**American Association of Zoo Veterinarians Infectious Disease Committee Manual 2013**

**INFECTION HEMATOPOETIC NECROSIS VIRUS (IHNV)**

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<td><strong>Salmonids</strong></td>
<td>Horizontal - usually by direct contact with mucus, urine, feces, eggs/milt. Vertical transmission is suspected. Gills may be important portal of entry as virus survives &gt;1 mo in water and sediment. It also is transmitted via insect, annelid, and crustacean vectors.</td>
<td>Lethargy with sporadic hyperactivity, ascites, white fecal casts, dorsal darkening, petechiation, coelomic distension, hemorrhage, exophthalmia, and pale gills. Acute mortalities occur and scoliosis is observed in survivors.</td>
<td>Varies by strain and temperature. Highest mortality in younger fish at 8-15°C. Older animals present lower mortality rates and fewer clinical signs.</td>
<td>Increase temperature to &gt;15°C if possible; consider euthanasia of affected animals.</td>
<td>OIE reportable disease. Excellent biosecurity (isolation and disinfection). Egg disinfection. Culling and disinfection in the face of an outbreak. Increase temperature to &gt;15°C.</td>
<td>No.</td>
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**Fact Sheet Reviewed by:** Brent Whitaker, E. Scott Weber III

**Susceptible animal groups:** Salmonids – both freshwater and saltwater, and especially rainbow trout (*Oncorhyncus mykiss*), Atlantic salmon (*Salmo salar*), chinook salmon (*O. tshawytyscha*), sockeye salmon (*O. nerka*), and chum salmon (*O. keta*). Generally considered resistant are lake trout (*Salvelinus namaycush*), arctic char, (*Salvelinus alpinus*) and coho salmon (*O. kisutch*).

**Causative organism:** Family Rhabdoviridae, genus *Novirhabdovirus*, IHNV. Several clades of virus exist with certain clades or strains being isolated within certain geographic regions.

**Zoonotic potential:** None.

**Distribution:** Endemic to Pacific coast of North America (Alaska to California). It is now endemic to Japan and continental Europe. Outbreaks in other parts of the US and Asia have occurred.

**Incubation period:** Temperature dependent, ~5-45 days.

**Clinical signs:** The clinical presentation is more common in fry and fingerlings. Lethargy with sporadic hyperactivity is seen. Coelomic distension presents due to ascites. Pale fecal casts are observed trailing from vent. Darkening, petechiation, erythema, exophthalmia, and pale gills due to anemia are observed. Rapidly escalating mortalities occur which may reach >90%. Scoliosis and lordosis are common in 5-60% of fry and fingerling survivors. On hematology, leukopenia, neutropenia, and anemia with increased numbers of bilobed erythrocytes may be observed.
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**Post mortem, gross, or histologic findings:** Petechiation, erythema, and pallor may be observed grossly. Necrosis of renal hematopoietic tissue and spleen; possible focal necrosis in liver and gastrointestinal tract can be seen. Degeneration and necrosis of granular cells in the lamina propria, stratum compactum, and stratum granulosum of the gastrointestinal tract is sometimes considered pathognomonic for IHN. Pleomorphic intracytoplasmic and intranuclear inclusions in the pancreas can be observed. Older fish show fewer histologic lesions.

**Diagnosis:** Presumptive diagnosis is based on species, clinical signs, age, temperature, and geographic location. Definitive diagnosis for OIE requires viral isolation followed by molecular or immunologic identification. Other tests are available, e.g., virus neutralization, indirect fluorescent antibody testing, RT-PCR, and staphylococcal coagglutination, but are not approved for surveillance. Of these tests, the staphylococcal coagglutination is the most rapid.

**Material required for laboratory analysis:** Live fish – mucus or eggs. Dead fish – the same as live and also kidney and spleen by sterile collection or whole fish. Pool tissues from up to 10 fish (>0.5 g) with viral transport media and antibiotics (e.g., 4ml 10% fetal calf serum and 200 IU penicillin, 200 μg streptomycin, and 200 μg kanamycin per ml). Transport at 4˚C ASAP.

**Relevant diagnostic laboratories:** State Fish Health Laboratories; university laboratories specializing in fish virology, e.g., UC Davis Fish Health Laboratory.

**Treatment:** Increase temperature to >15˚C if possible.

**Prevention and control:** Excellent biosecurity is important prevention measure. For stocking, only acquire disinfected eggs (commonly iodophor disinfection) or from IHNV-free stock. Use virus-free water, or disinfect with ozone or UV. Sterilize feed (e.g., by heat). Consider non-susceptible species in endemic areas; surveillance of the young-of-the-year and female broodstock; and selective breeding to maintain virus-free stock. Commercial vaccine (Novartis) available in US and several products are under trial. In the face of an outbreak, cull and disinfect affected animals and increase temperature for remaining animals.

**Suggested disinfectant for housing facilities:** Virus is inactivated by formalin, sodium hypochlorite, iodophors, gamma and UV irradiation, pH <4 or >10, or temperatures >60˚C for 15 minutes. Resistant to ethanol.

**Notification:** Reportable disease, must notify the OIE.

**Measures required under the Animal Disease Surveillance Plan:** None.

**Measures required for introducing animals to infected animal:** Do not introduce susceptible fish to affected animals.

**Conditions for restoring disease-free status after an outbreak:** When the disease is first detected, an infected zone is established and a buffer zone is established peripheral to the problem. All infected animals are either culled or removed from the infected zone to reduce the risk of disease transmission and the area is disinfected. Biosecurity measures are reviewed and modified as needed within the infected zone. Surveillance is established until no virus is detected for at least 2 years.

**Experts who may be consulted:**
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**References:**
1. AFS Suggested Procedures for the Detection and Identification of Certain Finfish and Shellfish
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