

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

Authors: Fischer, John R., Jain, Anant V., Shipes, Derrell A., and Osborne, J. Scott

Source: Journal of Wildlife Diseases, 31(4) : 570-572

Published By: Wildlife Disease Association

URL: <https://doi.org/10.7589/0090-3558-31.4.570>

The BioOne Digital Library (<https://bioone.org/>) provides worldwide distribution for more than 580 journals and eBooks from BioOne's community of over 150 nonprofit societies, research institutions, and university presses in the biological, ecological, and environmental sciences. The BioOne Digital Library encompasses the flagship aggregation BioOne Complete (<https://bioone.org/subscribe>), the BioOne Complete Archive (<https://bioone.org/archive>), and the BioOne eBooks program offerings ESA eBook Collection (<https://bioone.org/esa-ebooks>) and CSIRO Publishing BioSelect Collection (<https://bioone.org/csiro-ebooks>).

Your use of this PDF, the BioOne Digital Library, and all posted and associated content indicates your acceptance of BioOne's Terms of Use, available at www.bioone.org/terms-of-use.

Usage of BioOne Digital Library content is strictly limited to personal, educational, and non-commercial use. Commercial inquiries or rights and permissions requests should be directed to the individual publisher as copyright holder.

BioOne is an innovative nonprofit that sees sustainable scholarly publishing as an inherently collaborative enterprise connecting authors, nonprofit publishers, academic institutions, research libraries, and research funders in the common goal of maximizing access to critical research.

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

John R. Fischer,¹ Anant V. Jain,² Derrell A. Shipes,³ and J. Scott Osborne,⁴ ¹ Southeastern Cooperative Wildlife Disease Study, College of Veterinary Medicine, The University of Georgia, Athens, Georgia 30602, USA; ² Georgia Diagnostic Assistance Laboratory, College of Veterinary Medicine, The University of Georgia, Athens, Georgia 30602, USA; ³ South Carolina Wildlife and Marine Resources Department, Box 167, Columbia, South Carolina, 29202, USA; ⁴ North Carolina Wildlife Resources Commission, 1328 Valley Road, Sanford, North Carolina, 27330 USA

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 aflatoxins 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 B₁), 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 virginianus*) 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.

This study was conducted through the sponsorship of the fish and wildlife agen-

cies of Alabama, Arkansas, Florida, Georgia, Kentucky, Louisiana, Maryland, Mississippi, Missouri, North Carolina, Puerto Rico, South Carolina, Tennessee, Virginia, and West Virginia (USA). Funds were provided by the Federal Aid to Wildlife Restoration Act (50 Stat. 917) and through Grant Agreement 14-45-0009-94-906, National Biological Service, U.S. Department of the Interior. Supplemental support was provided by the Georgia Veterinary Medical Experiment Station. We are grateful to wildlife biologists for submission of corn samples, Ms. Teresa Morrison of the Georgia Diagnostic Assistance Laboratory for technical expertise, Mr. Phil Trefsgar of the South Carolina Department of Agriculture for information regarding aflatoxin contamination of corn in South Carolina, and Dr. Victor Nettles for his comments on the manuscript.

LITERATURE CITED

- FOOD AND DRUG ADMINISTRATION. 1989. Corn shipped in interstate commerce for use in animal feeds; action levels for aflatoxins in animal feeds—Revised compliance policy guide; availability; FDA's policy on blending of aflatoxin-contaminated corn from the 1988 harvest with noncontaminated corn for use in animal feeds. Federal Register 54, Volume 100, U.S. Government Printing Office, Washington, D.C., pp. 22622–22624.
- GELDERBLOM, W. C., K. JASKIEWICZ, W. F. MARASAS, P. G. THIEL, R. M. HORAK, R. VLEGGAAR, AND N. P. KRIEK. 1988. Fumonisin—novel mycotoxins with cancer-promoting activity produced by *Fusarium moniliforme*. Applied and Environmental Microbiology 54: 1806–1811.
- JAIN, A. V., AND R. C. HATCH. 1982. Two dimensional thin layer chromatography of aflatoxins. In Advances in thin layer chromatography, J. Touchstone (ed.). John Wiley and Sons, Inc., New York, New York, pp. 363–373.
- MARASAS, W. F., AND P. E. NELSON. 1987a. Aflatoxicosis. In Mycotoxicology, introduction to the mycology, plant pathology, chemistry, toxicology, and pathology of naturally occurring mycotoxicoses in animals and man. The Pennsylvania State University Press, University Park, Pennsylvania, pp. 25–31.
- , AND ———. 1987b. Ochratoxicosis. In Mycotoxicology, introduction to the mycology, plant pathology, chemistry, toxicology, and pathology of naturally occurring mycotoxicoses in animals

- and man. The Pennsylvania State University Press, University Park, Pennsylvania, pp. 33–36.
- PIER, A. C. 1992. Major biological consequences of aflatoxicosis in animal production. *Journal of Animal Sciences* 70: 3964–3967.
- ROBINSON, R. M., A. C. RAY, J. C. REAGOR, AND L. A. HOLLAND. 1982. Waterfowl mortality caused by aflatoxicosis in Texas. *Journal of Wildlife Diseases* 18: 311–313.
- WILSON, H. R., J. G. MANLEY, R. H. HARMS, AND B. L. DAMRON. 1978. The response of bobwhite quail chicks to dietary ammonium and an antibiotic-vitamin supplement when fed B₁ aflatoxin. *Poultry Science* 57: 403–407.
- WOBESER, G. A. 1981. Mycotoxins. *In Diseases of wild waterfowl*. Plenum Press, New York, New York, pp. 175–180.

Received for publication 12 July 1994