Journal of Health Sciences Institute, 9(2): 267-270, 2024
DOI: 10.51754/cusbed.1502839

Journal of Health Sciences Institute

| cusbed.cumhuriyet.edu.tr Founded: 2016 Available online, ISSN: 2587-0874 Publisher: Sivas Cumhuriyet Üniversitesi

Important Viral Diseases in Trout and Treatment Methods

Mustafa Doğan[a,*]

Aquacultur Facility, Muğla, Türkiye
**Corresponding author*

Rewiev

History

Received: 20/06/2024
Accepted: 02/08/2024

ABSTRACT

Viral diseases cause significant economic losses in aquaculture enterprises in Turkey and around the world. In this review, information is given about the symptoms, diagnosis and treatment of infectious pancreatic necrosis (IPN), infectious hematopoietic necrosis (IHN), Viral hemorrhagic septicemia (VHS) diseases in rainbow trout (Oncorhynchus mykis) in different periods.

Keywords: Disease, Treatment, Trout, Viral

[a] tamdogan02@hotmail.com *https://orcid.org/0000-0002-1882-6930*

How to Cite: Doğan M (2024) Important Viral Diseases in Trout and Treatment Methods, Journal of Health Sciences Institute, 9(2): 267-270

Introduction

This comprehensive and in-depth study focuses on the identification, spread, effects, and control methods of common viral diseases observed in trout. The foundation of the work presents a detailed examination of deadly viral diseases such as Infectious Hematopoietic Necrosis (IHN), Viral Hemorrhagic Septicemia (VHS), and Infectious Pancreatic Necrosis (IPN) that affect trout and other salmonid species. Each of these diseases has significant impacts on aquaculture and natural fish populations worldwide, presenting major challenges due to the limited nature of current treatment methods. The study addresses key issues such as the definition of diseases, affected species, genetic diversity, geographic distribution, and factors contributing to the spread of diseases.

Moreover, the study extensively investigates various factors - particularly environmental conditions, water quality, high stocking densities, and the introduction of infected fish - that influence the spread of viral diseases. These factors have direct effects on the control and management of diseases and, therefore, are crucial components of disease prevention strategies.

Another significant aspect of the study is the detailed information it provides on the diagnosis and detection methods of diseases, especially the importance of modern laboratory techniques and early diagnosis. The critical importance of early diagnosis in controlling and minimizing the spread of diseases is emphasized.

Finally, the study discusses current strategies and approaches to the treatment and prevention of viral diseases. It covers a range of prevention and control strategies from vaccination, immunization methods, to quarantine and biosecurity measures. These strategies are highlighted as critically important in reducing the effects of diseases and ensuring sustainability in aquaculture.

Common Viral Diseases Affecting Trout

Infectious hematopoietic necrosis is a viral disease that primarily affects Atlantik salmon (Salmo salar) and trout species. First identified in the 1950s, IHN has been found in various salmonid fish, including sockeye and rainbow trout. The infectious hematopoietic necrosis virus is responsible for causing clinical disease and mortality in affected fish populations. There are five principal genetic groups of IHNV that have been identified, each with differing characteristics and geographical distributions. Unfortunately, there is currently no effective treatment for fish infected with IHNV. As a result, early detection and depopulation of infected fish remain the primary methods of controlling disease outbreaks (Center for Food Security & Public Health, 2007; Munir, 2013).

Viral hemorrhagic septicemia is another deadly viral disease that impacts trout and other fish species. First identified in European freshwater trout dating back to the late 1930s, VHS is now prevalent in various fish species worldwide, including farmed rainbow trout, turbot, and Japanese flounder. The viral hemorrhagic septicemia virus is responsible for causing this fatal disease. Similar to many other viral diseases affecting fish, there is no specific treatment or cure for VHS. The virus can be transmitted through diseased fish and non-symptomatic carriers,

making it challenging to control and eradicate from fish populations. Early detection and strict biosecurity measures are essential to prevent the spread of VHS in fish farms and natural habitats (Işıdan and Bolat, 2011).

Infectious pancreatic necrosis is an infectious viral disease that affects numerous fish species worldwide, including salmonids. This disease is of great concern in aquaculture, particularly among salmonid farmers, due to the significant losses it can cause in fish populations. The infectious pancreatic necrosis virus, a double-stranded unenveloped RNA virus, causes IPN. IPNV is the most prevalent virus among salmonids, primarily affecting rainbow trout. The virus is known for its ability to survive for extended periods in various environments, making it challenging to control and eradicate. As with IHN and VHS, there is no specific treatment for IPN, and prevention strategies, such as early detection and strict biosecurity measures, are crucial for managing disease outbreaks (Dopazo, 2020; Kim et al., 2023).

Factors Contributing to The Spread of Viral Diseases in Trout

Environmental factors and water quality play a significant role in the spread of viral diseases in trout. Poor water quality can lead to a more complicated course of the disease, resulting in higher mortality rates among fish populations. Water reuse, in particular, is an important environmental factor that affects the prevalence of diseases such as Infectious Hematopoietic Necrosis, Rainbow Trout Fry Syndrome, and Viral Haemorrhagic Septicaemia. Maintaining optimal water quality is crucial for preventing and controlling viral diseases in aquaculture, as the lack of effective treatment options makes it challenging to combat these diseases once they emerge (Küçük and Yıldırım, 2017; Noble and Summerfelt, 1996).

High stocking densities contribute to the spread of viral diseases in trout by inducing stress and weakening the immune system of the fish. Numerous studies have demonstrated that increased stocking densities can lead to elevated stress levels and a heightened susceptibility to disease in juvenile rainbow trout. Stressful conditions in recirculating systems, such as poor water quality or high stocking densities, may contribute to disease outbreaks. Therefore, it is essential to manage stocking densities to minimize stress on trout populations and reduce the risk of viral diseases (Klug et al., 2021).

The introduction of infected fish and carriers into a trout population can exacerbate the spread of viral diseases. Infectious pancreatic necrosis virus, for example, is a widespread disease affecting young trout and Atlantic salmon, and can be introduced into a population through the transfer of infected fish. To control the spread of viral diseases in trout, it is vital to implement good biosecurity measures and avoid the introduction of infected fish. Some common viral diseases in aquaculture include Herpesviruses, Channel Catfish Virus Disease, Infectious Hematopoietic Necrosis, and Viral Haemorrhagic Septicaemia. Co-infection of rainbow trout with infectious hematopoietic necrosis virus and Flavobacterium psychrophilum is known to occur, further demonstrates the need for stringent biosecurity measures. While there are a number of drugs available to control rainbow trout diseases and pathogens, including antibiotics (oxytetracycline, amoxicillin, etc.) and chemical treatments to improve water quality (formaldehyde, chloramine T), prevention remains the most effective strategy. (Tamer et al., 2019; Nielsen et al., 2023).

Diagnosis and Detection of Viral Diseases in Trout

Clinical signs and symptoms of viral diseases in trout can vary, but there are some common features that can help in the identification of infected fish. In acute disease, affected fish may exhibit lethargy, sporadic whirling, or hyperactivity. Other nonspecific symptoms include darkening of the skin, exophthalmia, ascites, pale gills, hemorrhage, and a protruding vent with thick mucoid secretions. It is crucial to be aware of these clinical signs in order to diagnose and detect viral diseases in trout promptly (Kim and Leong, 1999).

Laboratory test methods are essential for the accurate diagnosis and detection of viral diseases in trout. One of these methods is the diagnosis by serological tests such as virus neutralization, immunofluorescence, immunoperoxidase and complement fixation, which are developed to detect and determine the amount of viral hemorrhagic septicemia virus in the organs of infected fish. Other diagnostic techniques (RT-PCR, ELISA) include pathological and immunological analyses, biochemical and physiological tests. These test methods are very important to confirm the presence of viral diseases and to determine the appropriate action plan for control and treatment (Pierce et al., 2013, Değirmenci and Çağırgan, 2017).

The importance of early detection and reporting of viral diseases in trout cannot be overstated. Early and accurate diagnosis is key to mitigating the impact of infectious diseases, along with efficient surveillance. Retail-sized rainbow trout experimentally found to be infected with VHSV demonstrate the importance of early detection and reporting in controlling the introduction and transmission of the pathogen. Since there are limited or no approved treatments for viral diseases in aquaculture species, prevention and control strategies such as good bio-security measures are essential in minimizing the impact of these diseases (Öztürk and Altınok, 2014).

Treatment and Prevention Strategies for Viral Diseases in Trout

Vaccination and immunization have been recognized as effective treatment methods for preventing a wide variety of bacterial and viral diseases in trout. Killed vaccines against Streptococcus spp. or/and Lactococcus spp. infections in rainbow trout or amberjack have demonstrated promising results. Furthermore, fingerling

trout can be immunized and protected against Viral Hemorrhagic Septicemia Virus using DNA immersion-vaccination (Wu et al., 2023). The development of cost-effective oral vaccination methods against viral diseases in fish is an area of ongoing research. However, it is stated that there is currently no effective treatment that provides a definitive solution for viral diseases in aquaculture species and that seasonal temperature changes cause such problems (Kırıcı et al., 2014).

Quarantine and biosecurity measures are crucial components of disease prevention and control in trout aquaculture. Implementation of biosecurity measures involves four management factors: fish, pathogens, environment, and human intervention. Some farm-level biosecurity measures include strict quarantine measures, egg disinfection, traffic control, water treatments, clean feed, and disposal of mortalities. Water sterilization and disinfection are also essential for reducing disease problems in aquaculture. To effectively diagnose and manage fish diseases, it is important to establish laboratories and quarantine facilities that can categorize diseases based on their causative agents, such as bacterial, viral, fungal, or parasitic diseases (Assefa and Abunna, 2018).

Management practices for disease prevention in trout aquaculture involve a multifaceted approach that combines several control strategies. Routine maintenance and attention to environmental conditions, such as water quality, are crucial for ensuring that these conditions meet the specific needs of the fish species being farmed. Additionally, when needed, a range of medicines and chemical treatments are available to control rainbow trout diseases and pathogens, including antibiotics. A comprehensive review of the best approaches to prevention and control of infectious diseases in aquaculture highlights the importance of implementing effective prevention and control measures to ensure the health and sustainability of global aquaculture operations (Assefa and Abunna, 2018; Durmaz and Albayrak, 2017).

Conclusion

This study provides a comprehensive review of common viral diseases in trout and offers significant information on the identification, spread, effects, and methods of combating these diseases. The diseases examined include Infectious Hematopoietic Necrosis (IHN), Viral Hemorrhagic Septicemia (VHS), and Infectious Pancreatic Necrosis (IPN), which have serious impacts on aquaculture and natural fish populations. The study thoroughly discusses various factors that influence the spread of viral diseases, diagnostic and detection methods, and strategies for treatment and prevention of these diseases.

The dissemination of viral diseases is influenced by several key factors, such as the quality of water, the density of stocked fish, and the introduction of infected individuals. These factors are of utmost importance when it comes to effectively controlling and managing diseases. The timely identification and precise detection of diseases play a crucial role in disease control and prevention. Advanced laboratory methods facilitate the swift and precise detection of diseases. It was reported that, while there are no specific treatments available for viral diseases, a variety of prevention and control strategies, including vaccination and biosecurity measures, have proven to be effective in mitigating the consequences of these diseases. Recommendations:

- In order to prevent the transmission of viral diseases, precautions should be taken for seasonal diseases, water quality should be optimized and stock densities should be meticulously managed.
- In order to prevent the spread of diseases, it is recommended to strengthen biosecurity measures, prohibit the introduction of infected fish into the farm and actively combat disease carriers.
- Encouraging vaccination practices to strengthen the immune systems of fish can be effective in implementing effective defense mechanisms against viral diseases.
- The quickly identification of diseases and establishment of rapid response mechanisms play an important role in effectively managing disease transmission and minimizing its consequences.
- In order to increase the effectiveness of combating viral diseases in aquaculture, it is very important to conduct comprehensive research on these diseases and control methods and also to train aquaculture producers on these issues.

To summarize, this review provides valuable suggestions on the problems encountered during the treatment of viral diseases in trout and possible approaches to overcome these problems. It is very important to take these suggestions into consideration in order to promote sustainable aquaculture and protect the welfare of fish populations.

References

Assefa, A., & Abunna, F. (2018). Maintenance of fish health in aquaculture: review of epidemiological approaches for prevention and control of infectious disease of fish. Veterinary medicine international, 2018(1), 5432497. DOI: 10.1155/2018/5432497

Center for Food Security & Public Health. (2007, July). Infectious Hematopoietic Necrosis (p. 1). Iowa State University. Retrieved from https://www.cfsph.iastate.edu/Factsheets/pdfs/infectious_hematopoietic_necrosis.pdf.

Değirmenci, U., & Çağırgan, H. (2017). Alabalıklarda (Oncorhynchus Mykiss, Walbaum) Viral Hemorajik Septisemi (VHS) Hastalığının Teşhisi İçin Enzyme-linked Immunosorbent Assay (ELISA) Yönteminin Geliştirilmesi.

Dopazo, C. P. (2020). The infectious pancreatic necrosis virus (IPNV) and its virulence determinants: What is known and what should be known. Pathogens, 9(2), 94. DOI: 10.3390/pathogens9020094

Durmaz, Y., & Albayrak, H. (2017). Önemli Balık Viruslarına Karşı Revers Genetik Yaklaşımlar. Erciyes Üniversitesi Veteriner Fakültesi Dergisi, 14(3), 209-218.

Işıdan, H., & Bolat, Y. (2011). A Survey of Viral Hemorrhagic Septicemia (VHS) in Turkey. Turkish Journal of Fisheries and Aquatic Sciences, 11(4).

Kırıcı, M., İspir, Ü., & Atamanalp, M. (2014). Efficacy of a Formalin-Killed Vaccine against Flavobacterium psychrophilum in Rainbow Trout (Oncorhynchus mykiss). Türk Tarım Ve Doğa Bilimleri Dergisi, 1(2), 215-218.

Kim, C. H., & Leong, J. A. (1999). Fish viruses. Encyclopedia of Virology, 558. DOI: 10.1006/rwvi.1999.0100

Kim, H. J., Olesen, N. J., Dale, O. B., Kim, Y. C., Jung, T. S., Vendramin, N., & Kwon, S. R. (2023). Pathogenicity of two lineages of

infectious hematopoietic necrosis virus (IHNV) to farmed rainbow trout (Oncorhynchus mykiss) in South Korea. Virus Research, 332, 199133. DOI: 10.1016/j.virusres.2023.199133

Klug, J. J., Treuting, P. M., Sanders, G. E., Winton, J. R., & Kurath, G. (2021). Kinetics of the stress response to stocking density and effects on mortality from infectious hematopoietic necrosis virus in rainbow trout. Journal of the American Association for Laboratory Animal Science: JAALAS, 60(6), 637. doi: 10.30802/AALAS-JAALAS-21-000003

Küçük, A., & Yıldırım, Y. (2017). Balıkların Önemli Viral Hastalıkları. Etlik Veteriner Mikrobiyoloji Dergisi, 28(1), 13-22. DOI: 10.35864/evmd.530086

Munir, M. (Ed.). (2013). Mononegaviruses of veterinary importance, volume 1: pathobiology and molecular diagnosis (Vol. 1). CABI. DOI: 10.1079/9781780641799.0000

Nielsen, S. S., Alvarez, J., Calistri, P., Canali, E., Drewe, J. A., Garin-Bastuji, B., Gonzales Rojas, J. L., Gortázar, C., Herskin, M. S., Michel, V., Miranda, M. Á., Padalino, B., Pasquali, P., Roberts, H. C., Spoolder, H., Ståhl, K., Velarde, A., Viltrop, A., Winckler, C., ... Bicout, D. J. (2023). Assessment of listing and categorisation of animal diseases within the framework of the Animal Health Law (Regulation (EU) No 2016/429): infectious pancreatic necrosis (IPN). EFSA Journal, 21(6), e08028. DOI: 10.2903/j.efsa.2023.8028.

Noble, A. C., & Summerfelt, S. T. (1996). Diseases encountered in rainbow trout cultured in recirculating systems. Annual Review of Fish Diseases, 6, 65-92. DOI: 10.1016/S0959-8030(96)90006-X

Öztürk, R. Ç., & Altınok, İ. (2014). Bacterial and viral fish diseases in Turkey. Turkish Journal of Fisheries and Aquatic Sciences, 14(1). DOI: 10.4194/1303-2712-v14_1_30

Pierce, L. R., Willey, J. C., Palsule, V. V., Yeo, J., Shepherd, B. S., Crawford, E. L., & Stepien, C. A. (2013). Accurate detection and quantification of the fish viral hemorrhagic septicemia virus (VHSV) with a two-color fluorometric real-time PCR assay. PloS one, 8(8), e71851. DOI: 10.1371/journal.pone.0071851

Tamer, C., Durmaz, Y., Palancı, H. S., Özan, E., Kadı, H., & Albayrak, H. (2019). A serological survey on ınfectious pancreatic necrosis virus (IPNV), viral hemorrhagic septicemia virus (VHSV) and ınfectious hematopoietic necrosis virus (IHVN) from rainbow trout in Turkey. Etlik Veteriner Mikrobiyoloji Dergisi, 30(2), 115-119. DOI: 10.35864/evmd.609700

Wu, D., Shao, S., Liu, Q., Wang, Q., Zhang, Y., & Liu, X. (2023). Protection of a CpG-adjuvanted DNA vaccine against infectious hematopoietic necrosis virus (IHNV) nature infection in rainbow trout (Oncorhynchus mykiss). Aquaculture, 572, 739555. DOI: 10.1016/j.aquaculture.2023.739555