

Outbreak Investigation of Rabies in Tsanni Village, Batagarawa Local Government Area, Katsina State, Nigeria: A Case Report

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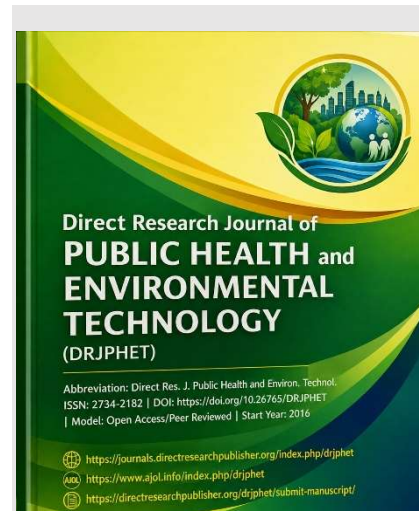
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ABSTRACT

Rabies is an acute, progressive, and almost invariably fatal viral disease of the central nervous system affecting humans and other warm-blooded animals. Although dogs are the principal source of human rabies, infection in livestock presents important veterinary, occupational, food-safety, and public-health concerns. These risks are particularly substantial in nomadic and pastoral communities, where livestock frequently interact with free-roaming dogs and access to veterinary services may be limited. This report describes a rabies outbreak involving dogs and cattle in Tsanni Village, Batagarawa Local Government Area, Katsina State, Nigeria. On 12th February 2025, a Community Animal Health Worker reported suspected rabies cases to the appropriate veterinary authority. Investigation revealed that a stray dog had entered a herd on 15th November 2024 and attacked two puppies. One puppy died on the day of the attack, while the surviving puppy developed aggression approximately 15 days later and subsequently bit its mother. The bitch later developed aggressive behavior and bit three adult cattle, one calf, and a neighboring dog. One exposed cow became aggressive and developed excessive salivation, hoarse bellowing, and abnormal posture approximately 57 days after exposure. The cow was slaughtered, and its head was partially processed for human consumption before being retrieved by the investigation team. Brain tissue from the cow's head tested positive with a rapid immunochromatographic assay, and the diagnosis was confirmed using the direct fluorescent antibody technique at the National Veterinary Research Institute. A calf and another exposed cow subsequently tested positive through saliva testing and were culled. A third exposed cow remained clinically normal, received four doses of post-exposure prophylaxis, and tested negative three months after the final dose. Ring vaccination was conducted in Tsanni and neighboring communities, during which 97 cattle were vaccinated. Community sensitization was also carried out. The outbreak highlights the consequences of inadequate vaccination, delayed reporting, traditional treatment, unsafe carcass disposal, and slaughter of suspected rabid livestock. Strengthening community-based surveillance, mass dog vaccination, laboratory diagnosis, timely post-exposure management, safe handling of suspect carcasses, and One Health coordination is essential for reducing rabies transmission in Katsina State and supporting Nigeria's goal of eliminating human deaths from dog-mediated rabies by 2030.

Keywords: Cattle; Dog bite; Katsina State; Nigeria; Outbreak investigation; Rabies



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INTRODUCTION

Rabies is a lethal zoonotic viral disease of the central nervous system that affects all warm-blooded mammals, including humans, domestic animals, and wildlife (Fooks *et al.*, 2017; WHO, 2024). Caused by the rabies virus (RABV), a neurotropic lyssavirus of the family *Rhabdoviridae*, the disease remains endemic across much of Africa and Asia, where it continues to impose substantial public-health, veterinary, and economic burdens (Hampson *et al.*, 2015; WOA, 2024). Despite being preventable through vaccination and post-exposure prophylaxis (PEP), rabies causes an estimated 59,000 human deaths annually, with more than 95% of these occurring in low- and middle-income countries (WHO, 2024; Abubakar *et al.*, 2024).

Dogs are the principal reservoir and source of human rabies infections, accounting for up to 99% of transmissions in endemic regions (WHO, 2024; Mshelbwala *et al.*, 2021). In sub-Saharan Africa, canine rabies is sustained by large populations of free-roaming and ownerless dogs, low vaccination coverage, and limited access to veterinary and public-health services (Tenzin *et al.*, 2022; Vakuru and Kwaghe, 2024). The virus is transmitted primarily through bites that introduce infectious saliva into wounds or mucous membranes, although contamination of broken skin or contact with nervous tissue from infected animals can also result in infection (CDC, 2026; Merck Veterinary Manual, 2023).

Following inoculation, RABV replicates locally in muscle or connective tissue before entering peripheral nerve endings and undergoing retrograde axonal transport to the spinal cord and brain (Fooks *et al.*, 2017; Hemachudha *et al.*, 2013). After replication in the central nervous system, the virus spreads centrifugally to peripheral tissues, including the salivary glands, enabling further transmission through saliva (WHO, 2024; StatPearls, 2025). The incubation period is highly variable, ranging from days to months, and depends on factors such as the site and severity of the bite, viral dose, host species, and distance from the exposure site to the central nervous system (Merck Veterinary Manual, 2023; Canada PHAC, 2011). In dogs, most clinical cases develop within 21–80 days after exposure, whereas in cattle, the incubation period typically ranges from 2 to 12 weeks but may extend to several months (Merck Veterinary Manual, 2023; IDOSI, 2020). Clinical rabies manifests in two principal forms: furious and paralytic. Furious rabies is characterized by restlessness, aggression, hyperexcitability, abnormal vocalization, excessive salivation, and attacks on animate and inanimate objects. Paralytic or “dumb” rabies presents with progressive weakness, paralysis, dysphagia, drooping of the jaw, and profuse salivation (Banyard *et al.*, 2013; WOA, 2024). In cattle, clinical signs may include unusual attentiveness, aggression, abnormal bellowing, altered posture, isolation from the herd, difficulty swallowing, and hypersalivation (Bano *et al.*, 2017; Ibrahim *et al.*, 2017).

Because these signs can mimic other neurological conditions such as listeriosis, lead poisoning, botulism, hypocalcemia, and tetanus, laboratory confirmation is essential for accurate diagnosis (WOA, 2024; Banyard *et al.*, 2013).

Livestock rabies is frequently under-recognized compared with canine and human rabies, yet it carries important veterinary, occupational, and food-safety implications (Hampson *et al.*, 2015; Mshelbwala *et al.*, 2021). Cattle and other herbivores may become infected when rabid dogs enter grazing areas, watering points, or livestock enclosures, and infected livestock may subsequently expose other animals and humans through bites or contact with saliva and nervous tissues (Fooks *et al.*, 2017; Merck Veterinary Manual, 2023). The risks are amplified in pastoral and nomadic communities, where extensive animal movement, close dog–livestock interactions, limited veterinary access, and low vaccination coverage facilitate transmission (Abubakar *et al.*, 2024; Tenzin *et al.*, 2022).

The economic burden of rabies is substantial. Globally, canine rabies is estimated to cost approximately 8.6 billion USD annually, with livestock losses accounting for a significant proportion of this burden, particularly in livestock-dependent economies in Africa and Asia (Hampson *et al.*, 2015; FAO, 2023). In Ethiopia, for example, household-level economic losses from livestock rabies were estimated at approximately 274 USD per affected household per year, reflecting direct mortality, precautionary culling, and opportunity costs (PMCID:12559520, 2025). In Africa, regional economic losses due to rabies have been estimated at 1.3 billion USD per year, including direct medical costs, travel expenses, lost income, and livestock losses (Tenzin *et al.*, 2022).

Nigeria remains endemic for rabies, but the true burden is uncertain due to under-reporting, incomplete surveillance, limited laboratory capacity, and poor documentation of animal cases (Mshelbwala *et al.*, 2021; Abubakar *et al.*, 2024). Previous Nigerian reports have documented rabies in cattle, calves, donkeys, and other domestic animals, including several cases in northern Nigeria (Mshelbwala *et al.*, 2013; Ibrahim *et al.*, 2017; Alhassan *et al.*, 2020). A national review identified inadequate dog vaccination, poor access to PEP, low community awareness, limited diagnostic capacity, and weak coordination between human and animal health services as major barriers to rabies elimination (Mshelbwala *et al.*, 2021; Federal Ministry of Livestock Development, 2025).

In response, Nigeria has adopted the global “Zero by 30” strategy, which aims to end human deaths from dog-mediated rabies by 2030 through mass dog vaccination, improved surveillance, access to PEP, community education, and multisectoral One Health collaboration

(WHO *et al.*, 2018; Federal Ministry of Livestock Development, 2025). Sustained vaccination coverage of approximately 70% of the dog population is generally required to interrupt transmission in endemic settings (WHO *et al.*, 2018; WOA, 2024). Recent national initiatives include large-scale dog and cat vaccination campaigns, procurement of anti-rabies vaccines, deployment of rapid-response teams to high-risk states, and validation of a rabies rapid-response (RRR) toolkit to enhance surveillance and inter-sectoral coordination (Federal Ministry of Livestock Development, 2025a, 2025b, 2025c).

Despite these efforts, progress towards elimination has been hindered by fragmented institutional coordination, insufficient financing, limited community engagement, and challenges in reaching remote pastoral communities (Abubakar *et al.*, 2024; Vakuru and Kwaghe, 2024). Recent analyses emphasize the need for a functional national coordination structure, implementation of the national strategic plan, sustained mass dog vaccination, and integration of environmental and community stakeholders into One Health frameworks (Abubakar *et al.*, 2024; Federal Ministry of Livestock Development, 2025c). This report describes a confirmed rabies outbreak involving dogs and cattle in a nomadic community in Tsanni Village, Batagarawa Local Government Area, Katsina State, Nigeria. It documents the epidemiological progression, clinical manifestations, laboratory findings, management measures, and public-health implications of the outbreak. It also highlights the importance of early reporting, proper carcass handling, dog vaccination, and One Health collaboration in rabies control.

Case Presentation

Outbreak Notification and Investigation

On 12th February, 2025, a Community Animal Health Worker informed the appropriate veterinary authority of suspected rabies cases in Tsanni Village, Batagarawa Local Government Area, Katsina State (Figure 1). An outbreak investigation team was promptly deployed to the affected community. The investigation included interviews with the herder and community members, reconstruction of the outbreak timeline, examination of affected animals, identification of exposed animals, collection of laboratory samples, and assessment of potential human and food-safety risks.

The affected herd was managed by a nomadic or pastoral household. The dogs associated with the herd had not been vaccinated against rabies. The investigation also revealed limited awareness regarding the significance of abnormal aggression, neurological disease, and dog bites. One of the affected dogs had been treated with traditional herbs rather than being reported for veterinary assessment. These factors contributed to delayed notification and prolonged contact between potentially

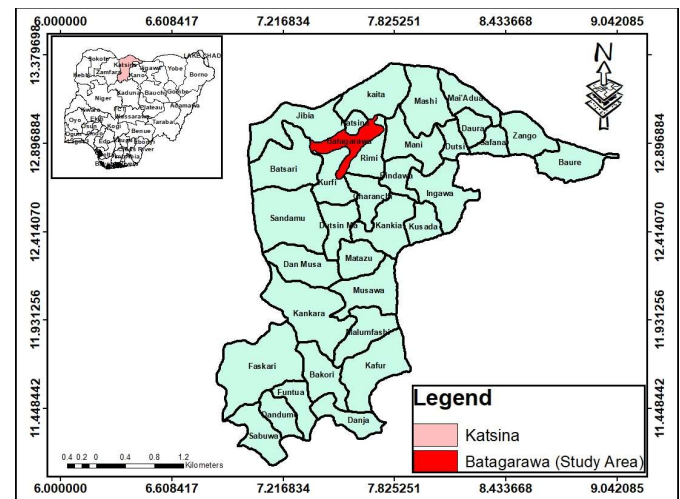


Figure 1: Map of Katsina State showing the outbreak area.

infected animals and the herd.

Epidemiological Sequence

The probable outbreak began on the 15th November, 2024, when a stray dog entered the herd and attacked two puppies. One puppy died on the same day. The second puppy survived but developed signs consistent with rabies approximately 15 days later, on 30th November, 2024. It became aggressive and attacked animate and inanimate objects. The puppy subsequently bit its mother, an adult bitch, on the face, shoulder, and leg. It was killed and buried without laboratory testing, and the incident was not formally reported to veterinary authorities.

The bitch was treated with traditional herbs. Approximately three weeks later, on 16th December, 2024, it developed aggression, biting of inanimate objects, emaciation, and pica. The bitch attacked three adult cattle, one calf, and a neighboring dog. The cattle were bitten on the head, foreleg, and flank, respectively. The calf sustained bites around the dewlap and neck, while the neighboring dog was bitten on the head and neck. The bitch was later killed and buried without submission of diagnostic samples.

One of the exposed cows developed clinical signs on 18th March, 2025. The cow became wild and aggressive and developed excessive salivation, hoarse bellowing, and abnormal posture. On 25th March, 2025, the cow was slaughtered and sold to local butchers. Its head was taken to food vendors and partially processed for human consumption.

The investigation team traced and retrieved the cow's head from the food vendors. The head was submitted to the Katsina Veterinary Reference Laboratory for testing. The event represented a substantial potential exposure risk for the owner, herders, butchers, food vendors, veterinary personnel, and other individuals who could have contacted saliva, brain tissue, spinal tissue, or

contaminated instruments. Further inquiries did not identify a known human exposure from the affected dogs or cattle, although systematic contact tracing was limited.

Laboratory Investigation

Rapid Immunochromatographic Testing

The whole head of the slaughtered cow was transported to the Katsina Veterinary Reference Laboratory. Brain tissue was removed for testing. A 10% brain-tissue suspension was prepared by weighing 1g of brain tissue and placing it in a sterile test tube containing 9mL of phosphate-buffered saline. The tissue was thoroughly homogenized using a sterile plastic stick. Three drops of the homogenized suspension were transferred into the sample buffer provided with the rapid immunochromatographic test kit and mixed gently. The test cassette was removed from its foil pouch and placed horizontally on a clean surface. Three drops of the prepared mixture were then dispensed into the sample well. The result was read after 10 minutes according to the manufacturer's instructions. For saliva testing, a sterile swab was immersed in the sample buffer and mixed thoroughly for approximately 30 seconds. Three drops of the resulting mixture were applied to the sample well, and the result was read after 10 minutes.

The brain sample produced two visible bands and was interpreted as positive for rabies antigen. The initial saliva samples collected from clinically normal exposed cattle were negative. Because rapid immunochromatographic assays may vary in sensitivity depending on the specimen type, viral load, stage of disease, and test characteristics, the positive brain result was referred for confirmatory testing.

Confirmatory Direct Fluorescent Antibody Testing

The brain sample was sent to the National Rabies Laboratory at the National Veterinary Research Institute. The presence of rabies virus antigen was confirmed using the direct fluorescent antibody technique (DFAT). The direct fluorescent antibody test is widely recognized as a reference method for post-mortem rabies diagnosis when appropriate brain tissue is available (WOAH, 2024). It is recommended by international animal-health authorities because it is rapid and highly sensitive and specific when performed correctly on suitable specimens (WOAH, 2024). On 2nd October, 2025, the calf developed abnormal behavior, aggression, excessive salivation, and hydrophobia. A saliva sample was collected using a sterile swab and tested using the rapid assay. The result was positive, and the calf was culled.

Three days later, saliva samples were collected from the remaining two exposed cows. One cow tested positive and was culled. The other cow tested negative and remained clinically normal. It received four doses of PEP under the supervision of the veterinary officer. A follow-up saliva

sample collected three months after the fourth dose tested negative. The negative saliva result in the clinically normal cow should be interpreted cautiously because viral shedding may be intermittent and a single negative result may not exclude infection. The favorable outcome was supported by continued clinical health, PEP administration, and negative follow-up testing.

Management and Control Measures

The herder initially declined the recommendation to cull all exposed animals because the government had not provided compensation. The investigation team therefore advised isolation of exposed animals, close observation, and administration of PEP under veterinary supervision. Clinically affected animals were culled after developing compatible signs or returning positive test results. The rabid cow had already been slaughtered before the investigation team arrived. Its head was retrieved from food vendors and submitted for laboratory testing. This intervention prevented further handling of the potentially infectious nervous tissue and facilitated diagnostic confirmation. However, the incident demonstrated the risk of slaughtering and marketing animals with neurological signs.

The calf and the rabies-positive cow were culled. The clinically normal cow that tested negative received four doses of human diploid cell rabies vaccine as PEP. The animal survived and remained healthy during follow-up. Decisions regarding PEP in exposed animals should be made by veterinary authorities after considering the nature of the exposure, clinical status, availability of testing, and applicable national guidelines. Ring vaccination was conducted in Tsanni Village and neighboring communities. A total of 97 cattle were vaccinated against rabies. Community sensitization accompanied the vaccination campaign. The sensitization focused on rabies recognition, dog vaccination, avoidance of suspected rabid animals, early reporting, and the need to seek veterinary or public-health assistance following a bite or contact with saliva or nervous tissue.

Community members were advised not to slaughter animals showing unexplained aggression, excessive salivation, abnormal vocalization, progressive paralysis, dysphagia, or other neurological signs. The investigation team also recommended that suspected rabid animals be reported to veterinary or public-health authorities rather than killed and buried without laboratory examination.

DISCUSSION

This report describes a probable dog-to-dog-to-cattle transmission chain in a nomadic community in Tsanni Village, Batagarawa Local Government Area, Katsina State. The outbreak began after a stray dog attacked two puppies and was followed by disease in one puppy, its dam, and exposed livestock. Rabies was confirmed in the

first affected cow through a positive rapid brain-tissue test and DFAT confirmation at the National Veterinary Research Institute. The epidemiological sequence is consistent with the recognized role of dogs as the principal reservoir and source of human rabies (WHO, 2024; Mshelbwala *et al.*, 2021). Although the index dog, the first puppy, and the bitch were not tested, the timing of the exposures, the clinical signs, and the subsequent laboratory-confirmed rabies in cattle strongly support the proposed transmission pathway.

The puppy developed aggressive behavior approximately 15 days after the attack by the stray dog. The bitch developed compatible signs approximately three weeks after being bitten by the puppy. One cow developed clinical disease approximately 57 days after being bitten by the bitch. These intervals demonstrate the variability of rabies incubation between animals and species. Previous studies have also reported considerable variation in the incubation period depending on bite location, depth, viral dose, and distance from the exposure site to the central nervous system (Spickler, 2021; Jemberu *et al.*, 2013; Tojinbara *et al.*, 2016).

The clinical signs observed in the cow and calf were compatible with furious rabies. Cow 1 showed aggression, excessive salivation, hoarse bellowing, and abnormal posture. The calf demonstrated aggression, salivation, and hydrophobia. Similar signs have been described in cattle affected by rabies (Bano *et al.*, 2017; Ibrahim *et al.*, 2017). However, clinical signs alone cannot establish a diagnosis because listeriosis, lead poisoning, botulism, cerebral parasitism, hypocalcemia, tetanus, and other neurological conditions may produce similar manifestations (Banyard *et al.*, 2013; WOA, 2024).

The use of brain tissue for confirmation was appropriate. The direct fluorescent antibody test is widely used for rabies diagnosis and is recommended by both the WHO and WOA when suitable specimens are available (WOA, 2024). In this outbreak, the rapid immunochromatographic test provided an initial positive result, while DFAT established laboratory confirmation. Where resources permit, molecular methods such as reverse-transcription polymerase chain reaction and sequencing could provide additional information about the virus and its relationship to canine rabies circulating in Katsina State.

The positive saliva results in the calf and one cow provided evidence of infection in exposed cattle. However, saliva testing has limitations. Viral shedding may be intermittent, collection may be technically challenging, and the sensitivity of the assay may vary according to disease stage. Consequently, a negative saliva result in an exposed but clinically normal animal does not necessarily exclude infection. Serial clinical monitoring, appropriate vaccination, and further testing are important in exposed animals.

The slaughter and processing of Cow represented the most serious food-safety and occupational concern.

The animal had displayed aggression, salivation, and abnormal posture before slaughter, yet its head entered the local food-processing chain. Rabies virus may be present in saliva and is concentrated in nervous tissues. Butchers, food vendors, transporters, veterinarians, and other handlers may be exposed through cuts, abrasions, or contact with mucous membranes. Human rabies has previously been reported following the handling of infected calves and other herbivores (Tariq *et al.*, 1991; Brito *et al.*, 2011).

Properly cooked meat is not regarded as the usual route of rabies transmission. However, the slaughter and preparation of an infected animal before cooking may expose people to saliva, brain tissue, and contaminated instruments. Animals with unexplained aggression, abnormal vocalization, excessive salivation, dysphagia, paralysis, or other neurological signs should therefore not be slaughtered for human consumption until they have been assessed by veterinary authorities.

The investigation did not identify a known human exposure. However, the absence of a documented exposure does not exclude the possibility of unrecognized contact. People may fail to report minor scratches, contamination of broken skin, or contact with saliva. A structured contact investigation should include the herder, household members, butchers, food vendors, transporters, slaughter workers, and veterinary personnel. Anyone with a possible exposure should be urgently referred for professional assessment and PEP.

PEP is highly effective when administered promptly before symptoms develop. It includes immediate wound washing with soap and running water, application of an appropriate antiseptic, and administration of rabies vaccine. Category III exposures may require rabies immunoglobulin or an approved alternative in addition to vaccination. Delays in seeking PEP may have fatal consequences, as demonstrated by reports of human rabies in people who did not receive appropriate prophylaxis (Audu *et al.*, 2019).

The killing and burial of the infected dogs without laboratory testing limited the investigation. It prevented confirmation of the likely source and reduced opportunities for virus characterization. Poorly buried carcasses may also remain accessible to scavenging dogs and wildlife, potentially perpetuating transmission. Suspected rabid animals should therefore be handled by trained personnel, and carcasses should be disposed of in a manner that prevents access by animals and protects people from contact with infectious tissues.

Traditional herbs were used to manage the puppy and bitch. The use of traditional medicine may reflect local cultural practices, limited access to veterinary care, financial constraints, or lack of knowledge about the fatal nature of clinical rabies. However, traditional remedies cannot replace veterinary assessment, animal vaccination, wound management, or human PEP. Delayed recourse to professional care may allow the disease to progress and

may increase the risk of transmission (Audu *et al.*, 2019; Jemberu *et al.*, 2013). The absence of dog vaccination was a major factor in the outbreak. Mass dog vaccination is the most important intervention for preventing dog-mediated human rabies. Sustained vaccination coverage of approximately 70% of the dog population is generally required to interrupt transmission in endemic settings (WHO *et al.*, 2018). Sporadic campaigns with low coverage may not adequately reduce the number of susceptible dogs. Vaccination programmes should therefore include owned dogs, free-roaming dogs, and dogs kept by hunters, herders, and pastoral households.

The vaccination of 97 cattle was an important outbreak-control measure because several cattle had been exposed. However, cattle vaccination alone cannot eliminate dog-mediated rabies. The long-term control priority must remain vaccination of dogs in Tsanni, Batagarawa, and surrounding communities. Livestock vaccination may be used as a complementary intervention during outbreaks, particularly where multiple animals have been exposed or where culling is difficult. The herder's reluctance to cull exposed animals because of the absence of compensation illustrates the socioeconomic challenges of rabies control. Livestock are valuable assets for pastoral households, and compulsory culling may result in substantial financial losses. When owners receive no support, they may hide cases, administer traditional remedies, move animals, sell them, or slaughter them for consumption. These practices increase the risk of disease spread.

Compensation schemes linked to early reporting and compliance with veterinary recommendations may improve cooperation. Other possible incentives include subsidized vaccination, free diagnostic testing, emergency veterinary support, and replacement assistance. Community leaders and pastoral associations should be involved in designing such interventions to ensure that they are acceptable and practical.

The Community Animal Health Worker played an important role in detecting and reporting the outbreak. In remote areas, community-based workers often provide the earliest link between livestock owners and veterinary authorities. They should receive training in rabies recognition, reporting procedures, safe handling, community education, and referral. A functional communication network linking community animal health workers with local veterinary offices and laboratories would improve the speed of outbreak response.

The outbreak demonstrates the need for One Health coordination. Veterinary officers are required for animal examination, vaccination, isolation, culling, and laboratory submission. Public-health officers are needed for exposure assessment and human PEP. Food-safety officials are needed to prevent infected animal products from entering markets. Local government and community leaders are needed for mobilization and sensitization. Laboratory personnel are needed for confirmation and

surveillance. Nigeria continues to face barriers to rabies elimination, including inadequate dog vaccination, limited surveillance, restricted access to PEP, insufficient laboratory resources, poor enforcement of vaccination regulations, and fragmented institutional coordination (Mshelbwala *et al.*, 2021). Recent analysis of Nigeria's elimination prospects has emphasized the need for better financing, a functional national coordination structure, implementation of the national strategic plan, and sustained mass dog vaccination (Abubakar *et al.*, 2024).

The economic burden of rabies also justifies investment in prevention. Costs arise from livestock deaths, human PEP, productivity losses, transport, diagnostic testing, surveillance, vaccination, and premature human deaths. The global economic burden of canine rabies has been estimated in billions of United States dollars, with livestock losses contributing significantly in economies that depend heavily on animals (Hampson *et al.*, 2015). Effective prevention is therefore not only a public-health priority but also an important livelihood and economic intervention.

This report has several limitations. The index dog, the first puppy, and the bitch were not tested, so the early stages of transmission remain based on epidemiological inference. The number of people involved in slaughter and processing was not documented in detail. Some dates in the field line list appear inconsistent and require verification. The rapid test kit's sensitivity, specificity, and quality-control procedures were not reported. In addition, no molecular analysis was performed. Despite these limitations, the diagnosis in the cow was confirmed by DFAT, and the outbreak provides valuable information about the risks associated with livestock rabies in pastoral communities.

Conclusion

This report documents a confirmed rabies outbreak involving dogs and cattle in a nomadic community in Tsanni Village, Batagarawa Local Government Area, Katsina State, Nigeria. The outbreak was probably initiated by a stray dog and amplified through transmission among dogs and exposed cattle. A clinically affected cow was slaughtered and its head was partially processed for human consumption before the investigation team retrieved it. Rabies was confirmed by rapid immunochromatographic testing and direct fluorescent antibody testing. A calf and another exposed cow subsequently tested positive, while a third cow remained clinically healthy following PEP and follow-up monitoring. The outbreak was facilitated by inadequate vaccination, delayed reporting, reliance on traditional treatment, killing of suspect dogs without laboratory testing, absence of compensation, and unsafe slaughter of a clinically suspect animal. These factors increase the risk of transmission to animals, herders, butchers, veterinary workers, food vendors, and community members.

Recommendations

The following measures are recommended:

1. Conduct regular and adequately funded mass vaccination of owned and free-roaming dogs in Batagarawa LGA and surrounding communities.
2. Strengthen community-based surveillance through training and support for Community Animal Health Workers.
3. Establish clear reporting pathways linking community workers, veterinary authorities, laboratories, and public-health services.
4. Prohibit slaughter and sale of animals suspected of rabies until veterinary assessment has been completed and improve rabies awareness among butchers, food vendors, livestock traders, and slaughter workers.
5. Provide protective equipment and training for personnel handling suspected rabid animals or nervous tissues.
6. Ensure reliable access to human rabies vaccine and rabies immunoglobulin or approved alternatives and coordinate veterinary, public-health, food-safety, laboratory, local-government, and community interventions through a One Health framework.

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