Opinion
Volume 13:06, 2024

Vitamins & Minerals

ISSN: 2376-1318 **Open Access**

Broiler Chickens' Bone Mineralization is Inhibited by Aflatoxin B1

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Introduction

The production of broiler chickens, a key source of protein for human consumption, is an important part of the worldwide poultry business. However, a number of factors, including the presence of mycotoxins in their feed, have a significant impact on the quality of the meat produced by broiler chickens. Aflatoxin B1 (AFB1) is one of these mycotoxins that is particularly harmful to animal health and a strong carcinogen. In addition to its well-known hepatotoxic effects, new research has revealed how it affects the health of the bones in broiler chickens. The methods by which AFB1 prevents bone mineralization in broiler chickens are examined in this paper, emphasizing how important it is to solve this problem for the sake of both food safety and animal welfare. Aflatoxins are naturally occurring mycotoxins that are frequently found in agricultural commodities including corn, peanuts, and feed grains. AFB1 is the most common and hazardous of the aflatoxins. Both humans and animals are at serious risk of health problems if they consume it. After consumption, the liver breaks down AFB1 into a number of metabolites, some of which are extremely reactive and can create DNA adducts that cause mutagenesis and cancer [1].

Because of their high feed intake in relation to body weight, broiler chickens are especially vulnerable to AFB1 infection. Reduced development rates, compromised immunological function, and heightened vulnerability to a number of illnesses can arise from long-term exposure to relatively low amounts of AFB1. Furthermore, the detrimental effects of AFB1 on broiler chicken bone health have been brought to light by recent studies. Strong and durable bones are formed through the intricate process of bone mineralization, which involves the deposition of minerals, mostly calcium and phosphorus, onto a collagen matrix. Any interference with this process may jeopardize general health and skeletal integrity. According to studies, broiler hens exposed to AFB1 had reduced bone mineral density, changed bone microarchitecture, and become more fragile [2].

Description

AFB1 affects bone mineralization in broiler chickens through a variety of methods. Interference with calcium metabolism is one of the main mechanisms. AFB1 causes disruption of calcium homeostasis by upsetting the equilibrium of hormones that regulate calcium, including calcitonin and Parathyroid Hormone (PTH). Because hydroxyapatite crystals are necessary for bone strength, their production is hampered by the decreased calcium availability for bone mineralization. Additionally, AFB1 causes inflammation and oxidative stress, which both lead to decreased bone production and bone resorption Reactive Oxygen Species (ROS), which are produced as a result of oxidative stress, have the ability to directly harm bone cells and suppress osteoblast activity, which hinders the creation of new bone. Furthermore, pro-inflammatory cytokines like Interleukin-6 (IL-6) and Tumor Necrosis Factor-Alpha (TNF-α) are released in response to inflammation, and they encourage bone resorption by stimulating osteoclasts and suppressing osteoblast activity [3].

Furthermore, it has been demonstrated that AFB1 interferes with the endocrine system, especially the hypothalamic-pituitary-gonadal axis, which is essential for the growth and preservation of bones. Reduced bone mineralization and increased bone turnover are two significant consequences of sex hormone dysregulation, including those of estrogen and testosterone [4]. Concerns about food safety are raised when AFB1 contamination impairs bone mineralization in broiler chickens, which has an impact on the animals' general health and wellbeing. Weakened skeletal structures make broiler chickens more vulnerable to fractures and skeletal abnormalities, which can cause pain and suffering. Additionally, since AFB1 is a recognized carcinogen that can cause liver cancer and other negative health effects, consumers are at danger when they find residues of the protein in chicken meat and eggs. In the end, combating AFB1 contamination necessitates a multipronged strategy requiring cooperation amongst numerous stakeholders, such as feed producers, chicken farmers, regulatory bodies, and research institutes. The poultry sector may respect animal welfare regulations, guarantee food safety, and preserve consumer trust in the caliber of poultry products by giving priority to initiatives to reduce AFB1 contamination and its effects on bone mineralization in broiler chickens [5].

Conclusion

The chicken business has serious difficulties due to aflatoxin B1 contamination, which compromises food safety and animal welfare. Its negative effects on broiler chicken bone mineralization emphasize how crucial it is to put in place efficient mitigation techniques to reduce exposure and lessen its effects. Stakeholders can endeavour to guarantee the production of safe and superior broiler chicken meat for consumers worldwide by addressing the fundamental pathways through which AFB1 compromises bone health. In conclusion, a comprehensive strategy including genetics, nutrition, management techniques, regulatory actions, and ongoing research is needed to address the negative effects of AFB1 on bone mineralization in broiler chickens. We can lessen the effects of AFB1 contamination and preserve the health and welfare of broiler chickens while guaranteeing the safety and quality of poultry products for consumers around the world by putting targeted interventions into place and encouraging cooperation between the scientific community and the poultry industry.

Acknowledgement

None.

Conflict of Interest

There are no conflicts of interest by author.

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Received: 02 November, 2024, Manuscript No. VTE-25-158863; **Editor Assigned:** 04 November, 2024, PreQC No. P-158863; **Reviewed:** 16 November, 2024, QC No. Q-158863; **Revised:** 21 November, 2024, Manuscript No. R-158863; **Published:** 28 November, 2024, DOI: 10.37421/2376-1318.2024.13.337

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How to cite this article: Liao, Dawson. "Broiler Chickens' Bone Mineralization is Inhibited by Aflatoxin B1." *Vitam Miner* 13 (2024): 337.