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Aflatoxin in milk and dairy products

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Abstract

Aflatoxins are toxic compounds that are produced by certain strains of molds, namely, Aspergillus flavus and Aspergillus parasiticus. These molds may invade stressed crops in the field or proliferate in improperly stored feed. Dairy cows are one of the many species of animals that may suffer both long-term and short-term adverse effects from consuming aflatoxin contaminated feed. In addition, dairy cows metabolize the toxin to a slightly different form, a portion of which is secreted into milk and can be consumed by humans.; Dairy Day, 1986, Kansas State University, Manhattan, KS, 1986;

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AFLATOXIN IN MILK AND DAIRY PRODUCTS

W. G. Ikins

Introduction

Aflatoxins are toxic compounds that are produced by certain strains of molds, namely, Aspergillus flavus and Aspergillus parasiticus. These molds may invade stressed crops in the field or proliferate in improperly stored feed. Dairy cows are one of the many species of animals that may suffer both long-term and short-term adverse effects from consuming aflatoxin contaminated feed. In addition, dairy cows metabolize the toxin to a slightly different form, a portion of which is secreted into milk and can be consumed by humans.

Toxic Effects of Aflatoxins

Aflatoxin B_1 (AFB_1) and aflatoxin G_1 (AFG_1) are produced in the greatest amounts by molds. AFB_1 is one of the most toxic compounds known to man. Oral doses of AFB_1 have been demonstrated to decrease the feed intake of dairy cows, reduce weight gain, and significantly reduce milk production. The liver and gall bladder appear to be the primary target organs for the toxic effect of aflatoxin, with calves being more sensitive than more mature cows. Of greater concern than the short-range effects are the long-range effects of repeated exposure of cows and humans to low doses of aflatoxins. AFB_1 is one of the most powerful cancer causing agents ever tested on experimental animals and also has been shown to cause birth defects. Aflatoxin M_1 (AFM_1), the form of toxin that is found in milk, is the result of the cows' body chemically altering AFB_1 in order to excrete it more easily. The short-term toxicity of AFM_1 appears to be the same as that of AFB_1 on experimental animals, but AFM_1 is not nearly as carcinogenic as AFB_1.

Aflatoxin in Dairy Cattle Feed

Most crops that are commonly used for dairy cattle feed are succeptible to invasion by the aflatoxin-producing molds. This is particularly true if the crops have been stressed by drought, insect attack, weed infestation, insufficient nutrients, and other factors. Perhaps more importantly, feed storage conditions that promote mold growth, such as excessive humidity and insufficient aeration, will also promote the production of aflatoxin. Corn has consistently had a problem with aflatoxin contamination, particularly in the southeastern U.S. Cottonseed and peanut meal have also been identified as likely sources of aflatoxin exposure for dairy cattle in the U.S. These meals are produced as a byproduct of oil production from the seeds. Because the toxin has little affinity for the oil, it becomes concentrated in the meal.

Aflatoxin M_1 in Milk and Milk Products

The amount of AFM_1 secreted in milk is directly related to the amount of AFB_1 ingested by the cow. Although the amount of AFM_1 secreted into milk depends on the individual cow and the experimental conditions, the levels are generally less than 5% of the AFB_1 ingested in the feed. Elimination of an aflatoxin-contaminated diet results in a relatively rapid disappearance of the AFM_1 in milk. AFM_1 has been reported to decrease and then become undetectable 4 days after removal of contaminated feed.

AFM_1 remains relatively stable during the processing of milk. Bulk pasteurization of milk at 62°C for 30 min has been demonstrated to result in only minor losses of toxin. A high temperature, short-time pasteurization treatment (71°C for 40 sec) appeared to slightly increase the proportion of destroyed AFM_1 toxin. Spray drying of milk to produce a dried milk powder, however, reduced the AFM_1 concentration by 85%.

During the separation of cream from skim milk, a large majority of the AFM_1 detected in whole milk remained in the skim milk. This is thought to be due to the chemical association of AFM_1 with milk proteins. Because cheese is mainly protein, the concentration of AFM_1 in cheese made from contaminated milk is often higher than the concentration in the original milk. In addition, molds capable of producing aflatoxin can grow on the surface of some cheeses under optimal growing conditions.

Read More About It

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