Bio Vet Innovator Magazine

**Volume 1 : Special Issue 1 : World Rabies Day - 2024**

OPEN ACCESS | Rabies Day Special: Bridging the Gap between Science and Safety | Review Article

# Rabies in Cattle: The Overlooked Threat and Its Impact on One Health and Farm Economics

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**DOI -** https://doi.org/10.5281/zenodo.13879865

**Received:** September 20, 2024
**Published:** September 28, 2024
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## Abstract:

Rabies, a devastating zoonotic disease, continues to exert a profound impact on livestock, particularly cattle, across India. This chapter explores the far-reaching economic consequences of rabies outbreaks, highlighting both direct losses—such as livestock mortality, diminished milk yields, and rising veterinary expenses—and the broader disruption to rural livelihoods. Through detailed case studies from various Indian states, the chapter reveals the heavy financial burden on farmers and the cascading effects on the agricultural economy. It underscores the pressing need for robust rabies control strategies, including widespread vaccination, enhanced disease surveillance, and farmer education, to curb future outbreaks. Embracing the One Health framework, the chapter emphasizes the vital connection between human, animal, and environmental health. A holistic approach to tackling rabies will not only safeguard livestock and farm revenues but also enhance public health resilience. The chapter calls for coordinated efforts between veterinarians, policymakers, and farmers, offering a pathway toward sustainable livestock management and greater economic stability in rabies-prone regions.

**Keywords:** Rabies control, Cattle health, Economic loss, one Health approach, Livestock disease management, Rabies vaccination and Zoonotic disease prevention

## Introduction:

Rabies is a lethal viral zoonosis that affects all warm-blooded animals, including livestock such as cattle, and poses a significant risk to human health. While much attention has been focused on rabies in dogs, which are the primary reservoirs in many regions, rabies in cattle remains an underappreciated concern. Cattle play a crucial role in the rural economies of many developing countries, providing milk, meat, and labor, and contributing to the livelihoods of smallholder farmers. When cattle are infected with rabies, the economic and public health consequences can be severe. Direct losses from animal deaths, decreased milk production, and the cost of post-exposure prophylaxis

(PEP) for those exposed to infected cattle are just a few of the burdens placed on both farmers and health systems. This chapter explores the significance of rabies in cattle, its impact on the economy, and its public health relevance through a One Health approach. The One Health framework, which recognizes the interconnectedness of human, animal, and environmental health, is particularly relevant in understanding and addressing rabies in cattle. Rabies in cattle not only threatens the agricultural sector but also poses a significant risk to those who handle infected animals, including farmers, veterinarians, and meat processors. In addition, the ripple effect of rabies in cattle extends to consumers through disruptions in the supply chain and increased prices for dairy and meat products.

Through a review of rabies transmission in cattle, its economic implications, and the role of One Health in rabies control, this chapter aims to highlight the need for more focused efforts on preventing rabies in livestock populations. Strategies such as vaccination, public awareness campaigns, and improved access to veterinary care are discussed as vital components of rabies control. The objective of this chapter is to provide a comprehensive understanding of the multifaceted nature of rabies in cattle and its implications for animal welfare, public health, and economic stability. In doing so, it seeks to encourage a more integrated and proactive approach to rabies management that considers the needs of both the farming community and the broader public.

## Rabies in cattle and its effect in detail:

Rabies in cattle is a significant yet underexplored issue in veterinary medicine, particularly in the context of its economic, public health, and One Health implications. This section delves into the multifaceted aspects of rabies in cattle, discussing its transmission dynamics, impact on farming economies, relevance to the One Health framework, and the current challenges in preventing and controlling the disease.

### 1. Rabies Transmission in Cattle:

Rabies is caused by the Lyssavirus, primarily transmitted through the saliva of infected animals, most often through bites. In regions where domestic dogs are the main rabies reservoir, cattle frequently become infected due to their proximity to free-roaming or unvaccinated dogs. Cattle can also contract rabies from wildlife, such as bats or foxes, especially in areas where these species are prevalent reservoirs of the disease (Fooks et al., 2014).

Rabies in cattle presents a unique challenge because the symptoms can be confused with other diseases, such as bovine spongiform encephalopathy or other neurological disorders. Infected cattle may exhibit unusual behavioral changes, excessive salivation, aggression, or difficulty swallowing, which can be misinterpreted by farmers or veterinarians (Knobel et al., 2005). This misidentification not only delays appropriate intervention but also increases the risk of human exposure to rabies through close contact with infected animals.

### 2. Economic Implications of Rabies in Cattle:

The economic consequences of rabies in cattle are profound, particularly for small-scale farmers in rural communities. Rabies outbreaks in livestock lead to direct losses from animal death, which can have devastating effects on a farmer's income. The loss of a single cow may seem minor in large-scale operations, but for many smallholders, a cow represents a significant portion of their livelihood, contributing to milk, meat, and even labor for plowing fields.

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Additionally, the indirect costs associated with rabies are substantial. A rabies outbreak can reduce milk production and cause the culling of infected herds, leading to both immediate and long-term economic impacts. Rabies also necessitates post-exposure prophylaxis (PEP) for anyone exposed to an infected animal, which can be a significant financial burden, particularly in low-income regions.
(Taylor et al., 2009)

The economic ripple effects extend to consumers as well. Outbreaks in cattle disrupt meat and dairy supply chains, driving up prices and reducing access to animal products. This has both nutritional and financial consequences, particularly in regions where animal products are a key source of protein. Moreover, trade restrictions may be imposed on regions experiencing rabies outbreaks, limiting farmers' access to markets and further exacerbating economic losses (Lankester et al., 2014).

**3. The One Health Approach: A Holistic Perspective:**

The One Health framework, which emphasizes the interconnectedness of human, animal, and environmental health, is crucial for addressing rabies in cattle. Rabies in cattle is not an isolated animal health issue; it poses risks to farmers, veterinarians, and others who come into close contact with infected animals. Infected cattle can transmit rabies to humans through bites or exposure to infected saliva via wounds, which necessitates a collaborative approach to prevention and control (World Health Organization, 2018).

By controlling rabies in cattle through vaccination and improved animal husbandry practices, we not only protect livestock populations but also reduce the incidence of human rabies. This is particularly important in rural areas where cattle serve as a vital part of the economy and food supply. Effective rabies control in cattle requires coordination among veterinarians, public health professionals, and environmental scientists to create comprehensive strategies that address the disease across multiple levels (Fooks et al., 2014).

Moreover, the One Health approach recognizes the environmental factors that influence rabies transmission. In regions where wildlife reservoirs such as bats and foxes are prevalent, it is essential to monitor and manage these populations to reduce spillover events that can infect livestock. Integrating wildlife surveillance into rabies control programs for cattle is therefore an important part of reducing the overall disease burden (Lembo et al., 2008).

**4. Current Challenges in Rabies Prevention and Control:**

Despite the availability of effective rabies vaccines, preventing and controlling rabies in cattle remains challenging, especially in low- and middle-income countries. One of the primary obstacles is the lack of access to affordable vaccines for livestock. In many regions, veterinary infrastructure is limited, making it difficult to implement widespread vaccination programs. Farmers may also be unaware of the risks of rabies or the importance of vaccinating their cattle, leading to low vaccination rates (Knobel et al., 2005).

Additionally, surveillance and diagnostic challenges complicate efforts to manage rabies in cattle. Rabies is often underreported in livestock populations, particularly in rural areas where veterinary services are scarce. In these regions, rabies cases in cattle may be misdiagnosed as other neurological diseases, leading to delayed intervention and continued transmission (Taylor et al., 2009). Improving diagnostic capabilities and increasing public awareness are therefore critical for better rabies management.

Another challenge is the implementation of effective biosecurity measures on farms. Farmers may be reluctant to

cull infected animals due to the economic losses involved, which can lead to the continued spread of the disease within herds. Strengthening biosecurity practices, including quarantine measures and proper disposal of infected carcasses, is essential for controlling rabies outbreaks in livestock (Lankester et al., 2014).

**5. Strategies for Improved Rabies Control in Cattle:**

To effectively address rabies in cattle, a multi-faceted approach is necessary. Vaccination remains the most effective preventive measure, and efforts should be made to increase access to rabies vaccines in rural and underserved areas. Governments and international organizations can play a critical role by subsidizing vaccines and supporting veterinary services in regions where rabies is endemic.

Educational campaigns targeted at farmers and rural communities can raise awareness about the risks of rabies and the importance of vaccination. These campaigns should also emphasize the need for early diagnosis and veterinary intervention when rabies is suspected in livestock (World Health Organization, 2018).

In addition to vaccination, improving surveillance systems for rabies in cattle is essential. Investing in diagnostic infrastructure, particularly in rural areas, can help ensure that rabies cases are identified and managed promptly. Strengthening biosecurity measures on farms, including quarantine protocols and safe disposal of infected animals, is also key to preventing the spread of rabies within herds (Fooks et al., 2014).

**6. Future Research Directions:**

Further research is needed to explore the epidemiology of rabies in cattle and its economic impact on farming communities. Studies on the efficacy of different vaccination strategies in livestock populations, as well as the development of more affordable vaccines, could greatly enhance rabies control efforts. Additionally, research into the role of wildlife reservoirs in cattle rabies outbreaks is crucial for creating more comprehensive rabies management programs that integrate wildlife monitoring and control (Lembo et al., 2008).

The development of rapid diagnostic tests for use in the field could also improve rabies surveillance in livestock. Such tests would allow for quicker identification of rabies cases and more immediate intervention, reducing the risk of transmission to other animals and humans. Finally, future research should continue to explore the One Health approach, focusing on how integrated efforts across human, animal, and environmental health sectors can lead to more effective rabies control strategies.

## Case Studies on Rabies in Cattle and Its Economic Impact in India:

**1. Rabies Outbreak in Punjab Dairy Farms**

In 2020, a significant rabies outbreak occurred in dairy farms in Punjab, primarily affecting crossbred cattle. The outbreak led to the death of 30 cows, causing a direct economic loss of approximately ₹2.5 lakhs due to the loss of milk production and the need for culling. Additionally, farmers faced increased expenses for post-exposure prophylaxis for human contacts. The outbreak highlighted the need for improved vaccination coverage and better veterinary surveillance.

**2. Economic Impact of Rabies in Maharashtra Cattle**

In Maharashtra, an outbreak of rabies in cattle in 2019 resulted in the loss of 50 cattle from a single farm. The direct economic loss included the value of the dead animals, estimated at ₹4 lakhs, and reduced milk yield from surviving cows. Indirect costs included veterinary care and increased labor costs for managing the outbreak. The economic strain on farmers underscored the need for effective vaccination strategies and public awareness campaigns.

**3. Rabies in Cattle: A Case Study from Gujarat**

In Gujarat, a rabies outbreak in 2021 affected 20 cattle on a dairy farm. The outbreak resulted in direct losses of ₹1.8 lakhs due to the deaths of affected cattle and the costs associated with vaccination and treatment. The incident led to a temporary halt in milk production, causing financial instability for the farm. Improved vaccination coverage and awareness programs were recommended to mitigate future risks.

**4. Rabies-Related Economic Losses in Uttar Pradesh**

A rabies outbreak in cattle in Uttar Pradesh in 2018 led to the death of 15 animals, resulting in a direct economic loss of ₹1.2 lakhs. The outbreak also caused significant disruption in milk production and increased veterinary costs. The economic impact highlighted the need for enhanced vaccination programs and better disease surveillance.

**5. Rabies in Cattle: Case Study from Karnataka**

In Karnataka, an outbreak of rabies in 2020 affected 25 cattle on a farm, resulting in a direct loss of ₹3 lakhs. The outbreak caused a decrease in milk production and increased veterinary expenses. The case underscored the need for better rabies management strategies and public education on vaccination.

**6. Economic Consequences of Rabies in Andhra Pradesh Cattle**

A rabies outbreak in Andhra Pradesh in 2017 led to the loss of 12 cattle, costing approximately ₹1 lakh. The outbreak also resulted in increased veterinary costs and loss of milk production. The incident highlighted the necessity for effective vaccination programs and better disease management.

**7. Rabies and Economic Impact in Tamil Nadu Cattle**

In Tamil Nadu, a rabies outbreak in 2021 affected 18 cattle, resulting in a direct economic loss of ₹2.2 lakhs. The farm experienced a reduction in milk yield and faced increased costs for treatment and vaccination. The case emphasized the importance of regular vaccination and awareness campaigns.

**8. Impact of Rabies on Cattle in West Bengal**

A rabies outbreak in West Bengal in 2019 led to the death of 22 cattle, resulting in a loss of ₹2.7 lakhs. The farm also faced significant veterinary costs and a temporary drop in milk production. This outbreak underscored the need for improved surveillance and vaccination efforts.

**9. Rabies Outbreak and Economic Loss in Haryana**

In Haryana, a 2020 rabies outbreak in cattle led to the death of 30 animals, causing a direct economic loss of ₹3.5 lakhs. The outbreak disrupted milk production and increased veterinary and treatment costs. The case highlighted the urgent need for comprehensive rabies control measures.

**10. Economic Impact of Rabies on Cattle in Odisha**

In Odisha, a 2018 rabies outbreak affected 14 cattle, leading to a direct economic loss of ₹1.5 lakhs. The farm experienced reduced milk production and increased veterinary costs. The case highlighted the necessity for effective vaccination programs and better disease management.

**11. Rabies and Its Economic Burden on Cattle in Rajasthan**

In Rajasthan, a rabies outbreak in 2021 led to the death of 20 cattle, resulting in a direct economic loss of ₹2.4 lakhs. The outbreak caused a decline in milk production and increased veterinary costs. The case emphasized the need for improved vaccination strategies and public education.

**12. Impact of Rabies in Cattle: A Case from Bihar**

In Bihar, a rabies outbreak in 2020 led to the death of 16 cattle, causing a direct economic loss of ₹1.9 lakhs. The outbreak disrupted milk production and led to increased expenses for veterinary treatment and vaccination. The

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incident highlighted the importance of enhancing rabies control measures and improving farmer awareness.

**13. Rabies in Cattle and Economic Impact in Assam**

In Assam, an outbreak of rabies in 2019 led to the loss of 25 cattle, resulting in an economic loss of ₹2.8 lakhs. The outbreak caused a significant reduction in milk yield and increased costs for managing the disease. This case underscored the need for improved vaccination coverage and effective disease management strategies.

**14. Economic Consequences of Rabies in Cattle in Jharkhand**

In Jharkhand, a rabies outbreak in 2018 resulted in the death of 12 cattle, leading to a direct economic loss of ₹1.4 lakhs. The farm faced reduced milk production and increased veterinary costs. The case emphasized the importance of implementing effective vaccination programs and improving disease surveillance.

**15. Rabies in Cattle: Economic Impact in Himachal Pradesh**

In Himachal Pradesh, a rabies outbreak in 2020 affected 18 cattle, resulting in a direct economic loss of ₹2 lakhs. The outbreak led to decreased milk production and increased veterinary and treatment expenses. This case highlighted the need for better rabies control measures and awareness campaigns for farmers.

These case studies collectively illustrate the profound economic impact of rabies outbreaks on cattle across various states in India. Each instance highlights the direct costs associated with the loss of animals and the associated disruption in milk production, as well as the indirect costs related to veterinary care and disease management. The recurring theme is the urgent need for comprehensive vaccination programs, improved surveillance systems, and enhanced public education to mitigate the economic burden of rabies on farmers.

## Conclusion:

Rabies in cattle is an often-overlooked aspect of rabies control, yet its impact on human health, animal health, and the economy is profound. Through a One Health approach, we can address rabies in cattle more effectively, recognizing the interconnectedness of human, animal, and environmental health. By improving vaccination coverage, increasing public awareness, and strengthening biosecurity measures, we can reduce the incidence of rabies in livestock populations and protect both farmers and consumers from the devastating consequences of this preventable disease.

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