Infection with ranavirus

PATHOGEN INFORMATION

1. CAUSATIVE AGENT

1.1. Pathogen type

Virus.

1.2. Disease name and synonyms

Infection with ranavirus. No specific synonyms, but the terms ranavirosis, ranavirus disease or ranaviral disease can be used.

1.3. Pathogen common name and synonyms

Members of the genus *Ranavirus*, including:

Frog Virus 3 (FV-3) (synonyms: Box turtle virus 3; Bufo United Kingdom virus- BUK; Bufo marinus Venezuelan iridovirus 1; Lucké triturus virus 1; Rana United Kingdom virus – RUK; Redwood Park virus; Stickleback virus; Tadpole edema virus – TEV; Tadpole virus 2; Tiger frog virus - TFV; Tortoise virus 5).

Ambystoma tigrinum virus (ATV) (synonym: Regina ranavirus).

Bohle iridovirus (BIV).

Santee-Cooper ranavirus (SSRV) (synonyms: Doctor fish virus – DFV; Guppy virus 6 – GV6; Largemouth bass virus – LMBV).

Rana esculenta iridovirus

Singapore grouper iridovirus

Testudo iridovirus

1.4. Taxonomic affiliation

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

Virus species within the genus *Ranavirus* except Epizootic Haematopoietic Necrosis Virus (EHNV) and European Catfish Virus (ECV) (synonyms: European sheatfish virus – ESV; Ictalurus melas ravanirus).

1.4.2. Phylum, class, family, etc.

Ranavirus is a genus within the family Iridoviridae

1.5. Description of the pathogen

Large (120 to 300 nm diameter), icosahedral, linear double stranded DNA viruses. The ranavirus genome, which is typically 100-210 kbp in size, is circularly permuted and terminally redundant. Virus particles may be enveloped (obtained from the plasma membrane) or unenveloped; replicates in the cytoplasm or nucleus.

1.6. Authority (first scientific description, reference)

Granoff, A., Came, P. E. and Breeze, D. C. (1966) Viruses and renal carcinoma of *Rana pipiens*. I. The isolation and properties of virus from normal and tumor tissue. *Virology*, **29**, 133-148.

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

Fresh 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 has not been experimentally documented.

2.2. Life cycle

Not applicable.

2.3. Associated factors (temperature salinity, etc.)

Seasonal variations in the prevalence or severity of disease outbreaks have been reported, with both being greater during the warmer months, therefore temperature is considered a likely factor influencing disease outbreaks, but no experimental data is available.

2.4. Additional comments

None.

3. HOST RANGE

3.1. Host type

Amphibians (all members of the class *Amphibia* are considered to be susceptible). Infection also can occur in fish and reptiles with fatal consequences.

3.2. Host scientific names

Amphibia.

3.3. Other known or suspected hosts

Fish and reptiles.

3.4. Affected life stage

All life stages have been shown to be susceptible.

3.5. Additional comments

None.

4. GEOGRAPHICAL DISTRIBUTION

4.1. Region

Americas, Asia and Pacific, Europe.

4.2. Countries

Known presence in Canada, USA, Venezuela, Australia, China, United Kingdom and Croatia.

DISEASE INFORMATION

5. Clinical Signs and Case Description

5.1. Host tissues and infected organs

Infection has been demonstrated in all major tissues except for striated (skeletal) muscle, smooth muscle and cardiac muscle. However, virus can be isolated from skeletal muscle, probably from blood in tissues.

5.2. Gross observations and macroscopic lesions

The most common presentation is an explosive mortality event with death due to peracute systemic haemorrhagic disease. In these cases, usually there are no external lesions. Skin vesicles have been reported with ATV infection in tiger salamanders (*Ambystoma tigrinum*). A chronic ranavirus disease, characterised by skin ulceration and necrosis of the distal limbs, has been reported from the United Kingdom.

5.3. Microscopic lesions and tissue abnormality

In haematoxylin and eosin stained sections of skin, epithelial hyperplasia with disruption of the normal stratified architecture of the epidermis and often with necrosis of the deeper epithelial layers has been reported. Multiple foci of necrosis can be found in tissues, but these are rare in cases of the skin ulcerative form of disease. These necrotic foci are most obvious in the renal and splenic haematopoietic tissue and in the liver. Intracytoplasmic virus inclusions have been reported in a variety of tissues, most obviously in hepatocytes.

5.4. OIE status

Under consideration for listing.

6. Social and Economic Significance

Considered to be of some economic importance due to disease and mortalities in farmed *Lithobates catesbeianus* (formerly *Rana catesbeiana*) and harvested *Rana esculenta*. Potential economic losses due to potential risk of disease spread to fish. Social consequences of the disease are high where large-scale disease outbreaks occur in wild amphibians, such as in the United Kingdom and North America.

7. Zoonotic Importance

None.

8. Diagnostic Methods

Virus culture followed by identification using electron microscopy and/or PCR. Electron microscopical or PCR examination of diseased tissues can also be used.

8.1. Surveillance methods

PCR to detect DNA coding for the major capsid protein, as described by Hyatt *et al.* (2000)..

8.2. Presumptive methods

The occurrence of an explosive mortality outbreak with consistent gross signs of systemic haemorrhagic disease, or signs of chronic disease with skin ulceration and/or distal limb necrosis are potential indicators of infection. In haematoxylin and eosin stained histological sections: the presence of epidermal hyperplasia with necrosis and/or foci of necrosis within the renal and/or splenic haematopoietic tissue and/or liver with/without the presence of intracytoplasmic inclusions within hepatocytes.

8.3. Confirmatory methods

Examination of diseased tissues by electron microscopy for evidence of mature virions in the cytoplasm of infected cells can assist confirmatory diagnosis. It is recommended that PCR to detect DNA coding for the major capsid protein (which is highly conserved between ranavirus species) be used for confirmatory diagnosis. Methods for electron microscopy and PCR are described by Hyatt *et al.* (2000). Immunohistochemistry can also be used as a confirmatory test. The method for immunohistochemistry is described by Reddacliff & Whittington (1996).

9. Control Methods

No known methods of prevention or control. The use of specific pathogen-free (SPF) stocks under biosecure conditions is the recommended method for prevention of ranavirus disease in amphibian farms. Infected amphibians should not be transported into areas known to be free of ranavirus. A 4% concentration of sodium hypochlorite can be used to disinfect premises and fomites; ozone treatment can be used to sterilise water (Miocevic *et al.* 1993).

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OIE Reference Experts and Laboratories in 2007	