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Case report of foot and mouth disease outbreak in a university cattle herd after introduction of new stock

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Abstract

An outbreak of foot and mouth disease (FMD) was reported in the cattle herd at the University of Maiduguri, Borno State, Nigeria, shortly after the introduction of new stock into the farm, without quarantine or health screening. The affected herd comprised mixed Bunaji and Sokoto Gudali breeds managed extensively. The clinical signs included profuse salivation, oral vesicles, lameness and ulcerative lesions in the inter-digital spaces and mucous membranes. These signs rapidly progressed and spread across the herd, prompting immediate clinical and epidemiological investigations. A thorough diagnostic protocol was implemented, comprising clinical examination, sample collection for virological and serological analysis, and epidemiological assessment of risk factors. Epithelial samples and oropharyngeal swabs yielded cytopathic effects on bovine thyroid (BTY) cell cultures, confirming the presence of FMD virus (FMDV). Serum neutralization tests further substantiated the diagnosis, indicating active infection. Parasitological findings revealed incidental helminth infestations that may have aggravated clinical severity of the viral infection. The absence of biosecurity measures and recent animal introduction were identified as key contributors to the outbreak. The condition was managed with systemic anti-microbial therapy, anti-parasitic treatment, multivitamin supplementation and rigorous topical antiseptic care. Affected animals were isolated and monitored to prevent disease spread. This report highlights the consequences of inadequate biosecurity and lack of initial quarantine before introduction of new stock into a farm, and further underscores the importance of early clinical recognition, rapid virological confirmation and integrated supportive care in managing FMD outbreaks in institutional herds. The case serves as a critical reminder of the transboundary risks posed by unrestricted animal movements and the essential role of veterinary oversight in livestock health security.

Keywords: Foot and mouth disease; Cattle herd; Biosecurity breach; Vesicular lesions; Virus isolation.

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Introduction

Foot and mouth disease (FMD) is a highly contagious viral disease of cloven-hoofed animals, including cattle, swine, sheep, goats and various wildlife species. It is caused by the foot-and-mouth disease virus (FMDV), an Aphthovirus of the family *Picornaviridae* (Grubman and Baxt, 2004). The disease is characterized by fever and the formation of vesicles and erosions on the tongue, dental pads, lips, nostrils, interdigital spaces and teats, leading to excessive salivation, lameness, anorexia and significant production losses (Sobrino *et al*., 2001; Alexandersen *et al*., 2003).

FMD is endemic in many parts of sub-Saharan Africa, including Nigeria, where livestock movement, poor quarantine measures and limited access to vaccination programs contribute to the disease's persistence and transmission (Ehizibolo *et al*., 2013; Begovoeva *et al*., 2023). The disease remains one of the most economically devastating animal diseases worldwide due to trade restrictions, loss of productivity and the cost of containment efforts (Knight-Jones and Rushton, 2013).

The transmission of FMD occurs primarily through direct contact with infected animals or indirectly through contaminated fomites, feed or aerosols. Introduction of infected animals into naïve herds is reportedly one of the most common routes of outbreak initiation, especially in communal grazing or research settings where biosecurity is often compromised (Andres *et al*., 2004). The incubation period ranges from 2 to 14 days, depending on the virus strain, dose, and host susceptibility (Alexandersen and Donaldson, 2002).

The present case report documents an outbreak of foot and mouth disease in a University cattle herd in Nigeria, following contact with new stock acquired for experimental purposes. The report showcases the clinical presentation, diagnostic approach and management interventions, and highlights the critical role that biosecurity and quarantine measures play in disease prevention and control.

Case Presentation

Signalment and History: A suspected outbreak of a vesicular disease, later confirmed to be foot and mouth disease (FMD), was reported to the Large Animal Unit of the Veterinary Teaching Hospital, University of Maiduguri, Nigeria, by the herdsman in charge of the institutional cattle herd. The herd is part of the University's livestock research and teaching resources, housed within the expansive premises of the university farm. The cattle, which include a mixed group of adult Bunaji and Sokoto Gudali breeds of both sexes, were maintained under an extensive management system with supplemental feeding and routine grazing activities.

The initial concern arose when the herdsman observed unusual clinical signs in several animals, which included profuse salivation, inappetence and reluctance to move, which became markedly evident approximately 24 hours prior to notification of the veterinary team. According to the herdsman's account, the clinical signs began insidiously in a few animals and rapidly spread to several others within a short timeframe, raising suspicion of a contagious condition.

Further inquiry into the recent management practices revealed that, approximately one week prior to the onset of the clinical signs, a new group of cattle were introduced into the farm premises for experimental purposes. These animals were sourced from a different region and were immediately co-mingled with the resident university herd without undergoing any form of quarantine, screening or health certification. There was no implementation of biosecurity protocols, such as isolation, diagnostic screening or

vaccination status verification, during their introduction. This lapse in preventive biosecurity measures raised the index of suspicion for an infectious, transboundary animal disease introduced via the newly introduced animals.

Given the acute onset and rapid progression of symptoms among the previously healthy animals, coupled with the epidemiological link to recent contact with potentially infected stock, an immediate investigation was initiated by the Large Animal Medicine Unit to determine the cause and to contain the spread of the suspected outbreak.

Diagnostic Plan: Upon arrival at the scene, the veterinary team devised a stepwise diagnostic approach aimed at identifying the aetiological agent, ruling out differential diagnoses, and instituting appropriate therapeutic and containment strategies. The plan included:

1. Comprehensive Clinical Examination: Each affected animal was systematically examined to document the nature and extent of clinical lesions, evaluate systemic involvement and assess the general health status of the herd.
2. Sample Collection: Epithelium from vesicular lesions, oropharyngeal swabs and serum samples were collected under aseptic conditions from clinically affected cattle. The samples were appropriately labeled, preserved and prepared for transport to a reference veterinary diagnostic laboratory for virological and serological analysis.
3. Differential Diagnosis Consideration: The clinical team considered other vesicular diseases that mimic FMD, such as vesicular stomatitis, bovine viral diarrhea-mucosal disease (BVD-MD), bluetongue, malignant catarrhal fever (MCF) and rinderpest (though eradicated), in the formulation of differential diagnoses.
4. Epidemiological Assessment**:** A rapid appraisal of the herd's grazing routes, history of vaccination, previous exposure to similar outbreaks and movement records of introduced animals was conducted to understand the possible transmission dynamics and risk factors.

The overarching goal of this diagnostic plan was not only to confirm the presence of FMD virus (FMDV), but also to provide a basis for immediate and long-term control strategies to prevent further spread within and outside the university premises.

Clinical Findings: The physical examination revealed consistent and pathognomonic lesions in the affected animals that were highly indicative of FMD. The following signs were documented:

i. Profuse salivation and frothy drooling: Most of the animals exhibited continuous drooling of saliva, resulting in wetting of the lower jaw and forelimbs, with some showing froth around the lips and nostrils.

ii. Oral vesicles and ulcerative lesions**:** Multiple animals showed ruptured vesicular lesions and erosions on the oral mucosa, particularly the tongue, lips and gums (Figure 1). In some cases, the erosions had progressed to ulcerations covered by necrotic debris, causing evident discomfort during mastication.

Figure 1: Vesicular lesions on the tongue (arrowed) of cattle suspected of having foot and mouth disease.

iii. Erosions on the muzzle and dental pad: The muzzle area was inflamed, and the dental pad in some cattle showed ulcerative lesions suggestive of previous vesicular rupture (Figure 2 and 3).

iv. Interdigital and coronary band lesions: A number of animals had painful inter-digital erosions and vesicular lesions on the coronary band (Figure 4), resulting in reluctance to move, lameness and a characteristic shuffling gait. This was particularly notable in younger stock and lactating cows.

v. Serous ocular discharge: Bilateral ocular discharge of a clear watery consistency was observed in several animals, accompanied by blepharospasm and occasional conjunctival congestion.

vi. General anorexia and mild depression: Affected animals exhibited varying degrees of inappetence, dullness, and reduced rumination. Some were found recumbent, likely due to the pain associated with locomotion and oral ulcerations.

These clinical manifestations were consistent with the epitheliotropic and highly contagious nature of FMD virus infection. The clustering of signs, sudden onset, high morbidity, and association with un-quarantined animal introduction further supported the suspicion of an acute FMD outbreak.

Figure 2: Erosions on the dental pad (arrowed) of cattle suspected of having foot and mouth disease.

Figure 3: Erosions on the muzzle (arrowed) of cattle suspected of having foot and mouth disease.

Figure 4: Erosions in the interdigital space (arrowed) of cattle suspected of having foot and mouth disease.

Moreover, the fast-spreading nature of the illness across animals of various ages and physiological statuses highlighted the vulnerability of the herd in the absence of prior immunization and the inadequacy of instituted biosecurity measures.

Tentative Diagnosis and Differential Diagnosis

The clinical evaluation of the affected cattle, alongside the epidemiological background of the case, guided the diagnostic reasoning process towards a tentative diagnosis of foot and mouth disease (FMD). The outbreak followed the recent introduction of new stock into the University cattle herd, a factor that raised immediate concerns regarding the

possible transmission of highly contagious diseases. Clinically, the animals presented with hallmark signs suggestive of a vesicular disease, including excessive salivation, vesicle formation on the tongue and interdigital spaces, oral erosions, and lameness due to lesions on the feet. These features are pathognomonic for vesicular diseases and therefore necessitated a differential diagnostic approach.

The principal differential diagnoses considered were foot and mouth disease (FMD) and vesicular stomatitis (VS)**.** Both diseases affect cloven-hoofed animals and are characterized by similar clinical manifestations, including fever, vesicular lesions on the oral mucosa, inter-digital spaces and teats, as well as subsequent erosions and ulcerations. These similarities often complicate clinical differentiation, especially in field settings where laboratory confirmation may be delayed or unavailable.

However, several key considerations informed the prioritization of FMD as the leading tentative diagnosis. First, the epidemiological context strongly supported FMD. The disease is enzootic in many parts of Nigeria and is often precipitated by the introduction of infected or carrier animals into naïve herds. The recent addition of new cattle into the University herd without adequate quarantine measures or health screening significantly heightened the suspicion of an FMD outbreak.

Secondly, the high transmissibility and rapid spread of clinical signs among the herd were consistent with the epidemiological characteristic of FMD. FMD is notorious for its extremely high contagion potential, with transmission occurring through direct contact, aerosols, fomites and contaminated feed or water. In contrast, while vesicular stomatitis also spreads among animals, it typically exhibits a more limited and slower transmission dynamics and is less common in cattle herds within the region.

Furthermore, species susceptibility and geographical prevalence supported the presumptive diagnosis of FMD. Although vesicular stomatitis can affect cattle, horses and swine, its occurrence in Nigeria is rare and poorly documented, making it an unlikely cause under the prevailing conditions. In contrast, FMD has a well-established epidemiological footprint in the region, with periodic outbreaks reported in both commercial and rural livestock settings.

Based on these clinical, epidemiological, and ecological factors, a tentative diagnosis of foot and mouth disease (FMD) was made. This working diagnosis was essential in guiding immediate outbreak response measures, including the isolation of clinically affected animals, the restriction of animal movement and the initiation of biosecurity and preventive protocols to contain further spread within the University herd and to surrounding livestock populations.

Laboratory Diagnosis

Following the field investigation and the consistent clinical signs observed in the affected animals, laboratory diagnostic efforts were focused on the virological confirmation of foot and mouth disease (FMD) virus (FMDV) through virus isolation, which remains a classical and reliable diagnostic approach, particularly in resource-limited settings.

Epithelial tissue samples were aseptically collected from active vesicular lesions located on the tongues, dental pads, and inter-digital spaces of clinically affected cattle. In addition, oropharyngeal swabs and serum samples were obtained from selected symptomatic animals to enhance diagnostic accuracy. All samples were carefully handled and transported in refrigerated conditions using viral transport media (VTM) and sterile sample containers to maintain viral integrity prior to laboratory analysis.

The samples were submitted to the regional veterinary diagnostic laboratory for conventional virus isolation. Upon receipt, epithelial samples were subjected to homogenization in phosphate-buffered saline (PBS) containing antibiotics to inhibit bacterial and fungal growth. The homogenates were centrifuged, and the supernatants inoculated onto primary bovine thyroid (BTY) cell cultures, a cell line highly sensitive to FMDV. The cultures were maintained under standard incubation conditions and monitored daily for cytopathic effects (CPE).

After 24 to 48 hours post-inoculation, characteristic cytopathic changes indicative of FMDV infection, such as cell rounding, detachment and monolayer destruction, were observed in inoculated BTY cell cultures. These CPEs were absent in the negative control cultures. The presence of such cytopathogenicity in a highly susceptible cell line, coupled with the pathognomonic clinical signs previously observed in the field, was strongly supportive of FMDV as the causative agent.

Furthermore, a serum neutralization test (SNT) was performed using sera from the affected animals. The presence of specific neutralizing antibodies to FMDV serotypes further substantiated the presumptive diagnosis, suggesting active or recent viral exposure.

Taken together, the combination of clinical evidence, epidemiological context and successful isolation of virus exhibiting cytopathic effects in BTY cells confirmed a diagnosis of foot and mouth disease. The identification of FMDV by virus isolation reinforced the urgent need for stringent control measures, especially considering the transboundary and highly contagious nature of the disease.

Other Laboratory Findings

In order to comprehensively assess the health status of the affected herd and to rule out potential concurrent infections that could complicate the clinical picture, additional laboratory investigations were conducted alongside the virological confirmation of foot and mouth disease virus (FMDV). These included parasitological examination of fecal samples, protozoological assessment and haematological profiling using blood samples from selected cattle exhibiting clinical signs.

Evaluation of the Faecal Samples for Helminth eggs: Faecal samples were analyzed using standard floatation and sedimentation techniques to identify helminth ova. The results revealed the presence of gastrointestinal and liver fluke eggs in two of the sampled animals. Specifically, Cattle A demonstrated moderate levels of *Strongyle*-type eggs and *Dicrocoelium dendriticum* eggs, both scored as "++", indicating a moderate parasitic burden. Cattle B, on the other hand, showed the presence of *Moniezia* spp. eggs and *Fasciola* spp. eggs, likewise graded "++". These findings, while indicative of concurrent helminthiasis, were considered incidental and not directly contributory to the primary clinical condition under investigation, namely foot and mouth disease (FMD). Nonetheless, the parasitic infestations could have had a compounding effect on the general health and immune status of the animals, possibly exacerbating the clinical manifestations and slowing recovery.

Protozoological Evaluation of the Faecal and Blood Samples: Microscopic examination of faecal smears and stained blood films for haemoparasites and enteric protozoa revealed no evidence of protozoan infection in the examined animals. The absence of protozoan parasites ruled out differential diagnoses such as trypanosomosis or coccidiosis, which may occasionally mimic systemic signs of viral infections in cattle.

Haematological Analysis of Blood Samples: While a full hematological panel was attempted, the available data were inconclusive due to technical constraints during sample processing and limitations in reagent supply at the diagnostic laboratory. Consequently, no definitive conclusions could be drawn from the haemogram at the time of reporting.

Collectively, the laboratory results, particularly the virological evidence of cytopathic effects in bovine thyroid (BTY) cell cultures and the serological detection of FMDV-specific neutralizing antibodies, unequivocally supported the field diagnosis of foot and mouth disease. The incidental parasitic findings underscored the importance of concurrent disease management in outbreak settings.

Treatment and Supportive Care

In the absence of a specific anti-viral therapy for foot and mouth disease, the clinical management strategy adopted for the affected cattle was focused on symptomatic relief, prevention of secondary bacterial infections, mitigation of parasitic burden and enhancement of overall immune function to aid recovery. Treatment was tailored to address both the primary viral disease and any predisposing or co-existing conditions that could compromise the health and productivity of the animals.

Systemic anti-microbial therapy was initiated to prevent opportunistic bacterial infections, particularly in animals with extensive mucosal and interdigital lesions. Long-acting oxytetracycline (Limoxin L.A 20%®, Interchemie werken “De Adelaar” B.V) was administered intramuscularly at a dosage of 20 mg/kg body weight as a single dose. This broad-spectrum antibiotic provided coverage against a wide range of Gram-positive and Gram-negative bacteria, offering a prophylactic shield against bacterial super-infections, which are common complications of FMD due to ruptured vesicles and compromised epithelial barriers.

In view of the incidental helminthic findings, anti-parasitic therapy was also incorporated into the treatment regimen. Albendazole (Hebei Veyong Pharmaceutical Co., Ltd China) was administered orally at a dose of 10 mg/kg body weight to eliminate gastrointestinal and hepatic helminths. This anthelmintic intervention not only addressed the parasitic burden but also improved the animals' general health status and resilience to viral infection.

To support convalescence and reinforce the immune response, multivitamin supplements were administered at a dose of 5 mL per animal (Kepro VitaFlash®, Kepro B.V., Maagdenburgstraat Holland). The supplement provided essential micronutrients, including vitamins A, D and E, which play critical roles in epithelial regeneration, immune modulation and overall recovery during infectious disease episodes.

Topical care was also prioritized, particularly for lesions located in the inter-digital spaces. Antiseptic solutions were used to clean and disinfect the affected areas daily (Durvet Controlled Iodine Spray®, Durvet, USA). This hygienic intervention was essential in preventing fly infestation, abscess formation and the progression to foot rot or lameness. Animals were housed in dry, clean environments to minimize further trauma and microbial contamination of lesions.

Supportive care also involved close monitoring of affected animals for changes in appetite, mobility and hydration status. Severely affected individuals were isolated to prevent disease transmission and to provide stress-free environments conducive to healing.

Advisory and Biosecurity Recommendations

Following the clinical and laboratory evidence suggestive of a foot and mouth disease (FMD)

outbreak in the university herd shortly after the introduction of new stock, a series of critical advisory and biosecurity measures were issued to the herdsman and the university livestock management team. These recommendations were aimed at halting disease progression, preventing recurrence and strengthening the herd's overall biosecurity posture.

The herdsman was strongly advised on the immediate need for strict implementation of biosecurity protocols as a cornerstone for infectious disease control. One of the primary recommendations was the immediate segregation of all clinically affected animals from the apparently healthy members of the herd. This measure is fundamental in the containment of highly contagious transboundary animal diseases such as FMD, which spreads rapidly through direct contact, aerosols and fomites. Isolating symptomatic animals helped to reduce viral shedding into the environment and limited the exposure of susceptible animals to infectious secretions, thereby breaking the transmission cycle.

In addition, the practice of quarantining all newly introduced animals for a minimum of 14 days was emphasized. Quarantine serves as a critical window to observe for subclinical infections and incubation of diseases that may not be immediately apparent at the point of entry. During this observation period, veterinary assessment, diagnostic testing, and baseline health evaluations should be conducted before integrating new stock into the main herd. This pre-entry screening protocol is vital for early detection and exclusion of infectious diseases, including those with latent periods such as FMD.

The herdsman was further cautioned against the mixing of animals from different sources without prior veterinary inspection and clearance. This is particularly important in institutional herds where frequent animal introductions for research, teaching or breeding purposes may occur. Each consignment of animals must be treated as a potential biosecurity threat until proven otherwise. Movement records, health certificates and serological screening results should be reviewed by a qualified veterinarian before the animals are allowed to interact with the existing stock.

Moreover, the need to implement a regular and strategic deworming and vaccination programme was reiterated. Internal parasitism compromises the immune status of livestock, predisposing them to opportunistic infections and reducing the efficacy of vaccination. A well-structured deworming schedule, based on faecal egg count monitoring and seasonal parasitic load trends, should be adopted. Similarly, the university herd must adhere to a comprehensive vaccination calendar that includes core vaccines against endemic and economically significant diseases such as FMD, blackleg, haemorrhagic septicaemia, and contagious bovine pleuropneumonia, among others. The FMD vaccine, in particular, should be administered based on serotype prevalence and epidemiological trends within the region.

Lastly, the herdsman was instructed on the need for prompt reporting of any suspected disease outbreaks or abnormal animal health events**.** Timely communication with veterinary authorities allows for rapid response, initiation of confirmatory diagnosis, and implementation of containment measures. Delay in reporting not only exacerbates the spread of disease but also compromises the herd's welfare and economic viability. Awareness creation on clinical signs of FMD and other transboundary diseases, coupled with regular training of farm personnel on disease recognition and reporting protocols, was recommended as part of a broader capacity-building effort.

Collectively, these biosecurity and advisory measures were designed not only to address the immediate outbreak but to embed a

culture of proactive health management within the university herd. The successful implementation of these recommendations requires the commitment of both farm personnel and institutional leadership to uphold the principles of One Health and preventive veterinary medicine.

Discussion

The outbreak described in this case report highlights a classic presentation of foot and mouth disease (FMD) in a cattle herd, triggered by a fundamental breakdown in biosecurity protocols following the introduction of unquarantined new stock of cattle. The incident underscores not only the vulnerability of cattle herds to transboundary animal diseases but also the urgent need for strict adherence to standard health and quarantine protocols in animal husbandry and livestock research facilities.

The clinical presentation of the affected animals was highly suggestive of FMD, with hallmark signs such as profuse salivation, vesicular and ulcerative oral lesions, inter-digital and coronary band erosions, and associated lameness. These findings are consistent with descriptions in previous studies by Mahapatra *et al*. (2015) and Alexandersen *et al*. (2003), who reported that such lesions are the result of viral replication in epitheliotropic tissues, leading to vesicle formation, rupture and subsequent ulceration. The acute onset and high morbidity observed in the present outbreak, along with the rapid spread across different ages and sex categories, mirror the epidemiological dynamics earlier documented in endemic FMD settings across Sub-Saharan Africa, including Nigeria (Ehizibolo *et al*., 2014; Lazarus *et al*., 2012).

The timeline of onset of clinical signs, approximately one week after the introduction of new animals without quarantine, strengthens the hypothesis of an introduced source of infection. This aligns with the observations of Knight-Jones and Rushton (2013), who emphasized the role of uncontrolled animal movement and the lack of quarantine as major risk factors for FMD spread in countries where the disease in endemic. The failure to implement even minimal screening or vaccination verification protocols before integrating the new stock into the resident herd created an epidemiological bridge for the introduction of FMD virus (FMDV), likely from an endemic zone with asymptomatic carriers or animals incubating the infection.

Laboratory investigations were pivotal in confirming the diagnosis of FMD. Virus isolation on primary bovine thyroid (BTY) cell cultures, which exhibited characteristic cytopathic effects (CPE), provided classical virological confirmation. This approach, though relatively slow compared to molecular diagnostics like RT-PCR, remains a gold standard in many parts of the developing world where access to advanced diagnostic tools is limited (Reid *et al*., 2006). The observed CPE (monolayer destruction and cell rounding) has been well-documented in literature as pathognomonic for FMDV on BTY cells (OIE, 2021). The serological identification of FMDV-specific neutralizing antibodies through serum neutralization tests (SNT) further reinforced this diagnosis, indicating active or recent exposure to the virus.

These laboratory findings correlate well with reports on earlier Nigerian outbreaks documented by Namatovu *et al*. (2013) and Ehizibolo *et al*. (2014), where virus isolation and SNT were also employed as reliable confirmatory tools for FMD diagnosis. The incorporation of oropharyngeal swabs and serum analysis in addition to lesion epithelium sampling improved diagnostic accuracy, in line with the recommendations of the World Organization for Animal Health (OIE, 2021).

Differentiating FMD from other vesicular diseases such as vesicular stomatitis (VS), bluetongue, bovine viral diarrhea-mucosal disease (BVD-MD) and malignant catarrhal fever (MCF) was a critical step in the diagnostic process. While the overlapping clinical signs necessitated broad initial considerations, several factors helped narrow down the diagnosis. Notably, the regional rarity and slower transmission pattern of VS, as reported by Camila *et al*. (2018), made it a less likely cause. Furthermore, the absence of bloody diarrhea, mucosal hemorrhages, or lymphadenopathy ruled out BVD-MD and MCF. The rapid intra-herd spread and severe inter-digital lesions observed recorded in the present study are more characteristic of FMD than any other vesicular disease in cattle (Grubman and Baxt, 2004).

The absence of quarantine, diagnostic screening and vaccination history documentation among the newly introduced cattle represents a significant breach in standard animal introduction protocols. This oversight likely facilitated the incursion of FMD into a previously stable herd. According to OIE guidelines (2021), quarantine of new animals for at least 21 days, along with serological screening and review of vaccination records, is a critical component of disease prevention, particularly for high-risk transboundary diseases like FMD.

Studies by Mattia *et al*. (2023) in Nigeria and Chimera *et al*. (2022) in Malawi have shown that institutional and private herds that adopt strict quarantine and movement controls report fewer FMD outbreaks compared to those with lax or non-existent protocols. The findings from our report support this assertion and reinforce the need to institutionalize biosecurity measures in academic and research livestock farms.

Although parasitological examination revealed the presence of *Strongyle*, *Dicrocoelium dendriticum*, *Moniezia spp.*, and *Fasciola spp.* eggs in some animals, these were considered incidental. Nonetheless, their presence could have had immunosuppressive effects or exacerbated the clinical signs of FMD through added physiological stress, as documented by Ola-Fadunsin *et al*. (2020) and Hamid *et al*. (2023). These findings justify the inclusion of anti-parasitic therapy as a supportive measure during outbreak response, as was done in this case.

The incidental co-morbidities also highlight the complex interplay between infectious and parasitic diseases in endemic livestock populations and underscore the importance of routine deworming and comprehensive herd health programs.

The treatment protocol employed was largely symptomatic, as no specific anti-viral therapy exists for FMD. The use of long-acting oxytetracycline, albendazole, multivitamins, and antiseptic topical care was both rational and aligned with established outbreak management practices in resource-constrained settings (Radostits *et al*., 2007; Abutarbush, 2010; OIE, 2021). These measures not only prevented secondary infections but also improved the general health and immune response of affected cattle.

Topical care of foot lesions along with environmental hygiene significantly reduced the risk of foot rot and abscess formation, while vitamin supplementation likely aided epithelial repair in oral and digital lesions. Similar therapeutic interventions have been reported by Ularamu *et al*. (2020) and Gubbins *et al*. (2025) in Nigerian outbreaks and remain relevant in the absence of licensed anti-viral agents.

Although FMD is not considered zoonotic, its economic and epidemiological significance is immense. Outbreaks in university or institutional herds, like the one reported here, not only disrupt teaching and research but also risk spreading infection to neighboring communities and commercial farms. Infected

cattle may experience reduced productivity, weight loss, delayed growth in young stock and fertility issues in breeding animals (Knight-Jones and Rushton, 2013).

This outbreak presents an important case for the integration of One Health principles in livestock management at academic institutions. Veterinary oversight of animal introductions, routine health checks, structured disease surveillance and staff training on biosecurity protocols should be prioritized.

Conclusion: The investigation into the sudden outbreak of a vesicular disease in the University of Maiduguri cattle herd confirmed the occurrence of foot and mouth disease (FMD), supported by strong clinical suspicion, epidemiological context and virological laboratory evidence. The outbreak was temporally linked to the recent introduction of un-quarantined cattle from an external source, highlighting a critical lapse in biosecurity and animal health management protocols. The clinical presentation marked by characteristic oral and podal lesions, hypersalivation and lameness, aligned with the known pathognomonic features of FMD in cattle. Virus isolation from epithelial tissues using susceptible bovine thyroid cell cultures, along with the detection of FMD-specific neutralizing antibodies, provided definitive confirmation of the disease. This case highlights the profound risks associated with non-compliance to standard quarantine procedures and demonstrates how a single event of poor biosecurity can compromise an entire herd, with potential implications for surrounding livestock populations. Additionally, the incidental detection of helminth infections during laboratory investigation, though not causal, revealed underlying herd health vulnerabilities that may influence disease resilience and recovery.

Recommendations: To mitigate the risk and recurrence of foot and mouth disease (FMD) and other transboundary infections in cattle herds, a proactive, multi-faceted strategy is essential. Strict quarantine protocols should be enforced for all incoming animals, with a minimum isolation period of 14 days and comprehensive veterinary screening prior to integration into existing herds. Biosecurity must be strengthened through the development and enforcement of farm-specific protocols, including restricted animal movement, regular disinfection, verification of health certifications and effective vector control measures. Given the endemic nature of FMD in Nigeria, routine sero-surveillance and targeted vaccination programs should be implemented to monitor circulating serotypes and enhance herd immunity. Outbreak preparedness is also critical. Regular training of veterinary staff and herdsmen should focus on early detection, diagnosis and rapid response to disease outbreaks to minimize losses. Integrated herd health management practices, such as routine deworming, balanced nutrition and continual health monitoring, are necessary to improve livestock resilience. Finally, institutional policies should formalize disease prevention efforts. Animal farms must establish and enforce standard operating procedures (SOPs) for animal introduction, disease reporting, and emergency response as part of broader risk mitigation frameworks.

Conflicts of interest

The authors declare no competing interests.

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