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Experimental Studies on Pigs Infected with Japanese Encephalitis Virus Genotype 4

Hick Jing*

Department of Virology, Benha University, Benha 74078, Egypt

Introduction

Japanese Encephalitis Virus is a flavivirus primarily transmitted to humans through the bite of infected mosquitoes, particularly Culex species. It is the leading cause of viral encephalitis in Asia, with widespread occurrences in countries such as India, China, Thailand, and Vietnam. The virus exists as several genetically distinct strains, with Genotype 4 (G4) emerging as a dominant and highly pathogenic variant in recent years. While JEV primarily affects humans and horses, pigs play a central role in the transmission cycle of the virus, serving as amplifying hosts that allow mosquito vectors to feed on high viral loads. Experimental infections in pigs provide valuable insights into the mechanisms of JEV transmission, pathogenesis, immune responses, and the potential development of vaccines. This article reviews the significance of experimental studies involving JEV Genotype 4 infection in pigs, exploring the findings and their implications for human health and disease control. JEV is a mosquito-borne virus that belongs to the Flavivirus genus, and it is closely related to other important pathogens, such as West Nile Virus and Dengue Virus. The virus typically circulates in a zoonotic transmission cycle, with mosquitoes acting as vectors and pigs and birds acting as amplifying hosts. Infected pigs produce large amounts of viral particles in their blood and tissues, which can be consumed by mosquitoes, thereby maintaining the transmission cycle [1,2].

Description

JEV is classified into several genotypes based on genetic sequencing, with Genotype 4 (G4) becoming increasingly prevalent in recent outbreaks. Genotype 4 has shown particular adaptability to new ecological environments and may have enhanced transmission potential, contributing to its rise as a dominant strain in regions of Southeast Asia and China. The emergence of G4 has raised concerns regarding its capacity to cause more severe outbreaks, potentially leading to higher infection rates in humans and greater risks of encephalitis. Pigs are a key part of the epidemiological cycle of JEV. While they rarely develop the clinical signs of encephalitis themselves, they can harbor high levels of the virus, particularly in the bloodstream, for extended periods. Pigs are often asymptomatic but become crucial sources of viral amplification, especially during the period of viremia when mosquito vectors are most likely to feed on them. Because pigs can host a high viral load, they serve as reservoirs for the virus, allowing Culex mosquitoes to become infected and continue the cycle of transmission [3-5].

Conclusion

Experimental studies of pigs infected with Japanese Encephalitis Virus Genotype 4 have provided critical insights into the virus's pathogenesis, immune response, and transmission dynamics. While pigs do not typically develop clinical encephalitis, they play a central role in amplifying the virus and serving as a reservoir for mosquito vectors. Understanding the clinical progression of JEV G4 in pigs, as well as their immune responses, is essential for the development of effective control strategies, including vaccines and surveillance programs. Given the rising prevalence of Genotype 4, especially in Southeast Asia and China, these findings highlight the need for more targeted research and intervention measures to curb the spread of JEV, protect animal health, and reduce the risk to humans. Experimental studies using pigs as models will continue to be essential in the fight against JEV and in safeguarding both animal and public health in endemic regions.

Acknowledgement

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Conflict of Interest

None.

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***Address for Correspondence:** Hick Jing, Department of Virology, Benha University, Benha 74078, Egypt, E-mail: jingh@gmail.com*

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