



STUDY OF DANGEROUS DISEASES CAUSED BY FEED CONTAMINATION IN CATTLE: A NEW REVIEW

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ABSTRACT

Diseases caused by feed contamination in cattle can have significant impacts on both animal health and human health. One of the main contaminants found in cattle feed is aflatoxin, a mycotoxin produced by fungi that can contaminate feed before, during, and after harvest. Aflatoxin contamination in cattle feed can also have adverse effects on human health, as aflatoxins are known to be carcinogenic. Aflatoxin B1 (AFB1) is particularly concerning as it is a class 1 human carcinogen and can cause liver cancer in dairy cattle. Consumption of aflatoxin-contaminated feed can lead to liver toxicity, mutation, altered metabolism, decreased disease resistance, and reduced milk production in cattle. Aflatoxin contamination in animal feeds can also have adverse effects on human health, causing acute fatal aflatoxicosis. It is important to control aflatoxin contamination in animal feeds to prevent these health risks. Aflatoxin contamination in animal feeds can have detrimental effects on both humans and animals, highlighting the need for interventions to control aflatoxin contamination. Recently, many practical and scientific studies and reviews have been done in this field found high levels of aflatoxins in dairy feeds and cattle milk, which can lead to decreased milk production, reduced fertility, and increased susceptibility to infections. In this scientific study, we want to review the importance of animal feed hygiene and its impact on animals and humans. Therefore, hygiene in animal feed should be prioritized in livestock and poultry production centers.

Keywords: Animal Feed Hygiene, Mycotoxin, Salmonella, Dairy cattle, Contamination

Key Contribution: Based on scientific data, this review provides an overview of animal feed health factors with the impact of mycotoxins and animal feed contamination.

INTRODUCTION

In addition to aflatoxin and Salmonella contamination, cattle feed can also be contaminated with other pathogens and toxins. Contaminated feed can have various adverse effects on cattle, including liver toxicity, mutation, alteration in metabolism, decreased disease resistance, reduced milk production, and even death (Senerwa et al., 2016; lowast et al., 2020; Basaraba et al., 1999). It is important to note that feed contamination can also pose risks to human health, as humans can be exposed to contaminants through the consumption of contaminated meat and dairy products (Senerwa et al., 2016; Contreras-Trigo et al., 2022; Fels-Klerx & Bouzembrak, 2016). Coliforms, including Escherichia coli O157, can

be indicators of fecal contamination in feed and water, which can serve as a possible source of exposure to cattle for food-borne pathogens (Sanderson et al., 2005). Monensin, an ionophore antibiotic commonly used in cattle feed, can cause toxicosis in cattle when consumed in contaminated feed (Basaraba et al., 1999). Consumption of monensin-containing feed contaminated with macrolide antibiotic residues has resulted in the death of cattle (Basaraba et al., 1999). So we come to this important global conclusion that compliance with animal feed hygiene means progress in all parts of production, which was not paid attention to in the past (Picture 1).

Picture 1: The impact of feed contamination on livestock and livestock products



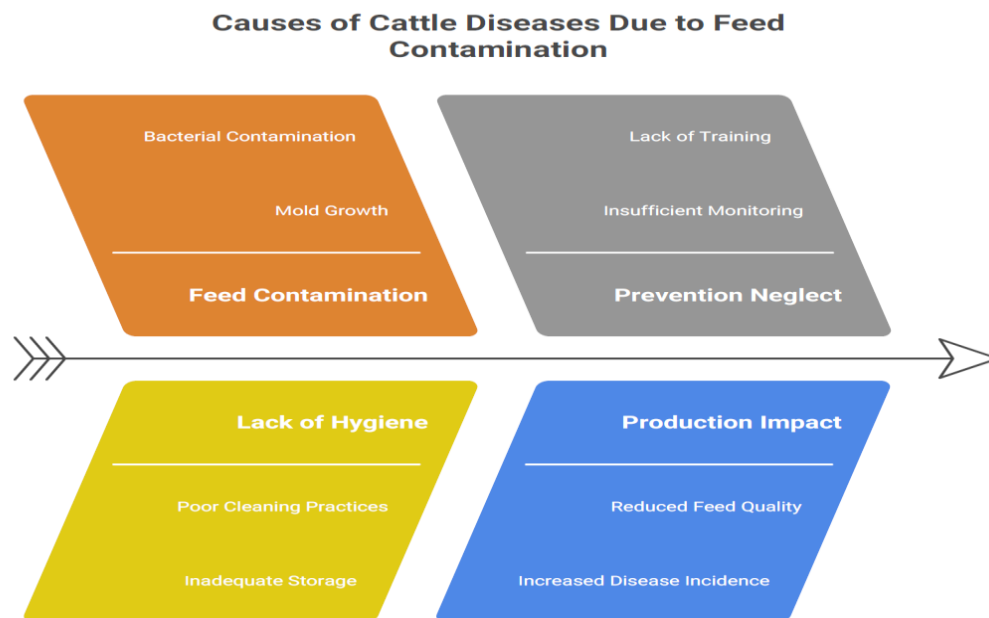
MATERIALS AND METHODS:

➤ Protocol and Registration

- No human or animal subjects were used, so this analysis did not require approval by an Institutional Animal
- Care and Use Committee or Institutional Review Board.

Methodology:

In this article, we would like to point out the very important point of animal feed contamination and lack of attention to it, which causes very important diseases in cattle. This research shows that prevention and hygiene of animal feed can increase production and reduce diseases in cattle. I would like to point out that the most important issue in animal husbandry should be the observance of animal feed hygiene, which is a type of prevention. Using cotton grass in feed is very suitable for dairy cows because it does not contain feed contaminants such as aflatoxins and is a good alternative to alfalfa and clover in the main feed of livestock (Baeelashaki et al., 2024).



Diseases: (Picture 2&3)

Overall, feed contamination in cattle can lead to various diseases and health issues. Aflatoxin contamination can result in reduced milk production, fertility issues, and increased susceptibility to infections (Senerwa et al., 2016).

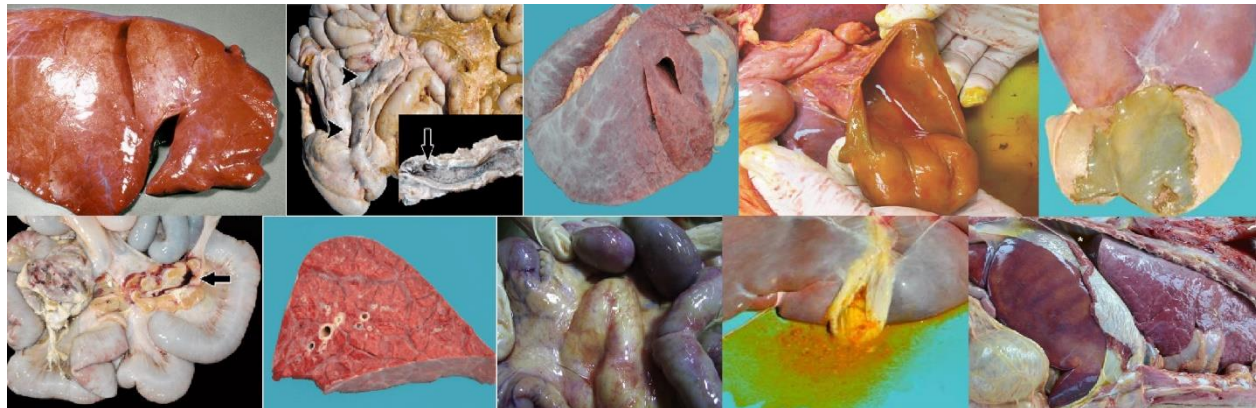
One of the most important diseases caused by feed contamination in cattle is salmonellosis, which is caused by the bacterium *Salmonella enterica*. Cattle can acquire *S. enterica* from other infected livestock, and contaminated cattle feed and feces can spread the pathogen throughout the herd (Carlson et al., 2010). A study conducted in a concentrated animal feeding operation (CAFO) in Texas found that starlings, an invasive bird species, played a role in the spread of *S. enterica* within the facility. Controlling starlings can help reduce the prevalence of *S. enterica* in cattle feed and water (Fels-Klerx & Bouzembrak, 2016; Carlson et al., 2011). Therefore, reducing contamination from these sources is important in preventing *S. enterica* infections in cattle and minimizing economic losses for producers (Carlson et al., 2011).

Cattle feed can also be a source of bovine spongiform encephalopathy (BSE), commonly known as mad cow disease. Cross-contamination of cattle feed with meat and bone meal (MBM) has been identified as a potential pathway for BSE infection (Paul et al., 2007; Schwermer et al., 2007). For example, cattle can be exposed to bovine spongiform encephalopathy (BSE) prions through contaminated feed (Hwang et al., 2018; Paul et al., 2007; Vos & Heres, 2009). BSE is a neurodegenerative disease that affects cattle and can have serious implications for human health (Hwang et al., 2018). Although the use of MBM in cattle feed has been banned in many countries, cases of BSE have still been detected in cattle born after the ban (Paul et al., 2007). Spatial analysis of the feed industry has shown a spatial relation between the use of MBM and the risk of BSE (Vos & Heres, 2009; Paul et al., 2007).

Although MBM has been banned in cattle feed in many countries, including France and Switzerland, cases of BSE have still been detected in cattle born after the ban (Paul et al., 2007). Other diseases, such as bovine cysticercosis, can be transmitted to cattle through ingestion of contaminated pasture with infected human stool (Alemneh, 2017). In addition to aflatoxin, *Salmonella enterica*, and BSE, other diseases can also be caused by feed contamination in cattle. For example, cattle can be infected with bovine cysticercosis by ingesting contaminated pasture with infected human stool (Alemneh, 2017). Monensin toxicosis, characterized by cardiac and skeletal muscle degeneration and necrosis, can occur in cattle that consume feed contaminated with monensin and macrolide antibiotics (Basaraba et al., 1999). Therefore, attention to animal feeds hygiene should be given a lot of attention.

A study conducted in Kenya found high levels of aflatoxins in both cattle feed and cattle milk (Senerwa et al., 2016). Aflatoxin B1 in feeds can decrease milk production, reduce fertility, and increase susceptibility to infections (Senerwa et al., 2016). These findings highlight the need for better understanding of the impacts of aflatoxins in the feed-dairy value chain and appropriate interventions to control aflatoxin contamination in animal feeds (Senerwa et al., 2016). Feedborne outbreaks of anthrax have also been reported in cattle (Elvander et al., 2015). Furthermore, feed contamination with antibiotics and other substances can lead to toxicosis in cattle (Basaraba et al., 1999). Other diseases, such as bovine cysticercosis and anthrax, can also be transmitted through contaminated feed (Alemneh, 2017; Elvander et al., 2015). Therefore, the sensitivity of animal feed contamination should be taken seriously.

Picture 2: The impact of animal feed contaminants on the internal organs of livestock

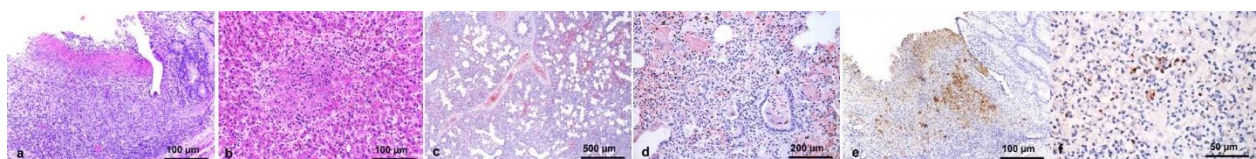


Bovine cysticercosis, caused by the ingestion of raw uncooked meat contaminated with the parasite *Taenia saginata*, can be transmitted to cattle through contaminated pasture with infected human stool (Alemneh, 2017).

Coliforms, including *Escherichia coli* O157, can be indicators of fecal contamination in feed and water, which can serve as a possible source of exposure to cattle for food-borne pathogens (Sanderson et al., 2005). Monensin, an ionophore antibiotic commonly used in cattle feed, can cause toxicosis in cattle when consumed in contaminated feed (Basaraba et al., 1999). Furthermore, feedborne outbreaks of diseases such as anthrax have been reported, emphasizing the importance of ensuring the safety and quality of cattle feed (Elvander et al., 2015). The consumption of feed contaminated with monensin, an ionophore antibiotic, and macrolide antibiotics can lead to toxicosis in cattle (Basaraba et al., 1999). Monensin toxicosis can cause cardiac and skeletal muscle degeneration and necrosis, leading to acute cardiac failure or chronic cardiovascular insufficiency (Basaraba et al., 1999).

Furthermore, contaminated feed can also contribute to the transmission of bovine cysticercosis, a parasitic disease caused by the ingestion of raw uncooked meat contaminated with the eggs of the tapeworm *Taenia saginata* (Alemneh, 2017). Cattle can become infected with *T. saginata* by ingesting contaminated pasture with human stool (Alemneh, 2017).

Picture 3: Microscopic photographs of the effects of animal feed contamination



Control and reduction methods:

To mitigate the risks associated with feed contamination in cattle, interventions such as monitoring and controlling aflatoxin levels in feed, implementing measures to prevent cross-contamination of feed with pathogens, and controlling bird populations in CAFOs can be effective strategies (Senerwa et al., 2016;

Carlson et al., 2011). Additionally, proper feed storage and handling practices, as well as regular testing of feed for contaminants, are crucial to ensure the safety and health of cattle and humans (Contreras-Trigo et al., 2022; Fels-Klerx & Bouzembrak, 2016; lowast et al., 2020). Measures such as proper storage and handling of feed, regular testing for contaminants, and implementing effective control strategies for invasive species like starlings can help mitigate the risks associated with feed contamination in cattle (Elser et al., 2019; Carlson et al., 2011). Additionally, monitoring and enforcing regulations on the use of feed additives and antibiotics in cattle feed can help prevent toxicosis and antibiotic resistance (Basaraba et al., 1999).

Implementing measures to prevent feed contamination, such as proper storage and monitoring of feed ingredients, can help mitigate the risks associated with diseases caused by feed contamination in cattle. Controlling and mitigating feed contamination is crucial to prevent the spread of these diseases and ensure the safety of both animals and humans. Implementing measures such as monitoring and testing feed for contaminants, implementing proper storage and handling practices, and controlling bird populations can help reduce the risk of feed contamination and the associated diseases in cattle.

Strategies to Mitigate Feed Contamination Risks in Cattle

Characteristic	Monitoring & Testing	Storage & Handling	Invasive Species Control	Regulation & Enforcement
 Aflatoxin Levels	Effective strategy	Crucial practice	Reduce contamination	Prevent toxicosis
 Pathogen Cross-Contamination	Prevent contamination	Proper practices	Control contamination	Prevent resistance
 Feed Contaminants	Reduce disease risk	Reduce disease risk	Reduce disease risk	Prevent toxicosis

DISCUSSION:

In this article, the direct impact of animal feed contamination, which causes very dangerous diseases in animal husbandry, was mentioned. We hope this article will have a positive impact on feed control methods and greater compliance with animal feed hygiene. Eugenics decisions and policies should be more carefully focused on health. In this way, we will have more production and less pollution, which will control the disease and prevent it. Therefore, it is suggested that work and production policies be planned based on health, especially the health of animal feed, so that we do not suffer from problems like the diseases mentioned in this article.

Table 1: Types of mycotoxins dangerous to livestock

Mycotoxins	Fungal species
Aflatoxins	Aspergillus flavus; A. parasiticus
Cyclopiazonic acid	A. flavus
Ochratoxin A	A. ochraceus; Penicillium viridicatum; P. cyclopium
Citrinin	P. citrinum; P. expansum

Patulin	<i>P. expansum</i>
Citreoviridin	<i>P. citreo-viride</i>
Deoxynivalenol	<i>Fusarium culmorum</i> ; <i>F. graminearum</i>
T-2 toxin	<i>F. sporotrichioides</i> ; <i>F. poae</i>
Diacetoxyscirpenol	<i>F. sporotrichioides</i> ; <i>F. graminearum</i> ; <i>F. poae</i>
Zearalenone	<i>F. culmorum</i> ; <i>F. graminearum</i> ; <i>F. sporotrichioides</i>
Fumonisin; moniliformin; fusaric acid	<i>F. moniliforme</i>
Tenuazonic acid; alternariol; alternariol methyl ether; altenuene	<i>Alternaria alternata</i>
Ergopeptine alkaloids	<i>Neotyphodium coenophialum</i>
Lolitrems alkaloids	<i>N. lolii</i>
Ergot alkaloids	<i>Claviceps purpurea</i>
Phomopsis	<i>Phomopsis leptostromiformis</i>
Sporidesmin A	<i>Pithomyces chartarum</i>

CONCLUSION

The feed contamination in cattle can lead to the transmission of various diseases, including aflatoxin poisoning, *Salmonella enterica* infection, BSE, bovine cysticercosis, and anthrax. These diseases can have significant impacts on both animal and human health. Implementing interventions to control feed contamination, such as monitoring and controlling aflatoxin levels, preventing cross-contamination, and controlling bird populations, is essential to ensure the safety and health of cattle and humans. Also, feed contamination in cattle can lead to the presence of aflatoxins and *Salmonella enterica*, both of which can cause diseases in cattle and have implications for human health.

It is crucial to implement interventions to control aflatoxin contamination in animal feeds and reduce contamination from sources such as cattle feces, cattle feed, and water to prevent the spread of *S. enterica* infections in cattle and minimize economic losses for producers. Further research is needed to better understand the impacts of feed contamination on animal and human health and to develop effective strategies for prevention and control. Overall, feed contamination in cattle can lead to various diseases and health risks for both animals and humans.

Controlling and preventing feed contamination is crucial to ensure the health and safety of cattle and the products derived from them. This can be achieved through measures such as monitoring and testing feed for contaminants, implementing good agricultural practices, and controlling the presence of wildlife and birds that can contribute to feed contamination (Elser et al., 2019; Carlson et al., 2011; Sanderson et al., 2005).

Overall, feed contamination in cattle can lead to various diseases and health issues. Aflatoxin contamination can cause liver toxicity and reduced milk production, while *Salmonella* contamination can result in widespread infections within cattle herds. Controlling the presence of contaminants in cattle feed, such as aflatoxin and pathogens like *Salmonella*, is crucial for maintaining animal and human

health. so we must pay attention, diseases caused by feed contamination in cattle can have significant impacts on both animal and human health. Aflatoxin, Salmonella enterica, monensin, and coliform bacteria are among the contaminants that can lead to various health issues in cattle. Implementing proper feed storage and handling practices, regular testing for contaminants, and controlling invasive species can help mitigate the risks associated with feed contamination in cattle. Implementing interventions to control feed contamination is crucial for maintaining animal and human health in cattle farming.

NOTES:

No human or animal subjects were used, so this analysis did not require approval by an Institutional Animal Care and Use Committee or Institutional Review Board.

The authors have not stated any conflicts of interest.

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