

# Infectious pancreatic necrosis

## AETIOLOGY

### CLASSIFICATION OF THE CAUSATIVE AGENT

- Infectious pancreatic necrosis virus is a bi-segmented double-stranded RNA virus of the family Birnaviridae. At least nine serotypes exist.

### RESISTANCE TO PHYSICAL AND CHEMICAL ACTION

Temperature: At 60°C, 99.999% inactivation in 30 minutes at pH 3 compared with 5 hours at pH 7–9.

pH: Inactivated at pH 12.5 in 10 minutes. Only partially inactivated at pH 2.5 in 1 hour.

Disinfectants: Inactivated by formalin 3%/5 minutes; sodium hydroxide pH 12.5/10 minutes; chlorine 40 ppm/30 minutes; and iodine compounds 30 ppm/5 minutes.

Survival: Remains viable for several weeks in pond mud at 10°C. In filtered water at 4°C, infectivity persists for several months.

## EPIDEMIOLOGY

### HOSTS

- Infectious pancreatic necrosis (IPN) is a highly contagious systemic birnavirus disease of young fish of salmonid species held under intensive rearing conditions.
- The disease most characteristically occurs in rainbow trout (*Oncorhynchus mykiss*), brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), Atlantic salmon (*Salmo salar*) and several Pacific salmon species (*Oncorhynchus* spp.).
- Viruses showing serological relatedness to IPN virus have been reported to cause diseases in some farmed marine fish species, such as yellowtail (*Seriola quinqueradiata*), turbot (*Scophthalmus maximus*) and halibut (*Hippoglossus hippoglossus*) and subclinical covert infections have been detected in a wide range of estuarine and freshwater fish species. Some of these viruses have been shown to cause IPN in salmonid fry under experimental challenge conditions, but others do not.

### TRANSMISSION

- Horizontally by contact through the water route and by ingestion of infected material
- Vertically (via fertilised eggs) from spawning carrier broodfish
- Direct contact with secretions from clinically infected fish
- Asymptomatic virus carrier fish or infected embryonated ova may introduce the virus into healthy stocks

### SOURCES OF VIRUS

- Virus is shed via faeces, sexual fluids and probably urine
- Infected transport water, contaminated nets, containers and other equipment
- Infectious virus can be transported and excreted by fish-eating birds and mammals

### OCCURRENCE

- The disease has a wide geographical distribution, occurring in most, if not all, major salmonid farming countries of North and South America, Europe and Asia, and has been reported from South Africa.
- It mostly occurs under intensive rearing conditions in salmonid hatcheries or in post-smolt Atlantic salmon in sea-cages.
- Susceptibility decreases with increasing age, with complete resistance to clinical disease in fry/fingerlings being reached at about 1500 degree-days (value obtained by multiplying the age in days by the average temperature during the lifespan) except for Atlantic salmon smolts, which develop the disease within weeks following transfer from freshwater to seawater.

## DIAGNOSIS

### CLINICAL DIAGNOSIS

- The first sign of an outbreak in salmonid fry is usually a sudden and progressive increase in daily mortalities in the hatchery, particularly in the faster-growing individuals
- Corkscrewing/spiral/whirling swimming motion
- Darkening pigmentation
- Pronounced distended abdomen
- Absence of food but presence of clear or milky mucus in stomach and anterior intestine is pathognomonic
- Long thin whitish faecal casts
- Mild to moderate exophthalmia
- Gills typically pale

### LESIONS

- Haemorrhages sometimes present in ventral areas, including ventral fins
- Spleen, kidney, liver and heart of fry are abnormally pale
- Petechial haemorrhages on the pyloric caecae and anterior adipose tissue and the body cavity may contain ascitic fluid

### DIFFERENTIAL DIAGNOSIS

- Infectious haematopoietic necrosis
- Rainbow trout fry syndrome

## LABORATORY DIAGNOSIS

### Procedures

#### Isolation and identification of the virus

- Inoculation of susceptible cell lines BF-2, CHSE-214 or RTG-2 followed by:
  - microscopic examination
  - virus neutralisation
  - immunofluorescent staining
  - immunoperoxidase staining
  - enzyme-linked immunosorbent assay (ELISA)

#### Direct detection in clinical material

- Immunofluorescent staining
- ELISA

### Samples

- Fry (length < 4 cm): whole body
- Fingerlings (length 4–6 cm): entire visceral mass
- Larger fish: liver, kidney and spleen

#### Identification and isolation of the agent

- Place fry, visceral mass or pieces of organs in transport medium for homogenisation

#### Direct detection in clinical material

- Fry or pieces of organs are fixed for histopathological examination and/or immunostaining
- Fry or pieces of organs are placed in extraction buffer for ELISA

## PREVENTION AND CONTROL

No treatment available.

### SANITARY PROPHYLAXIS

- Routine cleaning and disinfection of hatchery
- Reduction in stocking density

- Stocking only with fertilised eggs or fish of known health status (IPNV-free)
- Avoid mixing fish from different sites
- For Atlantic salmon smolts transferred to sea-cages, use single year class or stock rotation
- Use only protected water supply (e.g. spring or borehole ) or UV-treated river water for hatchery

### In outbreaks

- Strict isolation of outbreak with fish movement controls and control of human traffic
- Reduce population density (thinning out)
- Thorough cleaning and disinfection of hatchery, fry troughs/tanks and all equipment in contact
- Proper carcass disposal (incineration or lime pit)

### MEDICAL PROPHYLAXIS

- Three commercial injectable vaccines (two inactivated and one recombinant) are in use in Norway for Atlantic salmon smolts, but protection is reported to be only moderate. No commercial vaccines are available yet in other countries or for other salmonid species.

## REFERENCES

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### OIE Reference Experts and Laboratories in 2000

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