

Abalone Viral Mortality - Disease Card¹

by

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Preliminary remark. For the purposes of this disease card, abalone viral mortality encompasses crack-shell disease of *Haliotis hannai* and viral disease of *Haliotis diversicolor*, two syndromes which could be distinct diseases, pending further scientific information.

Pathogen information

1. causative agent

1.1. pathogen type

viruses

1.2. disease name and synonyms

crack-shell disease of *Haliotis hannai*, *Haliotis diversicolor* viral disease

1.3. pathogen common name and synonyms

abalone spherical viruses

1.4. taxonomic affiliation

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

no data

1.4.2. phylum, class, family etc...

no data

1.5. description of the pathogen

Virus type 1: spherical virion, 90-140 nm in diameter, two-layer envelope (8-10 nm) with a smooth surface; nucleocapsid measured 70-100 nm in diameter; replicated in cytoplasm of haemocytes and interstitial (or connective) tissues. ^(4,5,7)

Virus type 2: spherical virion, 100 nm in diameter, enveloped, hexagonal nucleocapsid (or icosahedral shape), replicated in cytoplasm of the epithelial cells of liver (hepatopancreas), kidney and intestines, and usually present in endoplasmic reticulum; DNA virus. ^(1,3,6)

Virus type 3: spherical virion, 135-150 nm, enveloped, with spikes on the surface, icosahedral nucleocapsid with a size of 100-110 nm in diameter; assembled in double-layered vesicles of the cytoplasm of infected liver and intestines cells (both epithelial cells and connective cells); speculated as nuclear replicated virus. ⁽⁹⁾

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Virus type 4: spherical virion, 90-110 nm, enveloped with a smooth surface, icosahedral nucleocapsid; assembled in double-layered vesicles of the cytoplasm of infected liver and intestines cells (both epithelial cells and connective cells); speculated as nuclear replicated virus. ⁽⁹⁾

Additional information:

- The samples of virus type 2, 3 and 4 are from the same region, Dongshan Fujian province, China.
- *Vibrio alginolyticus* and *V. parahaemolyticus*) may co-infect abalone which has been infected with virus and could be co-factors for *H. diversicolor* diseases. ^(9,10)

1.6. authority (first scientific description, reference)

virus type 1: Wang B., Li X., Gou C. Infection of spherical viruses from *Haliotis discus hannai* Ino. *Virologica Sinica*, 1997, 12(4): 360-363

virus type 2: Huang Y., Wu W., Yan J., Zhou W. Investigation on an exterminate disease of *Haliotis diversicolor aquatilis*, *Fujian Veterinary and Zootechnics*, 1999, 21(3): 4-5

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

Marine water

2. modes of transmission

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

virus type 1: horizontal, per os or oral transmission

virus type 2 (3 and 4): horizontal,

2.2. life cycle

no data

2.3. associated factors (temperature salinity, etc...)

virus type 1: low temperature (less than 20 °C)

virus type 2 (3 and 4): low temperature (less than 24 °C), usually in winter (from October to November) and summer (from April to May)

2.4. additional comments

Virus type 1-like particles were found present in other mollusc species such as turban shell (*Turbo* sp), mussel (*Mytilus edulis*) and tegula (*Tegula* [*Chlorostoma*] *rusticum*).

3. host range

3.1. host type

abalone

3.2. host scientific names

virus type 1: *Haliotis hannai* Ino

virus type 2 (3 and 4): *Haliotis diversicolor* Reeve

3.3. other known or suspected hosts

virus type 1: *Turbo* sp., *Tegula rusticum*, *Mytilus edulis*

virus type 2: unknown

3.4. affected life stage

virus type 1: young abalone. However, viral particles are also found in adult healthy abalone.

virus type 2: all developmental stages of abalone.

3.5. additional comments

Different names are used for the host species, such as *Haliotis diversicolor*, *Haliotis diversicolor aquatilis*, *Haliotis diversicolor supertexta* and *Haliotis diversicolor diversicolor*. It is suggested that these different names should be unified to be *Haliotis diversicolor* Reeve.

4. geographic distribution

4.1. region

virus type 1: North and Northeast of China (Dalian, Liaoning province along Bohai coast line)

virus type 2: South of China (Fujian, Hainan and Guangdong province in the southern sea of China)

4.2. country

China

4.3. additional comments

In Bohai and Huanghai coast line of China, the cultured abalone specie is *Haliotis hannai* Ino, while in southern sea coast line, the cultured abalone specie is *Haliotis diversicolor* Reeve

Disease information

1. clinical signs and case description

1.1. host tissues and infected organs

type 1: viral particles present in cytoplasm of haemocytes and interstitial (or connective) tissues.

type 2 (3 and 4): viral particles usually present in cytoplasm of epithelial and connective cells of liver and intestines. Apparently, viral particles may also be found in infected cell nuclei.

1.2. gross observations and macroscopic lesions

type 1 (associated with virus type 1): low activity, lost appetite, unsusceptible to light, thin shell, edge turndown, decreased growth rate, 50% mortality in 40-89 d by oral infection.

type 2 (associated with virus type 3 and 4): secretion of mucus, low activity, lost appetite, contracted feet and mantle, black and hardened feet, dead abalone presents swollen liver and intestines and adheres to the bottom of the pond, high mortality (100% in 3-9 d).

1.3. microscopic lesions and tissue abnormality

type 1: Observation based on H & E staining sections of mantle, feet, gill, liver (hepatopancreas), stomach and intestines, the common pathological changes are: necrosis

and disorder of connective tissues of all organs; necrosis of haemocytes and epithelial cells; disorder and detachment of epithelial cells of feet, mantle, liver and gills.

type 2 (3 and 4): based on microscopic observation: disorder and hypertrophy of epithelial cells of liver, detachment and vacuolization of epithelium and connective tissues. Based on ultrathin section observation, the infected cells show pathological change such as swollen membrane and mitochondria, denatured nucleoplasm, vacuolisation of cells and abound of endoplasmic reticulum in the cells.

1.4 OIE status

Currently not listed by the OIE

2. social and economic significance

no data but significant economic importance is suspected through the different reports which are currently available.

3. zoonotic importance

no data

4. 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.

4.1. screening methods

4.1.1. level I

type 1 (associated with virus type 1): low activity, lost appetite, unsusceptible to light, thin shell, edge turndown, decreased growth rate.

type 2 (associated with virus type 2): secretion of mucus, low activity, lost appetite, contracted feet and mantle, black and hardened feet, dead abalone presents swollen liver and intestines and adheres to the bottom of fishpond, high mortality (100% in 3-9 d).

4.1.2. level II: None

4.1.3. level III: None

4.2. presumptive methods

4.2.1. level I: see section 4.1.1.

4.2.2. level II

type 1: Observation based on H & E staining sections of mantle, feet, gill, liver (hepatopancreas), stomach and intestines, the common pathological changes are: necrosis and disorder of connective tissues of all organs; necrosis of haemocytes and epithelial cells; disorder and detachment of epithelial cells of feet, mantle, liver and gills.

type 2 (3 and 4): based on microscopic observation: disorder and hypertrophy of epithelial cells of liver, detachment and vacuolization of epithelium and connective tissues. Based on ultrathin section observation, the infected cells show pathological changes such as swollen membrane and mitochondria, denatured nucleoplasm, vacuolisation of cells and abound of endoplasmic reticulum in the cells.

4.2.3. level III: None

4.3. confirmatory methods

4.3.1. level I: None

4.3.2. level II: None

4.3.3. level III

Transmission Electron Microscopy. See description in sections above.

5. control methods

No known methods of prevention or control. Infected abalone should not be transported into areas known to be free of the disease.

Selected references

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