Infectious Spleen and Kidney Necrosis Virus (ISKNV): A Hidden Killer in Aquaculture

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ABSTRACT

Infectious Spleen and Kidney Necrosis Virus (ISKNV) is a very infectious virus with a large host range that includes over 50 freshwater and marine fish species and causes explosive and high-level mortality in those fish. It causes immune suppression and tissue damage, mainly targeting the spleen and kidney. ISKNV also poses serious economic threats to aquaculture globally, particularly in tropical areas. It is diagnosed predominantly by PCR and immunological techniques, while treatment is not effective. Prevention is dependent upon biosecurity, sound husbandry, and prompt detection. Constant vaccine development provides a promise of potential future control, so disease management is essential for sustainable aquaculture.

INTRODUCTION

Infectious Spleen and Kidney Necrosis Virus (ISKNV), which is deemed as one of the most dangerous fish diseases, affecting particularly tropical and subtropical aquaculture. First identified in the late 1990s, ISKNV is now found on multiple countries and in a wide variety of fish — including food fish such as tilapia and seabass, as well as ornamental fish such as gourami and goldfish. The most dangerous feature of ISKNV is its

capability to induce an outbreak of mass mortality rapidly without clear warning symptoms. This virus can be disseminated rapidly across hatcheries, grow-out ponds and in closed environment aquarium systems to become a global threat to aquaculture productivity, biodiversity and trade. As the development of the aquaculture industry continues, particularly in developing countries, knowledge and control of emerging viral diseases, such as that of ISKNV, are crucial for maintaining sustainable fisheries. In this article, we will discuss the characteristics of ISKNV and related fish diseases, diagnostic methods, and the optimal ways to prevent and control the disease to ensure the quality and sustainability of fish farming.

What is ISKNV?

ISKNV is a double stranded DNA virus of the Megalocytivirus genus and the Iridoviridae family. This susceptible condition affects freshwater and marine fish species perhaps even more often during periods of stress, such as during overcrowding or suboptimal water quality. The virus infects mainly kidney and spleen, the two most important immunological organs in fish, leading to an immune-depression and tissue necrosis, followed by mortalities. Main symptoms of the disease in fish include lethargy, ascites, exophthalmia, ragged fins, body hemorrhages (Subramaniam *et al*., 2016). Virus particles are approximately 150 nm in diameter and are spherical in an icosahedral shape. It encompasses five protein molecules and one linear double-stranded DNA (dsDNA) molecule of around 111 kb in size.

Commonly Affected Fish Species

ISKNV has a wide host range, affecting freshwater and marine fish. It has been reported that more than 50 species across the globe and continues to have new hosts identified. Some of the common fish species affected include:

- Tilapia
- Asian seabass (Lates calcarifer)
- Gourami
- Freshwater angelfish
- Goldfish and other ornamental fish
- Catfish

Since these species are of economic relevance in food production and the aquarium trade, the virus poses a serious economic threat.

Economic and Environmental Impact

Infectious Spleen and Kidney Necrosis Virus, or ISKNV, has triggered immense economic losses and environmental impacts on a global scale of aquaculture. For instance, In Ghana, ISKNV outbreaks on tilapia farms caused a major 46% drop in production with annual landings dripped down to about 30,000 tons during 2018 and 2019 with great economic losses (Ayiku *et al*., 2024). On the other hand, in India, ISKNV first reported in ornamental fishes, causing heavy mortalities, financial losses (Girisha *et al*., 2021) to local retailers and small-scale traders. The virus has caused large-scale mortalities in largemouth bass and mandarin fish farming in China and threatened the feasibility of aquaculture. ISKNV infects more than 50 species of freshwater and marine fish and causes mortality rates reaching 100% in susceptible populations (Girisha *et al*., 2021). Environmentally, ISKNV outbreaks cause mass mortality, causing the disruption of aquatic ecosystems, threat to biodiversity, and facilitation of spreading through international trade in live fish and aquatic products (Vaniksampanna *et al*., 2023).

Diagnosis of ISKNV

Molecular techniques (PCR and qPCR): Conventional PCR and real-time PCR remain

standard, sensitive, and specific techniques with which to detect ISKNV DNA in fish tissues. PCR tests aimed at the major capsid protein (MCP) gene have proved very useful in diagnosing and differentiating viruses of the Megalocytivirus genus, including ISKNV. This method has been validated as a reliable tool for diagnosis and is currently recognized worldwide by the OIE (World Animal Health Organization) and other regulatory bodies.

Immunological tests (IFAT, Western blot): Western blot using antibodies against ISKNV proteins has been documented as a confirmatory method (Guo *et al*., 2011).

Histopathology: Histopathological analysis with the help of electron microscopy, or rarely immunohistochemistry, is reported to be a supportive method used for the confirmation of ISKNV infection. The identification of the usual megalocytic cell inclusions can be regarded as an important histological marker of the disease.

Preventive Measures

As there are no effective treatments currently available in aquaculture, prevention is one of the best actions. The combination of proper biosecurity and regular monitoring may reduce the outbreaks.

1. **Quarantine New Fish:** Isolate new fishes at all times for 2–3 weeks and test for viral infections prior to commingling them with healthy stocks.

2. **Providing Good Water Quality:** Bad water quality will cause stress and suppress fish immune function, making them very susceptible to infection.

3. **Maintain Healthy Broodstock:** Ensuring that broodstock are virus-free and regular screening will help to avoid the vertical transmission (parent offspring).

4. **Vaccination:** Commercial vaccines are not widely available at this point; however, studies have indicated they are in the works and some have very good test vaccines.

5. **Biosecurity Practices:** Do not interchange equipment from tanks or farms. Disinfect nets, hands, and tanks routinely.

6. **Regular Monitoring:** Regular Health screening such as PCR screening and monitoring will Assist in early identification and swift action.

CONCLUSION:

Infectious Spleen and Kidney Necrosis Virus (ISKNV) poses a major threat to both food fish and ornamental fish industries. Prevention by biosecurity, surveillance, and good management is critical since there is no treatment available. Therefore, early detection is very important to restrict the spread and losses. ongoing Research on vaccines and rapid test detection provides a ray of hope for better control. Sustainable aquaculture depends on awareness and the act of managing disease.

REFERENCES

Ayiku, A. N., Adelani, A. A., Appenteng, P., Nkansa, M., Ngoi, J. M., Morang'a, C. M., ... & Duodu, S. (2024). Molecular epidemiology and current management of Infectious Spleen and Kidney Necrosis Virus (ISKNV) infection in Ghanaian cultured tilapia. *Aquaculture*, *581*, 740330.

Girisha, S. K., Kushala, K. B., Nithin, M. S., Puneeth, T. G., Naveen Kumar, B. T., Vinay, T. N., ... & Ramesh, K. S. (2021). First report of the infectious spleen and kidney necrosis virus (ISKNV) infection in ornamental fishes

in India. *Transboundary and emerging diseases*, *68*(2), 964-972.

Guo, C. J., Chen, W. J., Yuan, L. Q., Yang, L. S., Weng, S. P., Yu, X. Q., & He, J. G. (2011). The viral ankyrin repeat protein (ORF124L) from infectious spleen and kidney necrosis virus attenuates nuclear factor-κ B activation and interacts with I κ B kinase β. *Journal of general virology*, *92*(7), 1561-1570.

Subramaniam, K., Gotesman, M., Smith, C. E., Steckler, N. K., Kelley, K. L., Groff, J. M., & Waltzek, T. B. (2016). Megalocytivirus infection in cultured Nile tilapia Oreochromis niloticus. *Diseases of Aquatic Organisms*, *119*(3), 253-258.

Vaniksampanna, A., Manajit, O., Senapin, S., Kamsamarn, S., Wangman, P., Longyant, S., & Chaivisuthangkura, P. (2023). Generation of monoclonal antibodies against heterologously expressed major capsid protein of infectious spleen and kidney necrosis virus (ISKNV). *Aquaculture*, *563*, 738895.