quantitative data

References

- Adams, R.S. et. al. *Mold and mycotoxin problems in livestock feeding*. DAS 93-21. Pennsylvania State Univ. Coop. Ext. Svc. 17 pg.
<http://www.das.psu.edu/research-extension/dairy/nutrition/pdf/mold.pdf/view?searchterm=mycotoxin>
- Corn Protection Network. 2016. Ear Rots.
<http://cropprotectionnetwork.org/corn/ear-rots/> accessed 13Sep2017
- Hurburgh, C.R. *Mycotoxins in the Grain Market*. Integrated Crop Mgmt. News. Iowa State University Extension.
<http://www.extension.iastate.edu/Grain/Topics/MycotoxinsintheGrainMarket.htm> accessed 11/1/2009
- U.S. FDA. 2010. *Guidance for Industry and FDA: Advisory Levels for Deoxynivalenol (DON) in Finished Wheat Products for Human Consumption and Grains and Grain By-Products used for Animal Feed*, June 2010.
<http://www.fda.gov/Food/GuidanceRegulation/GuidanceDocumentsRegulatoryInformation/ChemicalContaminants/ChemicalContaminantsMetalsNaturalToxinsPesticides/ucm077969.htm#afla> accessed 05Jan2017