

Piscirickettsiosis

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Susceptible species

Piscirickettsiosis, caused by infection with *Piscirickettsia salmonis*, has been reported in pink salmon (*Oncorhynchus gorbuscha*), coho salmon (*O. kisutch*), chinook salmon (*O. tshawytscha*), rainbow trout (*O. mykiss*), and in Atlantic salmon (*Salmo salar*). Also susceptible to the infection and disease are non-salmonid species including white sea bass (*Atractoscion nobilis*), European sea bass (*Dicentrarchus labrax*) lumpfish (*Cyclopterus lumpus*), and blackspot grouper (*Epinephelus melanostigma*). The bacterium has also been detected by PCR in apparently healthy marine fish belonging to several species from the coast of Chile (Rozas and Enriquez, 2014).

Disease name

Piscirickettsiosis.

Aetiological agent

Piscirickettsia salmonis is a Gram-negative, non-motile, coccoid-like bacterium that occurs individually or in clusters, within macrophages and other phagocytic cells. The organism is transmitted directly through the water column. *P. salmonis* is related to members of the genera *Francisella*, *Coxiella*, and *Legionella* in the class Gammaproteobacteria (Fryer *et al.*, 1992). The bacterium is serologically homogeneous throughout its geographic range however, nucleotide sequences indicate genetic heterogeneity.

Geographical distribution

Primarily occurring in farmed marine fish, the disease and its causative agent have been reported from the Pacific coasts of North and South America, the Atlantic coast of Canada, the Mediterranean, the coasts of Ireland, Scotland, and Norway, and from Southeast Asia.

Associated environmental conditions

Piscirickettsiosis is a disease of farmed fish and the greatest impacts have been associated with infections in farmed salmon, particularly in Chile (Branson and Díaz-Muñoz, 1991; Cvitanich *et al.*, 1991). Risk factors include elevated water temperature, nearness to infected neighbouring farms and farm stocking density (Rees *et al.*, 2014). Some outbreaks have followed harmful algae blooms, episodes of extreme temperature or severe weather events.

Significance

In the northern hemisphere, outbreaks of piscirickettsiosis in farmed salmon are sporadic, usually limited in geographic range, of relatively short duration and with cumulative mortality up to 10%. In contrast, the disease is persistent, extensive and severe in Chilean salmon aquaculture, with farm-level mortality often in excess of 20%. In Chile, the economic impact of the disease has been estimated to be greater than USD 250 M (Rozas and Enriquez, 2014).

Gross clinical signs

The clinical signs may include darkening, anaemia, lethargy, inappetence, and erratic swimming behaviour. Affected fish may display generalized pallor and focal skin lesions, raised scales, nodules or ulcers. Clinical signs may be absent during acute infections. Lesions include swollen and discoloured kidney, splenomegaly, occasional ascites with exophthalmia and haemorrhages of the skin, visceral organs, skeletal muscle, and brain (Figure 1). Consistent with a septicæmia, microscopic lesions are widespread and in acute cases include multi-focal necrosis of haematopoietic and other organs followed by granulomatous inflammation. Haemorrhagic meningoencephalitis has been reported.

Control measures and legislation

Prevention of infection in farmed populations relies on stress reduction combined with optimal biosecurity practices. No effective vaccines have been reported (Evensen, 2016). Most isolates of *P. salmonis* are sensitive to a wide range of antimicrobial compounds *in vitro*. Although treatment relies on antibiotic therapy, the intracellular habitat of the bacterium reduces antibiotic efficacy resulting in the need for elevated doses and prolonged treatment regimens. This scenario increases the risk of developing antibiotic resistance. *Piscirickettsia salmonis* is not an OIE-listed agent, nor is it reportable in Norway, Ireland, Scotland or Canada.

Diagnostic methods

Piscirickettsiosis is diagnosed by confirming the presence of *P. salmonis* either in infected tissue or in culture, using molecular or serological methods. The bacterium replicates in cell lines derived from salmonid and non-salmonid fish and in blood- and/or L-cysteine-enriched bacteriological media (Figure 2) (Mauel *et al.*, 2008). A quantitative PCR assay, utilizing pathogen-specific primers and probe permits highly sensitive detection of *P. salmonis* DNA in tissues or cultures (Corbeil *et al.*, 2003). Serological detection of the agent by immunohistochemistry or by fluorescent microscopy from cultured organisms is made using specific antibodies (Jamett *et al.*, 2001).

Key references

- Branson, E. J. and Díaz-Muñoz, D. N. 1991. Description of a new disease condition occurring in farmed coho salmon, *Oncorhynchus kisutch* (Walbaum), in South America. *Journal of Fish Diseases* 14: 147-156.
- Corbeil, S., McColl, K. A. and Crane, M. S. 2003. Development of a Taqman quantitative PCR assay for the identification of *Piscirickettsia salmonis*. *Bulletin of the European Association of Fish Pathologists* 23: 95-101.
- Cvitanich, J. D., Garate, O. N. and Smith, C. E. 1991. The isolation of a rickettsia-like organism causing disease and mortality in Chilean salmonids and its confirmation by Koch's postulate. *Journal of Fish Diseases* 14: 121-145.
- Evensen, O. 2016. Immunization strategies against *Piscirickettsia salmonis* infections: review of vaccination approaches and modalities and their associated immune response profiles. *Frontiers in Immunology* 7: 1-9.
- Fryer, J. L., Lannan, C. N., Giovannoni, S. J. and Wood, N. D. 1992. *Piscirickettsia salmonis* Gen-Nov, Sp-Nov, the causative agent of an epizootic disease in salmonid fishes. *International Journal of Systematic Bacteriology* 42: 120-126.
- Jamett, A., Aguayo, J., Miquel, A., Muller, I., Arriagada, R., Becker, M. I., Valenzuela, P. and *al.* 2001. Characteristics of monoclonal antibodies against *Piscirickettsia salmonis*. *Journal of Fish Diseases* 24: 205-215.

- Mauel, M. J., Ware, C. and Smith, P. A. 2008. Culture of *Piscirickettsia salmonis* on enriched blood agar. *Journal of Veterinary Diagnostic Investigation* 20: 213-214.
- Rees, E. E., Ibarra, R., Medina, M., Sanchez, J., Jakob, E., Vanderstichel, R. and St-Hilaire, S. 2014. Transmission of *Piscirickettsia salmonis* among salt water salmonid farms in Chile. *Aquaculture* 428-429: 189-194.
- Rozas, M. and Enriquez, R. 2014. Piscirickettsiosis and *Piscirickettsia salmonis* in fish: a review. *Journal of Fish Diseases* 37(3): 163-188.

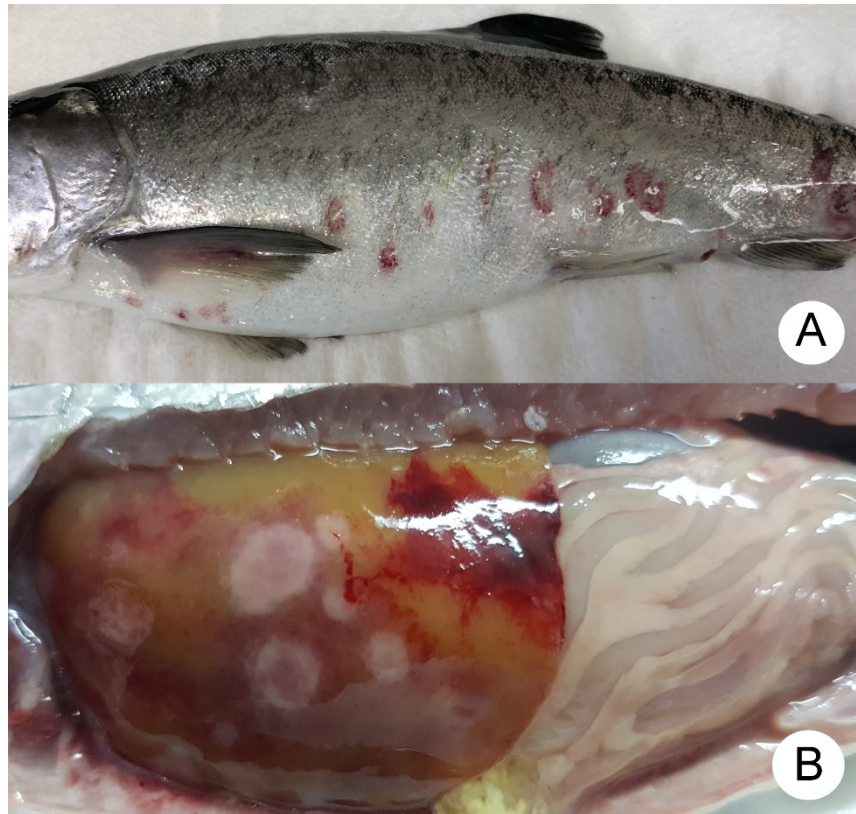


Figure 1. Signs associated with salmonid piscirickettsiosis. A, abdominal distension with ascites and haemorrhagic skin ulcerations in Atlantic salmon, *Salmo salar*. B, Pale, circular, subcapsular nodules, representing areas of inflammation and necrosis in liver of pink salmon, *Oncorhynchus gorbuscha*.



Figure 2. Colonies of *Piscirickettsia salmonis* on enriched blood-agar medium.

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