Aflatoxin M_1 in Milk

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How does aflatoxin M_1 contaminate milk and why is that a concern?

Dairy cattle produce milk contaminated with aflatoxin M_1 (AFM_1) after eating feeds contaminated with the mycotoxin aflatoxin B_1 (AFB_1). Aflatoxin B_1 is metabolized by enzymes found primarily in the liver to AFM_1. After AFM_1 is formed, it is excreted in urine and milk.

Action levels for AFB_1 in feed and AFM_1 in milk have been established because Aflatoxins B_1 and M_1 may cause cancer in humans. The action level for AFM_1 in milk is 0.5 ppb. Action levels for AFB_1 in feed vary. Action levels are further discussed below.

Aflatoxin B_1 is a mycotoxin produced by *Aspergillus* molds that grow on grains, especially corn, peanuts and cottonseed. It is rarely, if ever, found in forages. It is usually not present in high enough concentrations in corn silage to be of concern. Feedstuffs **do not** contain AFM_1, only milk.

How can AFM_1 contamination be removed from or controlled in milk?

Aflatoxin M_1 contamination of milk cannot be completely prevented because AFB_1 does occur naturally in grains. It is not practical to completely eliminate AFB_1 from feeds nor AFM_1 from milk. However, it is possible to control the amount of AFM_1 present in milk by limiting the amount of aflatoxin in animal feeds.

To control the amount of aflatoxin present in animal and human foods, the U.S. Food and Drug Administration (FDA) has established maximum amounts of aflatoxin that can be present in animal feeds and of AFM1 that can be present in milk. Such amounts are called *action levels*.

Action levels for aflatoxin in animal feeds and milk are listed in *Table I*. The action level for aflatoxin in corn, cottonseed meal and other feed ingredients intended for dairy animals is 20 ppb. Action levels are applicable for corn, cottonseed meal or other feed ingredients produced by a dairy operation for its own use, or purchased from other sources. There are no exemptions.

Blending feed containing aflatoxin in excess of an action level with other feed for the purpose of decreasing aflatoxin content below an action level is tolerated by FDA in the State of Nebraska, but the blended product cannot be used for dairy cattle, even if the aflatoxin concentration in the final blend is less than 20 ppb. Ration formulation by mixing grain with other feed is allowed, but each feed ingredient must contain less than 20 ppb aflatoxin. For more information about blending aflatoxin-contaminated feed and

uses for the blended product, contact the Nebraska Department of Agriculture at (402) 471-2394.

What can I do if milk from my dairy is found to contain excessive AFM_1 concentrations?

Aflatoxin M_1 concentrations in milk in excess of the action level (0.5 ppb) are termed "violative levels." Milk containing violative levels of AFM_1 cannot be marketed.

Stop using the aflatoxin-contaminated feed that causes violative levels of AFM_1 in milk.

The longer the aflatoxin-contaminated ration is consumed by the dairy cattle, the longer AFM_1 will appear in the milk.

Reformulate the ration using components that contain less than 20 ppb aflatoxin.

The component of the feed most likely to contain aflatoxin is corn. If cottonseed or cottonseed meal are in the ration, they may also be sources. Corn silage is probably not a significant source of aflatoxin, unless corn kernels are concentrated in the silage. Forage is rarely, if ever, a significant source of aflatoxin.

Use corn, cottonseed or cottonseed meal known to contain less than 20 ppb aflatoxin.

Require that your source of corn or cottonseed products have their product analyzed for aflatoxin at a laboratory acceptable to you before you accept delivery of the product. If aflatoxin content is found to be in excess of 20 ppb, you cannot use the product for your dairy cattle.

Aflatoxin analytical services are available from many laboratories. Results obtained from federal grain inspection service laboratories are legally recognized by the FDA. Results obtained from other laboratories may not be recognized by the FDA and may not have any legal standing. Results obtained using a black light *are not valid*, regardless who conducts the analysis.

May I analyze my milk for AFM_1 on my farm?

Analysis of milk for AFM_1 on dairy farms is possible using enzyme-linked immunosorbent assay (ELISA) technology. An incubator and test card are necessary to conduct the test.

Dairies already using such technology for analysis of antibiotic residues in milk may only have to purchase an AFM_1 test card. Ask your supplier of antibiotic residue test cards if they also have AFM_1 test cards.

An incubator to run the test will cost $200 to $400. The incubator may be used to run assays for beta-lactams, tetracyclines and sulfadimethoxine, as well as AFM_1. The test cards used to run the analysis cost $4 to 6$ each. Separate test kits are required for each assay.

For more information about analysis of milk for AFM_1, contact staff at the UNL VDC Tox Lab, (402) 472-8459 or visit UNL VDC web site at vbms.unl.edu/nvdls.

Table I. U.S. FDA action levels for aflatoxin in animal feeds and milk.

Commodity	*Action Level (ppb)*[1,2,3]
Corn and peanut products intended for finishing (i.e. feedlot) beef cattle	300
Cottonseed meal intended for beef cattle, swine, or poultry (regardless of age or breeding status)	300
Corn and peanut products intended for finishing swine of 100 pounds or greater	200
Corn and peanut products intended for breeding beef cattle, breeding swine, or mature poultry	100
Corn, peanut products, and other animal feeds and feed ingredients but excluding cottonseed meal, intended for immature animals	20
Corn, peanut products, cottonseed meal, and other animal feed ingredients intended for dairy animals, for animal species or uses not specified above, or when the intended use is not known	20
Milk	0.5 (aflatoxin M_1)

[1]ppb = parts per billion
[2]Feed for the listed animals and uses MAY NOT exceed the applicable action levels.
[3]Blending aflatoxin-contaminated feed to reduce aflatoxin concentration is restricted. Contact Nebraska Department of Agriculture for further information (402) 471-2394.

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