

Infectious haematopoietic necrosis



AETIOLOGY

CLASSIFICATION OF THE CAUSATIVE AGENT

Rhabdovirus of the virus family *Rhabdoviridae*, genus *Novirhabdovirus*.

RESISTANCE TO PHYSICAL AND CHEMICAL ACTION

Temperature: Inactivation in 15 minutes at 60°C and 8 hours at 32°C.

pH: Inactivated above pH 10 or below pH 4.

Chemicals: Inactivated by oxidising agents, sodium dodecyl sulphate, non-ionic detergents, and lipid solvents.

Disinfectants: Inactivated by 2% sodium hydroxide in 10 minutes; 3% formalin in 10 minutes; 0.5 ppm chlorine in 10 minutes and 25 ppm iodine in 5 minutes.

Survival: Remains viable for several weeks in mud and pond water.

- Virulent virus is shed from infected fish via faeces, urine, sexual fluids and mucus from gill and skin epithelia.

EPIDEMIOLOGY

HOSTS

- Infectious haematopoietic necrosis (IHN) is a highly infectious virus disease predominantly affecting cultured salmonids.
- Naturally occurring infections have been recorded from rainbow and steelhead trout (*Oncorhynchus mykiss*), sockeye salmon (*O. nerka*), chinook salmon (*O. tshawytscha*), coho salmon (*O. kisutch*), pink salmon (*O. gorbuscha*), chum salmon (*O. keta*) and Atlantic salmon (*S. salar*).
- It is reasonable to assume that all salmonid species are susceptible to infection.
- Other fish species can be infected experimentally.

TRANSMISSION

- Horizontal transmission may be direct or vectorial.
- Direct contact with clinically infected fish or their secretions (e.g. mucus, faeces and sexual fluids).
- Vectors may include parasitic invertebrates (e.g. copepods and leeches).
- Fish-eating birds may also be a vector.
- Asymptomatic carrier fish may introduce the virus into healthy stocks.
- Vertical or egg-associated transmission is believed to be responsible for the movement of virus to new geographic locations.

SOURCES OF VIRUS

- Contaminated transport water, nets, buckets or other equipment.
- Eggs from infected broodstock.

OCCURRENCE

The disease has been recorded among salmon and trout in many rivers, lakes and hatcheries in western North America and has been spread by movement of fish and eggs to parts of Europe and Asia. The disease is not endemic in all regions of countries from which it has been reported. Disease usually occurs at water temperatures between 4°C and 18 °C. Young fish up to 1 year are most susceptible to overt infection.

For detailed information on occurrence, see recent issues of *World Animal Health* and OIE Web site.

DIAGNOSIS

CLINICAL DIAGNOSIS

- Rapid increase in mortality in the population
- Fish typically become lethargic and gather in quiet areas of a pond
- Fish may exhibit brief periods of erratic swimming (e.g. whirling, flashing or swimming vertically)
- Fish may experience loss of equilibrium
- Abdominal distension or dropsy
- Protruding vent (anus) often with trailing mucoid faecal casts
- Haemorrhages on the skin, base of fins and vent
- Exophthalmia
- Overall darker coloration
- Pale gills

LESIONS

- There are no pathognomonic gross lesions
- Final diagnosis must await direct serological or molecular identification or virus isolation and confirmatory identification
- Lesions may be absent in cases of sudden mortality
- Excess ascitic fluid in the abdominal cavity usually containing blood
- Inflammation of the intestines that contain mucus instead of food
- Oedema and haemorrhage of the visceral organs
- Petechial or focal haemorrhages in the muscle and fat tissue
- Petechial haemorrhages in the swim bladder
- Degeneration of the gill lamellae

DIFFERENTIAL DIAGNOSIS

- Viral haemorrhagic septicaemia.
- Infectious pancreatic necrosis.
- Coldwater disease (*Flavobacterium psychrophila*).
- Whirling disease (*Myxobolus cerebralis*).
- Environmental stress factors (high ammonia levels, low oxygen) particularly in recirculation systems.
- Transportation and handling stress.

LABORATORY DIAGNOSIS

Procedures

Identification and isolation of the agent

- Collect samples of spleen, kidney and encephalon from freshly dead and moribund fish or samples of tissues and ovarian fluids from spawning females.
- Pieces of tissue are fixed for histopathological examination and/or immunostaining.
- A portion of the sample is placed in transport medium for virus isolation.
- A portion is placed in extraction buffer for enzyme-linked immunosorbent assay (ELISA) or polymerase chain reaction (PCR).

Confirmatory or screening tests

- Inoculation of susceptible cell lines such as EPC or BF-2 followed by:
 - Microscopic examination
 - Virus neutralisation
 - Immunofluorescent staining
 - Immunoperoxidase staining
 - Enzyme-linked immunosorbent assay
 - DNA Probe
 - Polymerase chain reaction

Serological tests

- Clotted blood samples or sera from both acute and convalescent fish

PREVENTION AND CONTROL

- No treatment is available for IHN
- An experimental DNA vaccine is in field testing

SANITARY PROPHYLAXIS

- Proper cleaning and disinfection of site
- Reduction in stocking density
- Regular health examinations
- Stocking with fish of known health status
- Quarantine new stocks for at least 2 weeks prior to introduction
- Control of human traffic
- Avoid mixing fish from different sites

In outbreaks

- Strict quarantine of outbreaks with movement controls and control of human traffic
- Destruction of all infected and exposed fish
- Proper carcass disposal
- Effluent treatment
- Thorough cleaning and disinfection of site

MEDICAL PROPHYLAXIS

- Research has produced several candidate vaccines that provide good protection. These include killed, attenuated and DNA vaccines. Some of these are commercially available as autogenous vaccines while others are undergoing field trials.

REFERENCES

WOLF K. (1988). Fish Viruses and Fish Viral Diseases. Cornell University Press, Ithaca, NY, USA.

WINTON J.R. (1991). Recent advances in the detection and control of infectious hematopoietic necrosis virus (IHNV) in aquaculture. *Ann. Rev. Fish Dis.*, **1**, 83–93.

WINTON J.R. (1997). Immunization with viral antigens: Infectious haematopoietic necrosis. *Dev. Biol. Stand.*, **90**, 211–220.

WINTON, J.R. & EINER-JENSEN, K. (2002). Chapter 3 - Molecular diagnosis of infectious hematopoietic

necrosis and viral hemorrhagic septicemia. *In*: Cunningham, C. (ed.) *Molecular Diagnosis of Salmonid Diseases*. Kluwer, Dordrecht.

Chapter 2.1.2. in the OIE *Diagnostic Manual for Aquatic Animal Diseases*, OIE, Paris, France.

Chapter 2.1.2. in the OIE *International Aquatic Animal Health Code*, OIE, Paris, France.

OIE Reference Experts and Laboratories in 2005	
<p>Dr J. Winton Western Fisheries Research Center 6505 N.E. 65th Street, Seattle, Washington 98115 UNITED STATES OF AMERICA Tel.: (1.206) 526.65.87, Fax: (1.206) 526.66.54, E-mail: jim_winton@usgs.gov</p>	