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Popular Article

## Unveiling the Impact of Tilapia Lake Virus (TiLV) on Tilapia Cultivation: An In-depth Analysis

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### Abstract

This article examines Tilapia Lake Virus (TiLV), a threat to tilapia aquaculture worldwide. TiLV, a single-stranded RNA virus, was discovered in 2009 and has since spread globally, causing high mortality rates and economic losses. Transmission occurs via waterborne routes and contact with infected fish. Detection methods include PCR and ELISA. TiLV outbreaks challenge food security and livelihoods, particularly in developing countries. Effective management strategies, such as biosecurity and vaccination, are crucial for mitigation. Continued research is essential for protecting tilapia farming from TiLV and other emerging diseases.

### Introduction

Tilapia cultivation is a cornerstone in the aquaculture industry, contributing significantly to global seafood production. The cultivation of tilapia has garnered attention from fish producers for several reasons. Firstly, it is recognized for its affordability, serving as an economical option for protein-rich nutrition. Additionally, tilapia is esteemed for its provision of high-quality protein and essential nutrients, making it a valuable dietary source. Furthermore, tilapia demonstrates resilience to high-density aquaculture practices, allowing for efficient production in confined spaces. Moreover, it has gained a reputation for its perceived resistance to diseases, further enhancing its appeal to fish producers (Surachetpong W et al., 2020). However, the emergence of Tilapia Lake Virus (TiLV) has presented formidable challenges to the sustainability of tilapia farming. Tilapia Lake Virus (TiLV) is a profoundly contagious pathogen with adverse repercussions for tilapia farming. Its identification in 2014 sparked significant international concern within the aquaculture community, primarily due to its link to elevated fish mortality rates and its substantial economic implications for the tilapia aquaculture sector. This article endeavors to delve into the intricacies of TiLV, encompassing its virology,



transmission dynamics, detection methodologies, and the socio-economic ramifications it imposes on tilapia culture.

### **Tilapia Lake Virus (TiLV)**

Tilapia Lake Virus (TiLV) represents a single-stranded RNA virus categorized under the Orthomyxoviridae family. Its discovery traces back to 2009 when it was initially identified in wild and farmed Nile tilapia (*Oreochromis niloticus*) inhabiting Lake Victoria in Israel. Subsequently, TiLV has proliferated across various tilapia-producing regions worldwide, including Asia, Africa, and the Americas.

### **Classification and Structure**

Tilapia Lake Virus (TiLV) belongs to the category of negative-strand RNA viruses. It is unique in its classification as the sole species within the monotypic genus Tilapinevirus, which itself constitutes the only genus within the family Amnoonviridae. Structurally, the virus manifests as an enveloped particle characterized by a helical nucleocapsid. Its genomic composition comprises ten segmented viral genomic strands, each containing open reading frames (ORF) responsible for encoding ten distinct proteins.

### **Virology and Pathogenesis**

TiLV predominantly targets tilapia species, inducing substantial morbidity and mortality rates, particularly among juvenile populations. The virus infiltrates multiple organs, including the brain, liver, spleen, kidney, and gills, instigating a spectrum of clinical manifestations such as lethargy, anorexia, erratic swimming behavior, and hemorrhages. Severe cases often culminate in alarmingly high mortality rates, reaching up to 90% in afflicted cohorts.

### **Transmission Dynamics**

TiLV dissemination encompasses diverse pathways, including waterborne transmission, contaminated equipment, infected broodstock, and cohabitation with diseased fish. Moreover, the virus demonstrates resilience in the environment, prolonging its transmission potential within aquaculture facilities and natural aquatic habitats.

### **Clinical signs and gross pathology**

Clinical manifestations and gross pathological findings associated with Tilapia Lake Virus (TiLV) infections exhibit variability based on geographical location. In Israel, farmed tilapia display symptoms such as lethargy, ocular changes, skin erosions, and darkening. Conversely, wild tilapia exhibit lethargy, skin erosions, and ocular lesions. Cases reported in Ecuador showcase exophthalmia, darkening, abdominal distension, scale protrusion, and gill pallor. Peru's cases feature ulcers and exophthalmia. In Thailand, symptoms include appetite loss, lethargy, abnormal behavior (e.g., surface swimming, cessation of schooling), pallor,



anaemia, exophthalmia, abdominal swelling, skin congestion, and erosion. Brain congestion and paleness of the gills and liver have also been documented (Jansen M. D. et al., 2018).

### **Detection Methodologies**

An array of molecular and serological techniques has been devised for TiLV detection, comprising polymerase chain reaction (PCR), real-time PCR, loop-mediated isothermal amplification (LAMP), and enzyme-linked immunosorbent assay (ELISA). These diagnostic modalities are pivotal in early detection and surveillance endeavors, essential for curtailing TiLV proliferation.

### **Socio-economic Impact on Tilapia Culture**

The advent of TiLV has precipitated profound socio-economic ramifications for tilapia aquaculture on a global scale. TiLV outbreaks engender substantial economic losses for tilapia farmers, stemming from diminished production yields, escalated mortality rates, and trade embargoes imposed on afflicted regions. Furthermore, the malady undermines food security and jeopardizes livelihoods, particularly in developing nations reliant on tilapia farming for sustenance and income generation.

### **Management and Control Strategies**

Efficient management and mitigation of TiLV necessitate a multifaceted approach, encompassing stringent biosecurity protocols, vigilant surveillance initiatives, selective breeding for genetic resistance, and the development of efficacious vaccination regimens. Implementing rigorous biosecurity measures, including equipment disinfection and water source monitoring, attenuates TiLV dissemination within and across aquaculture facilities. Concurrently, sustained research endeavors to elucidate TiLV epidemiology and host-pathogen interactions are imperative for devising targeted control strategies.

### **Conclusion**

Tilapia Lake Virus (TiLV) is a formidable adversary to the global tilapia aquaculture sector, necessitating concerted endeavors among researchers, industry stakeholders, and policymakers to mitigate its impact. Continued investment in research, surveillance, and disease management initiatives is imperative for fortifying the resilience and sustainability of tilapia farming systems in the face of emergent infectious threats like TiLV.

### **References**

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