

PATHOGEN INFORMATION

1. CAUSATIVE AGENT

1.1. Pathogen type

Virus.

1.2. Disease name and synonyms

Infectious myonecrosis (IMN).

1.3. Pathogen common name and synonyms

Infectious myonecrosis virus (IMNV).

1.4. Taxonomic affiliation

1.4.1. Pathogen scientific name (Genus, species, sub-species or type)

Infectious myonecrosis virus (IMNV) – proposed.

1.4.2. Phylum, class, family, etc.

IMNV is a putative totivirus. Phylogenetic analysis based on the RdRp clustered IMNV with *Giardia lamblia virus*, a member of the family Totiviridae.

1.5. Description of the pathogen

IMNV particles are icosahedral in shape and 40 nm in diameter, with a buoyant density of 1.366 g/ml in cesium chloride. The genome consists of a single, double-stranded (dsRNA) molecule of 7560 bp. Sequencing of the viral genome reveals two non-overlapping open reading frames (ORFs). The 59 ORF (ORF 1, nt 136–4953) encoded a putative RNA-binding protein and a capsid protein. The coding region of the RNA-binding protein is located in the first half of ORF 1 and contains a dsRNA-binding motif in the first 60 aa. The second half of ORF 1 encoded a capsid protein, as determined by amino acid sequencing, with a molecular mass of 106 kDa. The 39 ORF (ORF 2, nt 5241–7451) encodes a putative RNA-dependent RNA polymerase (RdRp).

1.6. Authority (first scientific description, reference)

POULOS B.T., TANG K.F.J., PANTOJA C.R., BONAMI J.R. & LIGHTNER D.V. (2006). Purification and characterization of infectious myonecrosis virus of penaeid shrimp. *Journal of General Virology*, **87**, 987–996.

1.7. Pathogen environment (fresh, brackish, marine waters)

IMN occurs in *Penaeus vannamei* farmed in brackish and marine water.

2. MODES OF TRANSMISSION

2.1. Routes of transmission (horizontal, vertical, direct, indirect)

Horizontal, via contaminated water, *per os* (cannibalism).

Vertical transmission is considered likely, but not experimentally documented.

2.2. Life cycle

Not applicable.

2.3. Associated factors (temperature salinity, etc.)

Temperature and salinity effects considered as likely contributors to disease outbreaks, but no experimental data is available.

2.4. Additional comments

IMN disease is not the same disease as penaeid white tail disease. The later disease is a recently discovered disease with gross and histological signs that mimic IMN, but which is caused by a different type of virus (a nodavirus named *Penaeus vannamei* novavirus – PvNV).

3. HOST RANGE

3.1. Host type

Penaeid shrimp.

3.2. Host scientific names

Natural infections: *Penaeus vannamei*.

Experimental infections: *Penaeus stylirostris* and *P. monodon*.

3.3. Other known or suspected hosts

Native wild penaeids in north-eastern Brazil are anecdotally reported as hosts.

3.4. Affected life stage

Late postlarvae (PL), juveniles and adults.

3.5. Additional comments

None.

4. GEOGRAPHICAL DISTRIBUTION

4.1. Region

North-eastern Brazil and South-East Asia.

4.2. Countries

North-eastern Brazil and Java, Indonesia.

DISEASE INFORMATION

5. CLINICAL SIGNS AND CASE DESCRIPTION

5.1. Host tissues and infected organs

Reported from: striated muscles (skeletal and less often cardiac), connective tissues, hemocytes, and the lymphoid organ parenchymal cells.

5.2. Gross observations and macroscopic lesions

Affected shrimp present focal to extensive white necrotic areas in striated (skeletal) muscles, especially in the distal abdominal segments and tail fan, which can become necrotic and reddened in some individual shrimp. These signs may have a sudden onset following stresses (e.g. capture by cast-net, feeding, sudden changes in temperature or salinity). Severely affected shrimp may have been feeding just before the onset of stress and will have a full gut. Such severely affected shrimp become moribund and mortalities can be instantaneously high and continue for several days.

Exposing the paired lymphoid organs by simple dissection will show that they are hypertrophied to 3–4 times their normal size.

5.3. Microscopic lesions and tissue abnormality

Stained or unstained tissue squashes of affected skeletal muscle or of the lymphoid organ (LO) may show abnormalities.

Tissue squashes of skeletal muscle when examined with phase or reduced light microscopy may show loss of the normal striations. Fragmentation of muscle fibres may also be apparent.

Squashes of the LO may show the presence of significant accumulations of spherical masses of cells (lymphoid organ spheroids or LOS) amongst normal LO tubules.

5.4. OIE status

Listed by the OIE as 'under study'.

6. SOCIAL AND ECONOMIC SIGNIFICANCE

An estimate published in a trade magazine from the Brazilian shrimp farming industry estimated the economic impact of IMN from 2002-2004 to be \$20 million (Nunes *et al.*, 2004). More recent estimates for IMN losses in Brazil are >\$100 million.

7. ZONOTIC IMPORTANCE

None.

8. DIAGNOSTIC METHODS

Three levels of examination procedures are used: screening methods for surveillance, presumptive diagnostic methods when abnormal mortalities occur, and confirmatory methods if available when a pathogen is encountered during screening or mortality outbreaks.

8.1. Screening methods

8.1.1. Level I

Onset of gross signs as described in section 5 (above) following handling or other episodes of stress.

8.1.2. Level II

By histopathology using routine H&E stained paraffin sections (Bell and Lightner, 1988),

shrimp with acute phase IMN present myonecrosis with characteristic coagulative necrosis of striated (skeletal) muscle fibers, often with marked edema among affected muscle fibers. Some shrimp may present with a mix of acute and older lesions. In these shrimp, the affected muscle fibers appear to progress from presenting coagulative necrosis to presenting liquefactive necrosis, which is accompanied by moderate infiltration and accumulation of hemocytes. In the most advanced lesions, hemocyte inflamed muscle fibers are replaced by a loose matrix of fibrocytes and connective tissue fibers that are interspersed with hemocytes and foci of (presumed) regenerating muscle fibers.

Significant hypertrophy of the lymphoid organ (LO) due to accumulations of lymphoid organ spheroids (LOS) is a highly consistent lesion in shrimp with acute or chronic phase IMN lesions. Often many ectopic LOS are found in other tissues not near the main body of the LO. Common locations for ectopic LOS include the hemocoelom in the gills, heart, near the antennal gland tubules, and ventral nerve cord.

8.1.3. Level III

RT-PCR using the methods described in Poulos *et al.* (2006) and Poulos *et al.* ("in press").

ISH using specific cDNA probes to IMNV according to the methods described in Tang *et al.* (2005).

8.2. Presumptive methods

8.2.1. Level I

See Section 5.

8.2.2. Level II

See Section 8.1.2.

8.2.3. Level III

See Section 8.1.3.

8.3. Confirmatory methods

8.3.1. Level I

See section 5 for the available diagnostic option.

8.3.2. Level II

See section 8.1.2. for the available diagnostic option.

8.3.3. Level III

See section 8.1.3 for the available diagnostic option.

9. CONTROL METHODS

No methods are known for prevention or control of IMN in farms, compartments, regions or countries using infected stocks of *Penaeus vannamei*. The use of specific pathogen-free (SPF) stocks (Wyban *et al.*, 1992) of *P. vannamei* under biosecure culture conditions (Lee & O'Byren, 2003; Lightner, 2005) is the recommended method for prevention of IMN disease.

IMNV infected broodstock (of any penaeid species), nauplii or PLs produced from infected broodstock

should not be transported into areas known to be free of the disease.

SELECTED REFERENCES

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OIE Reference Experts and Laboratories	