

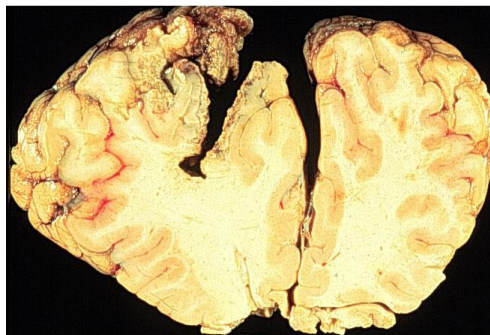
Fumonisin B1 is the most prevalent of several fumonisin mycotoxins (B1, B2, B3) produced by *Fusarium* molds in corn. Corn contamination can occur at very high levels when permissive environmental conditions coincide with vulnerable points in corn kernel production.



## Equine Leukoencephalomalacia (ELEM)

Horses and other equids, as well as rabbits are the most fumonisin-sensitive species. Consumption of corn contaminated with fumonisin B1 causes 'moldy corn poisoning', leukoencephalomalacia – which translates to softening of the brain's white matter. Onset of clinical signs depends on the dose of toxin ingested.

Affected horses become ataxic and centrally depressed, and may exhibit tremors, circling and head-pressing. They progress into recumbency and death. Rabbits are affected similarly. There is no treatment except removal of the contaminated corn from the diet, and such brain damage is not expected to be recoverable. Corn and corn by-products should comprise less than 20% of the equine or rabbit diet, and the corn utilized should contain no more than 5 ppm fumonisins (maximum 1 ppm, entire diet).



## Porcine Pulmonary Edema (PPE)

Pigs consuming fumonisin B1-containing corn first decrease their feed intake, then 4-7 days later exhibit respiratory difficulty followed by death due to acute pulmonary edema. For swine, corn and corn by-products should comprise less than 50% of the diet, and the corn utilized should contain no more than 20 ppm fumonisins (maximum 10 ppm, entire diet).



Catfish are also sensitive to fumonisin at 10 ppm in the total diet.

While ELEM and PPE are species specific, fumonisins produce hepatotoxic and nephrotoxic effects at some intake level in every species studied thus far. They are associated with esophageal cancer in humans, and are therefore limited to 2 – 4 ppm in corn intended for human consumption. The FDA has produced guidance levels for fumonisins in corn and corn products intended for human food and animal feeds (see table). Their entire report can be viewed at <https://www.fda.gov/RegulatoryInformation/Guidances/ucm109231.htm>

Human Food Product	Total Fumonisins (FB <sub>1</sub> +FB <sub>2</sub> +FB <sub>3</sub> )
Degermed dry milled corn products (e.g., flaking grits, corn grits, corn meal, corn flour with fat content of < 2.25%, dry weight basis)	2 parts per million (ppm)
Whole or partially degermed dry milled corn products (e.g., flaking grits, corn grits, corn meal, corn flour with fat content of ≥ 2.25 %, dry weight basis)	4 ppm
Dry milled corn bran	4 ppm
Cleaned corn for masa production	4 ppm
Cleaned corn for popcorn	3 ppm

Animal Feeds with Corn and Corn By-products	Total Fumonisins (FB <sub>1</sub> +FB <sub>2</sub> +FB <sub>3</sub> )
Equids and rabbits	5 ppm (no more than 20% of diet)**
Swine and catfish	20 ppm (no more than 50% of diet)**
Breeding ruminants, breeding poultry and breeding mink*	30 ppm (no more than 50% of diet)**
Ruminants ≥3 months raised for slaughter and mink raised for pelt production	60 ppm (no more than 50% of diet)**
Poultry raised for slaughter	100 ppm (no more than 50% of diet)**
All other species or classes of livestock and pet animals	10 ppm (no more than 50% of diet)**

\* Includes lactating dairy cattle and hens laying eggs for human consumption.

\*\* Dry weight basis

Fumonisin B1 is very similar in chemical structure to cell membranes' normal components, sphinganine and sphingosine. Fumonisin B1 disrupts cellular functions based on its ability to interfere with membrane and lipoprotein structure, cell regulation and communications. Most of fumonisin's toxic effects can be attributed to inducing apoptosis (programmed cell death).

The only way to handle fumonisin poisoning is to avoid it, which means testing source corn prior to inclusion in animal diets and careful testing of finished products to verify safety based on the FDA Guidance Levels for fumonisin.

Testing for fumonisin itself is only possible in corn and corn-based feed and can be conducted by TVMDL. For more information on fumonisin, contact TVMDL's Analytical Chemistry Section at 888.646.5623.