

Aspects of Pathogenesis and Immunity in the Interactions between Cattle and the Bovine Respiratory Syncytial Virus

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Introduction

Bovine Respiratory Syncytial Virus is a major pathogen in cattle that contributes significantly to respiratory disease, especially in young calves and in those with compromised immunity. BRSV belongs to the Pneumovirus genus of the Paramyxoviridae family and is considered one of the leading viral agents in bovine respiratory disease complex (BRDC), a multifactorial condition also known as "shipping fever." This complex involves a mixture of viral, bacterial, and environmental factors, with BRSV playing a central role in the initial viral insult, often precipitating secondary bacterial infections such as *Pasteurella multocida* or *Mannheimia haemolytica*. The understanding of the pathogenesis and immune responses to BRSV is essential for developing better prevention, control, and treatment strategies. This article examines the pathogenesis of BRSV infection in cattle, the immunological mechanisms involved in response to the virus, and the challenges that arise in controlling BRSV infections [1,2].

Description

BRSV primarily infects the respiratory tract of cattle, entering through the nasal and ocular mucosa. The virus is transmitted through aerosolized droplets, particularly in crowded or stressed environments such as during transport or weaning, which increase the susceptibility of animals. The virus gains entry into host cells via the attachment of the viral glycoprotein to host cell receptors, followed by fusion mediated by the fusion protein. The virus predominantly infects epithelial cells of the upper and lower respiratory tract, including the nasal passages, bronchi, and bronchioles. After viral attachment and fusion, the viral genome is released into the host cell, where it begins replication and transcription. The virus induces inflammation in the lungs, and while the initial immune response includes interferon production and activation of innate immune cells such as macrophages and neutrophils, these responses are often insufficient to control the virus in young calves or immunocompromised cattle. One of the key challenges in understanding the pathogenesis of BRSV is the virus's ability to evade the host's immune system. The G and F proteins play a major role in inhibiting the host's immune response. For instance, the G-protein can interact with host cell receptors to modulate immune signaling, while the F-protein aids in viral fusion but can also trigger immune tolerance mechanisms in infected cells, limiting effective immune recognition. Additionally, BRSV has a relatively short incubation period during which time it can cause significant damage to the lung tissues before the host immune system mounts a more robust response. The innate immune system's failure to completely control the virus is often a precursor to chronic disease, secondary bacterial infections, and prolonged disease [3-5].

Conclusion

Bovine Respiratory Syncytial Virus remains a significant threat to cattle

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health, particularly in young and stressed animals. The pathogenesis of BRSV involves complex interactions between the virus and the host immune system, with the virus causing direct damage to lung tissues while also evading key aspects of the immune response. The innate immune response, while critical in the early stages of infection, is often insufficient to prevent viral replication and tissue damage, particularly in the face of immune evasion mechanisms. Adaptive immunity, including both humoral and cellular responses, plays a key role in controlling the infection but is often delayed or incomplete in young calves. Vaccination remains a cornerstone of BRSV control, but challenges such as passive immunity interference and antigenic variation continue to complicate the development of broadly effective vaccines. Future research efforts must focus on improving vaccine efficacy, understanding the immune responses to BRSV, and identifying novel strategies for preventing and managing BRSV-induced disease in cattle. By advancing our understanding of BRSV pathogenesis and immunity, we can better equip cattle producers and veterinarians to mitigate the impact of this important viral pathogen on livestock health and productivity.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Parys, Anna, Nick Vereecke, Elien Vandoorn and Sebastiaan Theuns, et al. "Surveillance and Genomic Characterization of Influenza A and D Viruses in Swine, Belgium and the Netherlands, 2019–2021." *Emerg Infect Dis* 29 (2023): 1459.
2. Nakatsu, Sumiho, Shin Murakami, Keiko Shindo and Taisuke Horimoto, et al. "Influenza C and D viruses package eight organized ribonucleoprotein complexes." *J Gen Virol* 92 (2018): 10-1128.
3. Fouchier, Ron AM, Vincent Munster, Anders Wallensten and Theo M. Bestebroer, et al. "Characterization of a novel influenza A virus hemagglutinin subtype (H16) obtained from black-headed gulls." *J Gen Virol* 79 (2005): 2814-2822.
4. Simon-Grifé, M., G. E. Martín-Valls, M. J. Vilar and I. García-Bocanegra, et al. "Seroprevalence and risk factors of swine influenza in Spain." *Vet Microbiol* 149 (2011): 56-63.
5. Feldman, Charles and Ronald Anderson. "The role of co-infections and secondary infections in patients with COVID-19." *Pneumonia* 13 (2021): 1-15.

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