

Viral diseases of shrimp

5. Infectious hypodermal and hematopoietic necrosis virus (IHHNV)

Introduction:

The virus was first described in blue shrimp *Litopenaeus stylirostris* and white shrimp *L. vannamei* (Formerly called *Penaeus stylirostris* and *P. vannamei*) in the Americas in the early 1980s.

Virion:

IHHN-virus is a non-enveloped, icosahedral virus with 22–23 nm in diameter and holding linear ssDNA of 4.1 kb. IHHNV is single-stranded DNA virus. Thus it is a typical densovirus classified in the Parvoviridae family.

Signs:

Although IHHNV is low virulence virus in adult shrimp. But, It causes acute epidemics and mass mortality only with juveniles and sub-adults of *L. stylirostris*. The infection of this virus retards growth of shrimp so resulted in economic losses. In *L. vannamei*, it causes reduced, irregular growth and cuticular deformities that are collectively referred to as “**runt-deformity syndrome**” (RDS). The infectious hypodermal and hematopoietic necrosis virus is very pathogenic for *Litopenaeus stylirostris* whereas infection in *Litopenaeus vannamei* is known to induce development and growth abnormalities and cause economic losses that range between 10% and 50%.



Diagnosis:

IHHNV can be identified by routine histological technique with H&E staining and in situ DNA hybridization assays with a specific IHHNV probe. A polymerase chain reaction (PCR) assay is also described in the OIE Aquatic Animal Health Manual. By TEM icosahedral virions can be seen in the cytoplasmic region of infected cells. Several clinical evaluations had shown that hemolymph is the best tissue sample for reliable diagnosis of IHHNV infection.

Epidemiology:

In *L. stylirostris* the virus can transmit by vertical and horizontal route. IHHNV vertical transmission from infected females was clearly established.

5. Taura syndrome virus (TSV)

Introduction:

Taura syndrome was first known as a new disease in the Americas in 1992 but its viral etiology was not established until 1994. It is a recent viral pathogenic agent to arrive on the Asian scene.

Virion:

It is a naked (without envelop) 32 nm icosahedral virus containing ssRNA molecule with 10.2 kb length and positive sense [80]. However, it was later allocated to the family Dicistroviridae near the genus Cripavirus (cricket paralysis virus). GC content of the viral RNA ranging from 35 to 45%. RNA constitutes about 30% of the virion weight. A small genome-linked virus protein (VPg), is covalently attached to the 5' end of the genome

Signs:

Experimental bioassays have exposed that low-grade mortalities can occur and that *P. monodon* can carry asymptomatic infections.

Diagnosis Methods:

Pathological methods (H&E staining), Monoclonal antibody based methods, in-situ hybridization, Dot-blot method (Western blot), Immunohistochemistry methods, DNA amplification method (PCR).

6. Laem singh virus (LSNV)

Introduction:

Laem Singh virus (LSNV) is a new shrimp virus from Thailand.

Virion:

This virus hasn't envelopment. Its shape is icosahedral which size is about 27 nm diameter, similar to the size of viruses in the family Luteoviridae. On the other hand, LSNV is like family Barnaviridae based on some its properties.

Diagnosis:

In situ hybridization test and RT-PCR apply to detect infected shrimp.

7. Baculovirus midgut gland necrosis virus (BMNV)

Introduction:

BMNV was acute pathogen of larval stages of *M. japonicus* in Japan in the early period of shrimp culture development but was excluded from the cultivation system after the mode of transmission from infected broodstock was established, and thorough washing of the eggs or nauplii was employed as a routine preventative measure.

Host:

Penaeus monodon

Virulence and Signs:

Probably, it cause monodon slow growth syndrome (MSGs).

Diagnosis Methods:

In-situ hybridization, RT-PCR, Electron microscopy.

8. Macrobrachium rosenbergii nodavirus (MrNV)

Macrobrachium rosenbergii is fresh water shrimp. White tail disease (WTD) caused by both *Macrobrachium rosenbergii-nodavirus* (MrNV) and extra small viruses (XSV). MrNV is a satellite virus particles are found in *Macrobrachium rosenbergii* (giant river prawn) infected with *Macrobrachium rosenbergii nodavirus* (MrNV; a virus not yet classified but clearly related to viruses in the family Nodaviridae). WTD is a major problem. It is responsible for severe mortality in postlarvae of *M. rosenbergii* in the hatcheries and nurseries. White tail disease has been observed in freshwater prawn hatcheries and nursery ponds in different parts of India, causing high mortalities and huge economic losses.

Virion:

MrNV is a small, icosahedral, non-enveloped virus. Its size is 26–27 nm in diameter. The genome of MrNV composed of two pieces of ssRNA (RNA1 and RNA2) of 2.9 and 1.26 kb, respectively, and there is a single polypeptide of 43 kDa in the capsid.

Signs:

MrNV cause white tail disease (WTD) of freshwater prawns. Diagnosis: A number of diagnostic methods have been established to identify this virus including histopathology, immunological methods, reverse transcriptase-polymerase chain reaction technique (RT-PCR) and in-situ dot blot hybridization method using nucleic acid probes. A sandwich enzyme-linked immunosorbent assay have been developed to detect MrNV in freshwater prawns. Recently, genome-based methods, dot-blot hybridization and RT-PCR have been developed to detect MrNV.

Epidemiology:

White tail disease was first described in the French West Indies, later in China, India, then in Thailand and recently in Taiwan.

9. Extra small virus (XSV):**Introduction:**

The XSV (extra small virus) is a satellite virus particles are about 15 nm in diameter and serologically unrelated to those of MrNV. XSV is a positive-sense single-stranded RNA, about 800 bases in size, encoding a 17 kDa capsid protein. The mixed infection of MrNV and XSV is implicated in white spot disease of prawns. Extra small virus (XSV) may cause disease of shrimp and may produce white tail disease (WTD). It is may responsible for mortality in post-larvae of *M. rosenbergii* in the hatcheries and nurseries. It has reported the presence of XSV in addition to MrNV in WTD-infected postlarvae of freshwater prawns in India. XSV does not cause mortality in marine shrimp as observed in adult freshwater prawn.

Virion:

XSV is a virus-like particle (A satellite virus particles), icosahedral in shape and 15 nm in diameter, with a linear ssRNA.

Diagnosis:

Various methods have been developed to detect this virus including: histopathology, immunological methods, reverse transcriptase-polymerase chain reaction technique (RT-PCR), in-situ dot blot hybridization method, sandwich enzyme-linked immunosorbent assay, genome-based methods, dot-blot hybridization and RT-PCR.