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Aflatoxin Contamination of Corn Used as Bait for Deer in the Southeastern United States

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ABSTRACT: Samples of shelled corn used for wildlife feed were taken from bait piles and storage bins in North Carolina and South Carolina (USA) from 29 September through 28 November 1993, and were analyzed for aflatoxin. Twenty (51%) of 39 samples were positive, with aflatoxin levels ranging from a trace to 750 parts per billion. Based on the high prevalence of aflatoxin-contaminated corn, exposure of wildlife to aflatoxin undoubtedly occurs, although the effects of such exposure are largely unknown.

Key words: Aflatoxin, corn, bait, white-tailed deer, *Odocoileus virginianus*.

Weather conditions in North Carolina and South Carolina (USA) during the summer of 1993 resulted in low-moisture stress and insect damage that were conducive to growth of the fungus, *Aspergillus flavus*, in corn. As a result, greater aflatoxin contamination of corn occurred in the 1993 grain harvest as evidenced by the 240% increase in corn samples containing more than 100 parts per billion (ppb) of aflatoxin that were submitted to the South Carolina Department of Agriculture, Consumer Services Department, Laboratory Division (P. Trefsgar, pers. comm.).

Baiting is a legal deer hunting practice in North Carolina and South Carolina and bait piles of shelled corn are commonplace. Because large quantities of locally-grown corn were rejected for animal feeds due to high aflatoxin levels in these states, concern was expressed over the likelihood that this contaminated grain alternately would be used as deer bait. Our purpose was to identify potential exposure of white-tailed deer (*Odocoileus virginianus*) and other wildlife to aflatoxin in corn provided as bait or supplemental feed.

From 29 September through 28 November 1993, samples of shelled corn used for wildlife feed were collected from bait piles and storage bins from 39 sites on private and public properties in North Carolina (33°50′N to 36°20′N, 76°30′W to 82°20′W) and South Carolina (32°00′N to 33°20′N, 78°55′W to 81°50′W). Samples were submitted to the Georgia Diagnostic Assistance Laboratory, College of Veterinary Medicine, The University of Georgia, Athens, Georgia (USA) for aflatoxin analysis. The corn samples were ground and then tested for alfatoxins with an enzyme-linked immunosorbent assay kit (Agriscreen,® Neogen Corporation, Lansing, Michigan, USA). The positive samples were further analyzed to quantitate aflatoxin levels by the methods of Jain and Hatch (1982).

Thirty-nine corn samples were analyzed for aflatoxin content. Twenty samples (51%) contained aflatoxins (predominantly aflatoxin B_1), ranging from a trace to 750 ppb. Four samples (10%) contained from a trace to 20 ppb aflatoxin, 12 samples (31%) contained from 21 to 300 ppb, and four samples (10%) contained more than 300 ppb.

The effects of aflatoxin on domestic animals vary with species, dosage, and duration of exposure (Wobeser, 1981; Pier, 1992). Acute toxicosis typically is characterized by liver damage, whereas chronic exposure to low levels of aflatoxin may result in decreased growth rate, immune system suppression, liver damage, and liver cancer (Pier, 1992). Ducklings were reported to be the most susceptible to toxic effects, whereas sheep were the most resistant (Marasas and Nelson, 1987a).

Corn contaminated with more than 20 ppb aflatoxin may not be used in food for human beings or as feed for dairy cattle and young animals (Food and Drug Administration, 1989). Higher levels are allowed in feed for breeding cattle and swine or mature poultry (100 ppb), market hogs weighing more than 45 kg (200 ppb), and beef cattle in feedlots (300 ppb). Such levels have not been determined for wild animals, but adverse effects of aflatoxin on wildlife have been documented. Ingestion of waste peanuts containing 110 ppb aflatoxin caused the deaths of approximately 7,000 mallards (*Anas platyrhynchos*) in Texas (Robinson et al., 1982). The suspected source for fatal aflatoxicosis of approximately 500 snow geese (*Chen caerulescens*) was old corn used as bait (Robinson et al., 1982). Experimental feeding of 400 ppb to 1200 ppb aflatoxin to northern bobwhite (*Colinus virginanus*) chicks for up to 4 wk had adverse effects on body weight, feed consumption, feed conversion, mortality rate, and bone ash (Wilson et al., 1978).

Based on our study, numerous corn samples contained aflatoxin, and 10% of samples exceeded 300 ppb. These results may be an underestimate of the ultimate mycotoxin contamination level because warm, moist conditions within the bait pile could favor continued aflatoxin production (Pier, 1992). Additionally, assays were not performed for other mycotoxins that also may be present in corn such as ochratoxin A (Marasas and Nelson, 1987b), and fumonisins (Gelderblom et al., 1988). Although the target species for the baiting effort was white-tailed deer, a variety of other wild mammals and birds also consume this corn. The impact of wildlife exposure to these levels of aflatoxin is unknown. Considering this information, the practice of using aflatoxin-contaminated corn as bait for deer should be discouraged until more is known about the potential health risks to wild animals.

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