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Case Report

Rabies in Institutional Livestock: A Case Report and Occupational Risk Assessment

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I N F O

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A B S T R A C T

This report is about rabies in a cow maintained for research purposes in the Department of Animal Reproduction, Gynecology, and Obstetrics, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, Assam, highlighting a significant occupational hazard for veterinary personnel. The cow, intended for experimental studies, developed clinical signs consistent with rabies, including behavioral changes and progressive neurological deterioration, with no history of dog bite. Laboratory confirmation was obtained through Lateral Flow Assay (LFA) and Direct Fluorescent Antibody Assay (DFA), establishing rabies virus infection. This case underscores the risk of zoonotic disease exposure even in non-traditional settings, emphasizing the importance of rigorous biosecurity measures, routine animal vaccination, and pre-exposure prophylaxis for veterinarians and advocates for comprehensive surveillance and enhanced occupational safety protocols in research environments to mitigate the risk of rabies transmission, thereby protecting both human health and animal welfare.

Keywords: Occupational Risk, Rabies, Cow, LFA, DFA, Assam

Introduction

Rabies is a deadly zoonotic disease caused by Lyssavirus, a neurotropic virus belonging to the family Rhabdoviridae. It affects the central nervous system of mammals, including humans, leading to severe neurological symptoms and ultimately death.[1] The disease is primarily transmitted through the saliva of infected animals, most commonly via bites, scratches, or contamination of open wounds and mucous membranes. Dogs are the principal reservoirs of the virus in endemic regions, although epidemiological studies suggest that many wildlife species are responsible for transmitting rabies to both human and animal populations.[2]

Among farm animals, cattle are most commonly affected. In naturally occurring cases, the incubation period is about 3 weeks but may vary from 2 weeks to several months in different species. The course of the disease may vary from 1 to 6 days. In experimental studies, the average incubation period in cattle was recorded to be 15 days. Major clinical findings included excessive salivation, behavioral changes, bellowing, aggression, hyperesthesia and/or hyperexcitability, and pharyngeal paralysis.[3]

In the paralytic form of the disease, clinical signs manifested early by cattle include knuckling of the fetlocks of hind legs, sagging and swaying of the hindquarters while walking, and flaccidity of the tail to one side. Tenesmus, with paralysis of the anus, is a characteristic finding, but it may be transient or absent. Drooling of saliva, voiceless bellowing, or high-pitched bellowing are the most constant findings. When paralysis occurs, the animal becomes recumbent and unable to rise.[3]

In furious form, the animal has an alert appearance, is hypersensitive to sounds and movement, and may react violently to them, such that it looks like an intent to attack. These attacks are often badly directed and are hampered by the incoordination of gait. Loud, hoarse bellowing and sexual excitement are common at this stage. The bulls often attempt to mount inanimate objects. These signs may be evident for 24 to 48 hours, followed by sudden collapse, paralysis, and death within a few hours. There is no consistent pattern in either the development or the range of signs. Body temperature is usually within the normal limits but may be elevated to 103°F-105°F in the early stage due to muscular activity. The appetite in affected animals also varies such that some animals do not eat or drink, although they may take food into the mouth, apparently because of an inability to swallow. Others eat normally until the terminal stages of the disease. The variation in clinical findings is so wide that any animal known to be exposed and showing signs of spinal cord or brain involvement should be considered rabid until proven otherwise. In Africa and India, most cases of rabies in farm animals are of the furious form.[3]

Domestic livestock like cattle are rarely a source of infection for humans, although chance transmission to humans may occur if the mouth of a rabid animal is manipulated during treatment or examination. The virus may be present in the saliva for periods up to 5 days before signs are evident.[3]

The disease in unvaccinated and untreated humans has almost always proved to be fatal. For this reason, rabies remains one of the zoonotic diseases of prime importance, with veterinarians being at a very high risk.

Despite being a major public health concern in India, rabies remains underreported in Assam and other northeastern states. Limited epidemiological data, lack of awareness, misdiagnosis, and inadequate surveillance systems contribute to the low number of reported cases in this region. Additionally, remote and rural areas often face challenges in accessing timely post-exposure prophylaxis (PEP), further complicating disease management.[4]

Rabies also poses a significant occupational hazard for veterinarians, animal handlers, and livestock farmers, who are at an increased risk of exposure due to their frequent contact with potentially infected animals. Epidemiological studies on occupational animal bites among veterinarians in India indicated exposure prevalence of 43.34% in Karnataka,[5] 32.5% in Gujarat and Maharashtra,[6] and 31.8% in Uttarakhand, as well as some districts of Uttar Pradesh and Punjab.[7] Without proper preventative measures such as pre-exposure prophylaxis (PrEP) and strict adherence to safety protocols, these professionals remain vulnerable to the virus.

Given the fatal nature of rabies and the risk it presents to both the general public and high-risk occupational groups, there is a pressing need to enhance disease surveillance, improve diagnostic capabilities, and promote vaccination programs in Assam and other northeastern states of India. Strengthening public awareness, ensuring accessibility to PEP, and implementing robust animal vaccination campaigns are crucial steps in reducing the burden of rabies and preventing future outbreaks.[8]

This case study details rabies in an 8-year-old cow maintained for research purposes in the College of Veterinary Science, Khanapara, Guwahati, Assam. The cow exhibited clinical signs characteristic of rabies despite the absence of a known history of dog bite or contact with suspected rabid animals. The case underscores the importance of diagnostic surveillance, vaccination programs, and biosecurity measures to prevent rabies outbreaks in livestock, especially in research facilities where animals are housed for extended periods. Considering the high endemicity and fatality, this case further highlights an unusual presentation of rabies in cattle, warranting strict surveillance and pre-exposure vaccination in livestock in order to prevent human exposure and economic loss.

Case Presentation

The aforementioned crossbred cow, kept for undergraduate teaching and demonstration purposes in the Department of Animal Reproduction, Gynecology, and Obstetrics, College of Veterinary Science, Assam Agricultural University, Khanapara, Guwahati, was reared semi-intensively, being tethered while grazing in the nearby college playground during the daytime and housed in the cattle shed at night since its birth in this facility itself. The likelihood of an unnoticed exposure to a rabid animal remains high while being tethered for grazing in the playground.

Clinical Signs

The cow initially showed signs of anorexia and was dull and unresponsive to the calls of the caretaker, with a disinclination to walk on 6th and 7th April, 2024. No clinical laboratory examination was conducted; however, based on the symptoms manifested by the animal, the condition was tentatively diagnosed to be bovine ephemeral fever, also known as three-day sickness, caused by Ephemerovirus (genus)—an arbovirus of the Rhabdoviridae family, which is quite common in this region during the season. She was administered supportive treatment accordingly for the signs of fever, nasal discharge, and shifting lameness, expecting a favorable outcome. Since ephemeral fever is a self-limiting viral disease of short duration without complications, cattle usually recover, eliciting solid immunity.

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On the evening of 8th April, 2024, the cow started exhibiting pronounced signs of restlessness, aggression, hoarse bellowing, and drooling salivation, followed by recumbency and death on the afternoon of 10th April, 2024 (Figure 1 and 2). The clinical course was rapid and progressive, from mild signs to severe neurological dysfunction and death within five days. Anamnesis confirmed that the cow was not pre-immunized against rabies and there was no history of dog-bite exposure. Looking at the clinical manifestations toward the terminal stage, in order to confirm rabies, a post-mortem brain sample was subjected to lateral flow assay (LFA) and direct fluorescent antibody assay (DFA).

Figure 1.The cow was seen with drooling salivation toward the later stage of the disease

Figure 2.Lateral recumbency at the terminal stage of the disease

Laboratory Findings

The brain sample was found positive for both the Lateral Flow Assay (Anigen Rapid Rabies Ag Test kit manufactured by BioNote, Republic of Korea, Figure 3) and the Direct Fluorescent Antibody Assay (DFA) (Figure 4), confirming that the animal died of rabies.

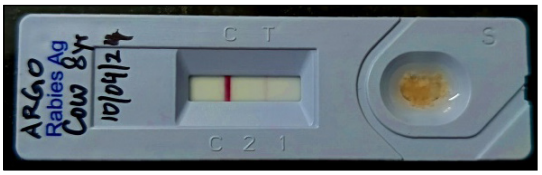

Figure 3.LFA kit showing two bands, indicating positive for rabies

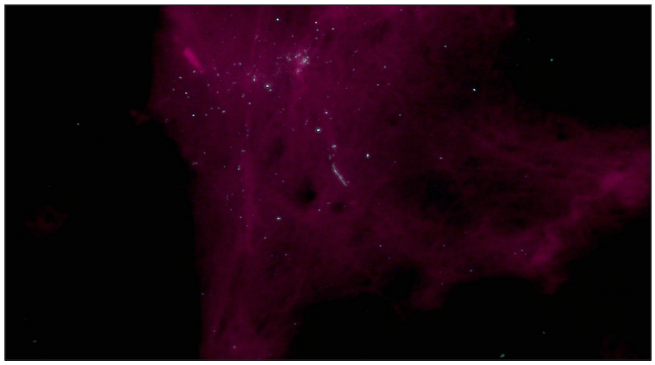

Figure 4.Apple green fluorescence indicating rabies viral inclusion bodies in the brain tissue (20,000 μm)

Public Health and Veterinary Response

Immediately following brain sample collection, the carcass was disposed of by deep burial. On laboratory confirmation of rabies, all the researchers and caretakers who were in contact with the cow were given a full course of post-exposure anti-rabies vaccination (Essen regimen), considering it to be a category II exposure. No RIG was prescribed, as there was no bite injury inflicted by the rabid animal on any of these animal handlers.

At the same time, other animals at the facility were shifted to an alternative location and kept under observation. They were administered post-exposure prophylaxis (4 doses each via intramuscular route), considering that they might as well have been exposed to a rabid animal that remained unnoticed.

Discussion

This case study highlights the significance of rabies as a major occupational hazard for veterinarians and field workers who work closely with both, domestic animals and wildlife. Moreover, clinical manifestations of bovine ephemeral fever closely resembled the initial phase of rabies, which jeopardizes the unsuspecting veterinarians and animal handlers providing care and treatment to such animals. In the absence of ante-mortem rabies diagnosis in animals, veterinarians need to be highly cautious handling such clinical presentations, especially in high rabies endemic regions. The present case identifies the significance of differential diagnosis protocols and proper biosecurity procedures driven by improper management as well as a lack of epidemiological studies to analyze the risk factors associated with rabies in this geographical location. With prior reports of rabies in livestock without dog bite history in the area,[9,10] and its proximity to the forest areas of Amchang Wildlife Sanctuary significantly increased the probability of domestic animal-wildlife interaction with resultant rabies spillover.[11]

While being tethered for grazing in the college playground, the cow had a high possibility of being bitten by a rabid

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free-roaming dog (FRD). The presence of FRDs in the area is attributable to the availability of food and space, favouring rabies transmission. This incident highlights the urgent need for dog population management and proper waste management by the municipality as well as public awareness initiatives by medical and veterinary professionals. With the college campus (26.12130 N-91.82080 E) adjoining the Amchang Wildlife Sanctuary (latitude—26.18417515814918, longitude—91.86206832457904), which is a home to various wildlife species, including the golden jackal (Canis aureus), it is not uncommon to witness FRDs in the campus chasing jackals.[12] This is a prime example of the overlap of the two epidemiological cycles of rabies, i.e., the sylvatic and urban cycles, thus facilitating the spillover of the virus between them.[13,14]

An effective strategy for rabies prevention is prioritizing the dog population management and mass vaccination of free-roaming dogs. Fitzpatrick and co-workers observed that vaccinating just 7% of the dog population annually was a highly cost-effective measure, potentially reducing human rabies deaths by 70% within five years. Furthermore, increasing the vaccination coverage to 13% of the stray dog population could prevent nearly 90% of human rabies cases.[15] Another critical approach involves conducting surveys among both the general and professional communities to gauge their understanding of rabies.[16] Based on these survey findings, extensive awareness programs should be implemented to educate local residents and field workers about rabies. This strategy is expected to play a pivotal role in eliminating human deaths caused by dog-mediated rabies by 2030.[8]

Conclusion

In conclusion, the persistent threat of rabies as an occupational hazard for veterinary professionals demands a multifaceted strategy that transcends traditional boundaries. Adopting a One Health approach is critical, as it integrates human, animal, and environmental health considerations to create a cohesive framework for disease prevention and control. Rigorous epidemiological studies are essential to map rabies incidence, understand transmission dynamics, and identify high-risk environments, which in turn can inform targeted interventions. Mass awareness programs play a key role in educating not only veterinary staff but also the broader community about the risks associated with rabies exposure and the importance of immediate, appropriate post-exposure actions. Equally important is the implementation of a comprehensive vaccination strategy that includes pre-exposure prophylaxis for at-risk professionals and FRDs that are reservoirs of rabies virus and robust pre-immunization campaigns for livestock in high endemic regions to reduce the casualty of infection leading to economic loss as well as threats to human lives. By intertwining these elements—One Health, epidemiological surveillance, public awareness, and vaccination of free-roaming dogs—the burden of rabies can greatly be reduced and enhance both occupational safety and public health outcomes. Collaborative efforts involving veterinarians, public health officials, municipalities, and policymakers are essential to prevent outbreaks and uphold the principles of One Health.

In view of the present case and high endemicity of the disease in this region, animals maintained in educational institutions for teaching and demonstration purposes should be administered a pre-exposure anti-rabies vaccine. At the same time, in order to avoid human exposure, all the animal handlers should be pre-immunized against rabies as well. Secondly, as far as possible, such institutional animals should be stall-fed, and all possible biosecurity measures should be taken to prevent entry of reservoir species to minimize the risk of such unnoticed exposure to rabid free-roaming dogs as well as wild animals.

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