



## Infectious haematopoietic necrosis (IHN)

Also known as infection with infectious haematopoietic necrosis virus (IHNV)

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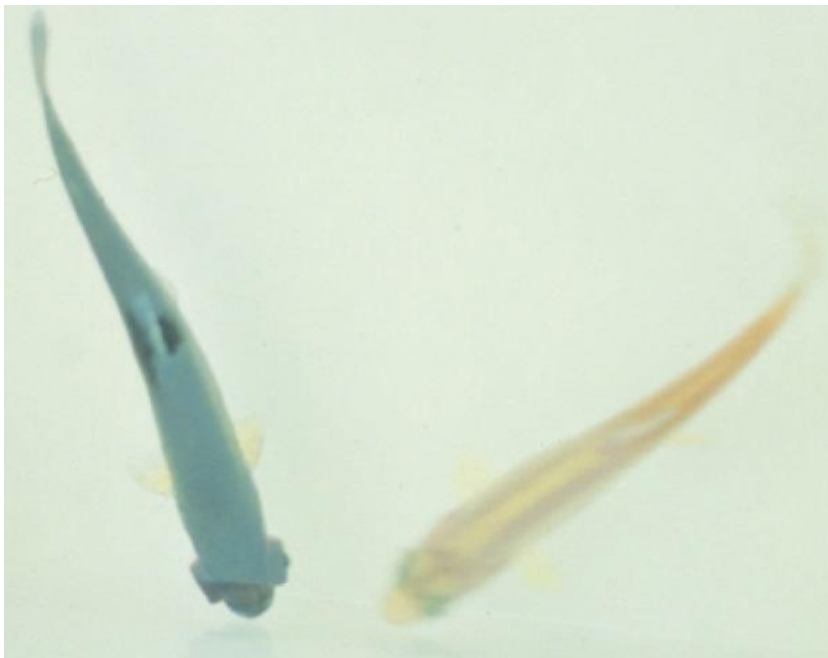
**Figure 1** Chinook salmon fry (*Oncorhynchus tshawytscha*) with IHN



Note: Characteristic darkening from the tail region, swollen abdomen and haemorrhaging at base of the fins.

Source: J Fryer

**Figure 2** Rainbow trout fry (*Oncorhynchus mykiss*) with and without IHN



Note: Infected fish (left) shows darker colouring and exophthalmia compared to the uninfected fish (right)

Source: G Kurath

## Signs of disease

Important: Animals with this disease may show one or more of these signs, but the pathogen may still be present in the absence of any signs.

Disease signs at the farm, tank or pond level are:

- mass mortality
- lethargic swimming with intermittent bouts of frenzied, abnormal activity (spiral swimming and flashing).

Gross pathological signs are:

- numerous yolk sac haemorrhages in the fry of rainbow trout and salmon
- darkening of the skin and pale gills
- haemorrhages on the abdomen and around the pupil of the eye
- exophthalmos (popeye) and a swollen abdomen
- trailing white faecal cast
- bleeding at the base of the fins
- stomach empty of food but distended with a gelatinous substance
- pale internal organs
- petechial (pinpoint) haemorrhages in the fatty tissue and muscle surrounding the organs and stomach wall
- spinal deformities in surviving fish.

Microscopic pathological signs are:

- necrosis of eosinophilic granular cells in the intestinal wall
- degenerative necrosis in haematopoietic tissues.

## Disease agent

IHN is caused by infection with salmonid *Novirhabdovirus*, also known as infectious haematopoietic necrosis virus (IHNV). This virus is an enveloped single-stranded, negative-sense RNA virus classified within the family *Novirhabdoviridae*, and is closely related to other important fish rhabdoviruses such as viral haemorrhagic septicaemia virus (VHSV) and spring viraemia of carp virus (SVCV). Molecular analysis suggests that IHNV was originally endemic to the Pacific coast of North America, and was spread to Europe and Asia through translocations of salmonid eggs or fry.

## Host range

**Table 1 Species known to be susceptible to IHN**

Common name	Scientific name
Amago salmon <sup>a</sup>	<i>Oncorhynchus rhodurus</i>
Arctic char	<i>Salvelinus alpinus</i>
Atlantic cod <sup>a</sup>	<i>Gadus morhua</i>
Atlantic salmon <sup>a</sup>	<i>Salmo salar</i>
Ayu	<i>Plecoglossus altivelis</i>
Brook trout <sup>a</sup>	<i>Salvelinus fontinalis</i>
Brown trout <sup>a</sup>	<i>Salmo trutta</i>
Burbot	<i>Lota lota</i>
Chinook salmon <sup>a</sup>	<i>Oncorhynchus tshawytscha</i>
Chum salmon <sup>a</sup>	<i>Oncorhynchus keta</i>
Coho salmon <sup>a</sup>	<i>Oncorhynchus kisutch</i>
Cutthroat trout <sup>a</sup>	<i>Oncorhynchus clarkii</i>
Gilt-head sea bream	<i>Sparus aurata</i>
Grayling	<i>Thymallus thymallus</i>
Lake trout	<i>Salvelinus namaycush</i>
Masu salmon <sup>a</sup>	<i>Oncorhynchus masou</i>
Pacific herring	<i>Clupea pallasii</i>
Pacific salmon <sup>a</sup>	<i>Oncorhynchus</i> spp.
Pike	<i>Esox lucius</i>
Pile perch	<i>Rhacochilus vacca</i>
Pink salmon <sup>a</sup>	<i>Oncorhynchus gorbuscha</i>
Rainbow trout	<i>Oncorhynchus mykiss</i>
Shiner perch	<i>Cymatogaster aggregata</i>
Sockeye salmon <sup>a</sup>	<i>Oncorhynchus nerka</i>
Tubesnout	<i>Aulorhynchus flavidus</i>
Turbot	<i>Scophthalmus maximus</i>
Whitespotted char	<i>Salvelinus leucomaenis</i>
White sturgeon	<i>Acipenser transmontanus</i>

<sup>a</sup> Naturally susceptible. Note: Other species have been shown to be experimentally susceptible.

**Table 2 Non-fish carriers**

Common name	Scientific name
Gill lice	<i>Salmincola</i> spp.
Leeches	<i>Piscicola</i> spp.
Mayfly	<i>Callibaetis</i> spp.
Piscivorous birds	Various genera and species

## Presence in Australia

Exotic disease—not recorded in Australia.

**Map 1 Presence of IHN, by jurisdiction**



## Epidemiology

- IHN is a cold-water disease. Clinical signs typically occur at temperatures between 8°C and 15°C. Outbreaks rarely occur once water temperatures reach more than 15°C.
- IHN is typically found in young, farmed trout and salmon fry or fingerlings, and in adults during or just following spawning.
- Mass mortalities of up to 90% can occur in hatcheries, typically with 100% of the population infected.
- Mortality also occurs in wild populations of Pacific salmon infected with IHNV. Survivors can be the source of infection of farmed stock.
- Susceptibility to infection varies between individuals of the same species and appears to be largely age dependent, with younger individuals being more susceptible.
- Fish that survive IHN are potential carriers of the virus for a period that depends on environmental conditions (such as temperature).
- The virus is shed into the water from infected fish through faeces, urine, spawning fluids and external mucous.
- Transmission is generally horizontal, with the virus entering fish through the gills and skin. Some blood-sucking parasites such as gill lice (*Salmincola* spp.) and leeches may serve as vectors.
- Virus can be transferred to new areas via the movement of infected fish or eggs, and by other sources such as contaminated equipment, water, birds or insects such as mayflies.
- Outbreaks are most likely to occur around the time of spawning, with increased levels of virus released into the environment with spawning fluids.

- It is believed that the spread of IHNV from the west coast of North America to Asia and Europe has been principally via the shipment of infected fish and eggs, suggesting some degree of vertical transmission. The risk of such egg-associated transmission is significantly reduced by the common practice of egg surface disinfection, but is not eliminated.

## Differential diagnosis

The list of [similar diseases](#) in the next section refers only to the diseases covered by this field guide. Gross pathological signs may also be representative of diseases not included in this guide. Do not rely on gross signs to provide a definitive diagnosis. Use them as a tool to help identify the listed diseases that most closely account for the observed signs.

## Similar diseases

Enteric red mouth disease, epizootic haematopoietic necrosis (EHN), furunculosis, infectious pancreatic necrosis (IPN), infection with HPR-deleted or HPRO infectious salmon anaemia virus, viral haemorrhagic septicaemia (VHS) and whirling disease.

## Sample collection

Only trained personnel should collect samples. Using only gross pathological signs to differentiate between diseases is not reliable, and some aquatic animal disease agents pose a risk to humans. If you are not appropriately trained, phone your state or territory hotline number and report your observations. If you have to collect samples, the agency taking your call will advise you on the appropriate course of action. Local or district fisheries or veterinary authorities may also advise on sampling.

## Emergency disease hotline

See something you think is this disease? Report it. Even if you're not sure.

Call the Emergency Animal Disease Watch Hotline on **1800 675 888**. They will refer you to the right state or territory agency.

## Further reading

CEFAS International Database on Aquatic Animal Diseases [Infectious Haematopoietic Necrosis](#)

World Organisation for Animal Health [Manual of diagnostic tests for aquatic animals](#)

These hyperlinks were correct at the time of publication.

## Contact details

Emergency Animal Disease Watch Hotline 1800 675 888

Email [AAH@agriculture.gov.au](mailto:AAH@agriculture.gov.au)

Website [agriculture.gov.au/pests-diseases-weeds/aquatic](http://agriculture.gov.au/pests-diseases-weeds/aquatic)

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