AMOEBIC GILL DISEASE

Background
Amoebic gill disease (AGD) can affect marine farmed salmonids in Scotland and is caused by the protozoan parasite *Neoparamoeba perurans*. AGD is one of the main problems for salmonid aquaculture in Tasmania, Australia, resulting in severe economic losses. Outbreaks have also been reported from New Zealand, United States, Canada, France, Spain, Ireland, Chile and Norway.

Clinical signs and diagnosis
Affected fish can appear lethargic, they breathe rapidly and congregate near the water surface. At clinical inspection the gills show multifocal patches of white to grey swollen tissue and increased mucus (Fig. 1). Diagnosis is made by histopathology, revealing a proliferative response of the gill epithelium, comprising lamellar hyperplasia and fusion, and associated amoebae (Fig. 2). Molecular testing can be used to identify the species of amoeba. The condition known as proliferative gill inflammation (PGI) is thought to have a multifactorial cause, of which amoebae are just one agent. Clinical signs and mortality depend on the level of infection and subsequent severity of the gill pathology. Therefore low or early infections may remain unnoticed. In severe cases the proliferated gill tissue impairs the respiratory capacity of the fish leading to asphyxia and death. Affected fish may be weakened and are more susceptible to other infections, but conversely, fish suffering from other diseases may also be more susceptible to AGD. Experience in Scotland suggests mortalities are typically 10-20%, but losses as high as 70% have occasionally been reported. In chronic cases low but ongoing mortalities can persist for up to three months.

Risk factors
Amoebae (15-40 μm diameter) are normally found free living in the marine environment, but under certain conditions they may proliferate causing AGD. Although the definitive factors causing the proliferation of amoebae are not fully understood, environmental and host factors as well as other potential concurrent pathogens are believed to have an important role in disease predisposition. AGD clinical outbreaks normally occur from late...
summer to early winter. Temperatures above 10°C were thought to trigger the disease, but Scottish outbreaks have occurred at temperatures from 7.5 to 13.5 °C. Recent studies show high salinity (>32 ppt) as a more relevant risk factor. High stocking densities, smolt size, quality and genetic origin, suspended organic matter, bio-fouling and previous gill damage could also affect disease occurrence. Some reports show higher prevalence in Atlantic salmon in their first year at sea and development of resistance after first infection. Differences in resistance of stocks are being investigated.

Disease transmission
The amoebae are transmitted through water and occasionally recorded on wild salmon without causing significant pathology; however these fish do not appear to be a reservoir of the pathogen. This apparent difference in incidence may be due to the higher stocking densities in aquaculture and the difficulty of obtaining samples for disease diagnosis in wild fish. Filter feeding shellfish are likely to come in contact with free living amoebae, but they have not been shown to be susceptible.

Treatment
Data show that some outbreaks disappear without treatment but when used freshwater baths or hydrogen peroxide are more widely accepted treatments. Chemical treatments can be effective if used at early stages of the disease, but they can also be detrimental by increasing tissue damage and decreasing oxygen uptake in fish with already severely compromised gills. The practicalities surrounding the administration and timing of the treatments are key factors influencing their use and success. Avoiding stress is recommended in all cases.

Further action and contacts details
If you suspect the presence of AGD within your aquaculture stock then it is advised that you contact your veterinarian to discuss potential treatments and options to limit the impact. Please also inform Marine Scotland at the address detailed below.

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