Hepatopancreatic parvovirus disease

PATHOGEN INFORMATION

1. CAUSATIVE AGENT

1.1. Pathogen type

Virus.

1.2. Disease name and synonyms

Hepatopancreatic parvovirus disease.

1.3. Pathogen common name and synonyms

Hepatopanceatic parvovirus of penaeid shrimp (HPV).

1.4. Taxonomic affiliation

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

Penaeus monodon densovirus (PmDNV)-proposed.

1.4.2. Phylum, class, family, etc.

HPV is a putative parvovirus (Brevidensovirus).

1.5. Description of the pathogen

HPV particles are in average 22 nm in diameter, icosahedral, and have a buoyant density of 1.413 g/ml in cesium chloride. The genome consists of a negative single stranded DNA molecule of approximately 5 to 6Kbp. Complete sequencing of an isolate that infects *Penaeus monodon* from Thailand (Sukhumsirichart et al. 2006) has revelaed the presence of 3 large open reading frames (ORFs). The left (ORF1), mid (ORF2), and right (ORF3) ORFs on the complementary (positive) strand may code for 428, 579 and 818 aminoacids, equivalent to 50, 68 and 92 kDa, respectively. A conserved replication initiator motif, NTP-binding and helicase domain similar to NS-1 of other parvoviruses have been identified within the ORF2, hence it is likely to encode the major non-structural protein (NS-1). The ORF1 is believed to encode a putative non-structural protein-2 (NS-2) of unknown function. The ORF3 encodes a major estructural protein (VP) of approximately 92 kDa, which may be cleaved to produce a 57-kDa structural protein.

1.6. Authority (first scientific description, reference)

BONAMI J.R., MARI J., POULOS B.T., & LIGHTNER D.V. (1995). Characterization of hepatopancreatic parvo-like virus, a second unusual parvovirus pathogenic for penaeid shrimps. *Journal of General Virology*, **76**, 813-817.

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

HPV occurs in wild and cultured penaeid shrimp 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 unlikely. Eggs may be easily contaminated during spawning when coming into contact with water and fecal material from infected females.

2.2. Life cycle

Not applicable.

2.3. Associated factors (temperature salinity, etc.)

No experimental data es available.

2.4. Additional comments

None.

3. HOST RANGE

3.1. Host type

Penaeid shrimp.

3.2. Host scientific names

Natural infections: *Penaeus monodon, P. esculentus, P. merguiensis, P. japonicus, P. chinensis, P. semisulcatus, P. indicus, P. penicillatus, P. schmitti, P. vannamei, P. stylirostris*.

Experimental infections: *P. monodon.*

3.3. Other known or suspected hosts

None.

3.4. Affected life stage

Early postlarvae (PL), juveniles and adults.

3.5. Additional comments

A disease with similar histopathological lesions in the hepatopancreas has been re-

ported in the Malaysian freshwater prawn *Macrobrachium rosenbergii*.

4. GEOGRAPHICAL DISTRIBUTION

4.1. Region

Indo-Pacific, West Africa, Madagascar, the Middle East, and the Americas.

4.2. Countries

China, Korea, Taiwan, Thailand, Singapore, Malaysia, Indonesia, the Philippines, Australia, Kenya, Madagascar, Israel, Kuwait, Mexico, Honduras, El Salvador, Colombia, Ecuador, Peru, and Brazil.

DISEASE INFORMATION

5. CLINICAL SIGNS AND CASE DESCRIPTION

5.1. Host tissues and infected organs

Reported from: tubule epithelial cells of the digestive gland (hepatopancreas). Less common in anterior midgut caecum and midgut mucosal epithelium cells.

5.2. Gross observations and macroscopic lesions

External signs of the disease are not specific for HPV and, frequently, diseased shrimp tend to be infected by other pathogens that may mask/compound the actual effect of HPV infection.

HPV infection in cultured shrimp has been linked to chronic mortalities during the early larval or postlarval stages and it may result in stunted growth during the early juvenile stages. The effect of HPV infection on adult shrimp is unknown however, it may compromise their survival if the infection is severe and the shrimp is in a highly demanding metabolic state (i.e., during gonad maturation). Although suspected, no epizootics of HPV disease have been confirmed and documented.

5.3. Microscopic lesions and tissue abnormality

Stained or unstained tissue squashes of affected hepatopancreas may show abnormalities.

Tissue squashes of hepatopancreas, when examined with conventional light microscopy, may show cells with enlarged nuclei.

5.4. OIE status

Listed (under study) under Article 1.2.3. of the Aquatic Code

6. SOCIAL AND ECONOMIC SIGNIFICANCE

Data not available. However, HPV may be more important than suspected. Even though HPV may not cause severe mortalities in grow out ponds, it may contribute to slow growth and reduced production in *P. monodon* farms.

7. ZOONOTIC IMPORTANCE

None.

8. DIAGNOSTIC METHODS

Three levels of examination procedures may be 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).

8.1.2. Level II

By histopathology using routine H&E stained paraffin sections (Bell and Lightner, 1988), shrimp with an active HPV infection present a characteristic cytopathic effect in the form of an intranuclear inclusion body that develops within E- and F-cells, mostly in the distal portion of the hepatopancreatic tubules. Typically, the nucleolus of affected cells also increases in size and appears as a “cap” on the developing inclusion body.

8.1.3. Level III

PCR using the methods listed in Table 1. There is not a single PCR method capable of detecting all known geographic isolates of HPV. Specific sets of primers must be employed depending on the geographic origin of the shrimp.

ISH using specific DNA probes to HPV according to the methods described in Lightner (1996).

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.

Table 1. Published PCR methods for detection of HPV from several geographic regions.

Geograpic origin: China. Primer set designation: 7490(F)/7852(R). Size of PCR product: 350 bp. Primer sequences: 7490F:5'-TGG-AGG-TGA-GAC-AGC-AGG-3' 7852R:5'-CCA-ACT-GTC-CTT-CGC-TCT-3' Other geographic isolates detected: Thailand (732 bp). Reference: Phromjai et al. (2001).
Geographic origin: Madagascar. Primer set designation: 2F/2R. Size of PCR product: 594 bp. Primer sequences: 2F:5'-GGA-AGC-CTG-TGT-TCC-TGA-CT-3' 2R:5'-CGT-CTC-CGG-ATT-GCT-CTG-AT-3' Other geographic isolates detected: China. Reference: Pantoja and Lightner (Unpublished).
Geographic origin: Thailand. Primer set designation: H441F/H441R. Size of PCR product: 441 bp. Primer sequences: H441F:5'-GCA-TTA-CAA-GAG-CCA-AGC-AG-3' H441R:5'-ACA-CTC-AGC-CTC-TAC-CTT-GT-3' Other geographic isolates detected: India. Reference: Phromjai et al.(2002), Manjanaik et al. (2005).
Geographic origin: Australia. Primer designation: 140F/140R. Size of PCR product: 140 bp. Primer sequences: 140F:5'CTA-CTC-CAA-TGG-AAA-CTT-CTG-AGC-3' 140R:5'-GTG-GCG-TTG-GAA-GGC-ACT-TC-3' Other geographic isolates detected: None other. Reference: La Fauce et al. (2006).

9. CONTROL METHODS

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

HPV 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.

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OIE Reference Experts and Laboratories in 2007	

Other Reference Experts and Laboratories in 2007	
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