

Bacterial Gill Disease

I. Causative Agent and Disease

Bacterial gill disease (BGD) is most commonly caused by filamentous bacteria within the genus *Flavobacterium* (most often *F. branchiophilum*). In previous taxonomy these bacteria were known as members of the Myxobacteria and were first placed in the genus *Cytophaga*, later changed to *Flexibacter* and now *Flavobacterium*. The syndrome of this disease includes swollen gill lamellae caused by proliferation of the epithelial cells sometimes resulting in lamellar fusion. The epithelial proliferation is a response to irritation from the large numbers of filamentous bacteria found attached to the gill surface. The thickened epithelial layer results in decreased gas exchange for respiration triggering explosive epizootics with high fish mortality of up to 25%.

II. Host Species

All cultured salmonids are susceptible and the disease is found worldwide. In Alaska, sockeye, Chinook and coho salmon appear to be most susceptible. Adults and yearlings are less susceptible than fry and fingerlings.

III. Clinical Signs

Fish with BGD show a loss of appetite, orient to the water current for increased flow over the gills and exhibit exaggerated opercular movements. An increase in mucus on the head and upper body may also be noted. BGD usually affects fry or fingerling salmonids in high density culture conditions. Therefore, the disease is often associated with sub-optimal water and environmental quality such as overcrowding that result in excessive ammonia, low dissolved oxygen levels and excess suspended organic matter. Such stressors can

predispose fish to infection by these bacteria that are present at low levels in the aquatic environment. BGD typically can occur in the spring with the feeding of starter mash that irritates delicate gill tissues of swim-up fry. The resulting gill hyperplasia (excessive cell division and thickness) interferes with normal gas exchange while secondary infections from fungus or other opportunistic pathogens may occur.

IV. Transmission

Transmission occurs horizontally through the water from fish to fish. Predisposing factors for epizootic outbreaks are sub-optimal environmental conditions and suspended solids or abrasive feeds. The incubation period can be as little as 24 hours or up to several weeks, most commonly during periods of colder water temperatures below 5°C.

V. Diagnosis

Fish with BGD have pale, swollen gills, flared opercula, are listless and do not feed well. Large numbers of filamentous rod-shaped bacteria are found attached to the gills causing epithelial hyperplasia and possibly fusion or clubbing of gill lamellae. The causative filamentous bacteria are Gram-negative, non-motile (or have gliding motility) and grow on *Cytophaga* or TYES agars.

VI. Prognosis for Host

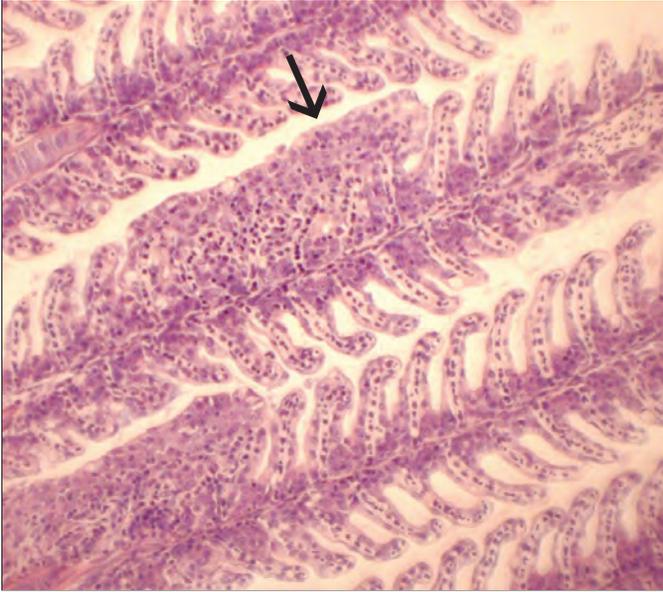
Early intervention in the progression of the disease may reduce fish mortality which can be significant. In a hatchery setting external chemical treatments with hydrogen peroxide may help control the bacteria. If gill tissue is severely damaged, fish may not survive the treatments. Preventative measures for BGD include maintaining the water supply

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free of fish (especially adults), mud and silt, reducing stress such as overcrowding, avoiding low dissolved oxygen or high ammonia levels and avoiding excessive fish handling.

VII. Human Health Significance

The causative bacteria of BGD are of no human health concern



Histological section of gill lamellar fusion (arrow) caused by external bacteria, X 100.



Higher magnification showing filamentous bacteria (arrow) on gill, X 400.