Mini Review
Volume 08:02, 2024

Virology: Current Research

ISSN: 2736-657X

Open Access

Managing Infectious Hematopoietic Necrosis Virus (IHNV) in Salmonid Aquaculture: Strategies and Challenges

Sara D. Artta*

Department of Microbiology and Immunology, Bambino Gesù Children's Hospital, Rome, Italy

Abstract

Infectious Hematopoietic Necrosis Virus (IHNV) is a significant pathogen affecting salmonid fish species worldwide, causing devastating losses in aquaculture. This manuscript provides a comprehensive overview of IHNV, covering its virology, epidemiology, clinical manifestations, diagnosis, and control measures. Understanding the biology and impact of IHNV is crucial for the sustainable management of salmonid populations and the aquaculture industry.

Keywords: Vaccination • Salmonid aquaculture • Disease management

Introduction

Infectious Hematopoietic Necrosis Virus (IHNV) is a negative-sense single-stranded RNA virus belonging to the Rhabdoviridae family, genus Novirhabdovirus. It primarily affects salmonid fish species, including trout and salmon, leading to severe systemic disease characterized by necrosis of hematopoietic tissues. IHNV poses a significant threat to the aquaculture industry worldwide, causing substantial economic losses due to mortality and trade restrictions [1].

Literature Review

IHNV has a bullet-shaped morphology and a genome consisting of six genes that encode structural and non-structural proteins. The virus replicates primarily in the cytoplasm of infected cells, leading to cell lysis and tissue damage. IHNV is highly contagious and can spread rapidly within fish populations through various routes, including waterborne transmission and vertical transmission from infected broodstock [2]. IHNV's bullet-shaped morphology is characteristic of the Rhabdoviridae family, with a lipid envelope surrounding its nucleocapsid core. The viral genome is approximately 11 kilobases in length and contains six genes arranged in the order 3'-N-P-M-G-NV-L-5'. These genes encode various proteins essential for viral replication, assembly, and pathogenesis.

The nucleocapsid protein encapsidates the viral RNA, forming the ribonucleoprotein complex essential for transcription and replication. The phosphoprotein and large protein constitute the viral RNA polymerase complex responsible for viral RNA synthesis. The matrix protein plays a role in viral assembly and budding, while the Glycoprotein (G) facilitates viral entry into host cells by binding to cellular receptors.

IHNV primarily targets hematopoietic tissues, including the kidney and spleen, leading to necrosis and hemorrhage. Following entry into the host cell, the virus replicates in the cytoplasm, utilizing the host cell's machinery to produce viral proteins and new viral particles. This replication process often results in cell lysis and the release of infectious virions, contributing to tissue damage and systemic spread of the virus. IHNV transmission can occur through various routes, including waterborne transmission via contaminated water sources or effluent from infected aquaculture facilities. Additionally, vertical transmission from infected broodstock to offspring can perpetuate the virus within fish populations. The virus can also spread horizontally through direct contact between infected and susceptible fish, as well as through exposure to contaminated equipment or surfaces [3].

Factors such as water temperature, pH, and stressors can influence IHNV transmission dynamics and disease severity. Elevated water temperatures, for example, can enhance viral replication and shedding, increasing the likelihood of outbreaks in aquaculture settings. Stressors such as overcrowding, poor water quality and transportation can weaken the fish's immune response, making them more susceptible to IHNV infection. Understanding the molecular mechanisms of IHNV replication and pathogenesis is essential for developing effective control strategies, including vaccines and antiviral therapeutics. Research efforts focused on elucidating the virus-host interactions and immune responses elicited by IHNV infection can inform the development of novel intervention strategies to mitigate its impact on salmonid aquaculture.

Discussion

IHNV is endemic in many salmonid-producing regions worldwide, with outbreaks occurring seasonally and in response to environmental factors such as temperature and water quality. Wild and farmed salmonid populations serve as reservoirs for the virus, facilitating its persistence and dissemination. Movement of infected fish and contaminated equipment can also contribute to the spread of IHNV between aquaculture facilities and natural water bodies.

Wild salmonid populations play a significant role as reservoirs for IHNV, harboring the virus asymptomatically and serving as potential sources of infection for farmed fish. The movement of infected fish, either through natural dispersal or human-mediated activities such as stocking and trade, can facilitate the spread of IHNV between aquaculture facilities and natural water bodies. Contaminated equipment, such as nets and vessels, can also serve as vectors for viral dissemination, particularly if proper biosecurity measures are not implemented [4].

Effective management of IHNV requires a multifaceted approach that addresses both environmental factors and human activities that contribute to viral transmission [5]. Enhanced surveillance, biosecurity protocols, and vaccination programs are essential components of control strategies aimed at minimizing the impact of IHNV on salmonid aquaculture and wild fish populations. Collaboration between stakeholders, including fish farmers, regulators, and researchers, is critical for implementing sustainable management practices that mitigate the spread of IHNV and promote the long-term health and resilience of salmonid ecosystems [6].

***Address for Correspondence:** Sara D. Artta, Department of Microbiology and Immunology, Bambino Gesù Children's Hospital, Rome, Italy; E-mail: m.zyan@csic.es*

Received: 01 March, 2024, Manuscript No. vcrh-24-133072; **Editor Assigned:** 04 March, 2024, PreQC No. P-133072; **Reviewed:** 15 March, 2024, QC No. Q-133072; **Revised:** 21 March, 2024, Manuscript No. R-133072; **Published:** 28 March, 2024, DOI: 10.37421/2736-657X.2024.8.238

Conclusion

Clinical signs of IHNV infection vary depending on the fish species, age, and environmental conditions. Affected fish may exhibit lethargy, anorexia, hemorrhages and exophthalmia. Internally, necrotic lesions are often observed in the kidney, spleen, liver, and gills. Mortality rates can be high, particularly in juvenile fish and under conditions of stress or overcrowding.

Acknowledgement

None.

Conflict of Interest

None.

References

1. Morzunov, Sergey P., James R. Winton and Stuart T. Nichol. "The complete genome structure and phylogenetic relationship of infectious hematopoietic necrosis virus." *Virus Res* 38 (1995): 175-192.
2. Schutze, Heike, Egbert Mundt and Thomas C. Mettenleiter. "Complete genomic sequence of viral hemorrhagic septicemia virus, a fish rhabdovirus." Virus genes 19 (1999): 59-65.
3. Dietzgen, Ralf G., Hideki Kondo, Michael M. Goodin and Nikos Vasilakis, et al. "The family Rhabdoviridae: Mono-and bipartite negative-sense RNA viruses with diverse genome organization and common evolutionary origins." *Virus Res* 227 (2017): 158-170.
4. Gao, Jian, Shuang Peng, Xinni Shan and Guoliang Deng, et al. "Inhibition of AIM2 inflammasome-mediated pyroptosis by Andrographolide contributes to amelioration of radiation-induced lung inflammation and fibrosis." *Cell Death Dis* 10 (2019): 957.
5. Ren, Xuan, Wenzhou Xu, Jiao Sun and Biao Dong, et al. "Current trends on repurposing and pharmacological enhancement of andrographolide." *Curr Med Chem* 28 (2021): 2346-2368.
6. Kumar, Gulshan, Davinder Singh, Javeed Ahmad Tali and Divya Dheer, et al. "Andrographolide: Chemical modification and its effect on biological activities." *Bioorg Chem* 95 (2020): 103511.

How to cite this article: Artta, Sara D. "Managing Infectious Hematopoietic Necrosis Virus (IHNV) in Salmonid Aquaculture: Strategies and Challenges." *Virol Curr Res* 8 (2024): 238.