Bacterial Coldwater Disease

I. Causative Agent and Disease
The causative agent of bacterial coldwater disease, *Flavobacterium psychrophilum*, is a Gram-negative very proteolytic bacterium that causes systemic disease in cold waters. Disease associated with this bacterium usually occurs below 12°C and in Alaska often occurs in extremely cold water temperatures of 1°C. The bacterium was originally classified in the genus *Cytophaga*, which was changed to *Flexibacter*, and is now assigned to the genus *Flavobacterium*. The species name *psychrophilum* means “cold loving”. Bacterial coldwater disease is most often characterized by tissue necrosis of the fins that progresses to complete destruction of the caudal peduncle exposing the vertebrae by ulceration and necrosis of the surrounding area. Other common names for this condition are peduncle disease or low temperature disease.

II. Host Species
Bacterial coldwater disease can affect salmonids in temperate salmonid producing regions worldwide. Juvenile coho and Chinook salmon are particularly susceptible.

III. Clinical Signs
Fingerlings showing darkening of the peduncle region, where water temperatures are between 4-12°C, may have up to 50% mortality prior to the occurrence of more chronic peduncle erosion. When acute, lesions appear in the areas of increased pigmentation on the peduncle region, or elsewhere. Ulcers are deep, and if fish survive, the caudal fin may erode completely exposing the vertebral column. When present, internal lesions may consist only of mild petechial hemorrhages within the adipose tissues surrounding the pyloric caeca. Chronic coldwater disease can result in lordosis and scoliosis (“crinkleback”) and an abnormal swimming posture from the destruction of muscle bundles adjacent to the vertebral column. Another sequella to the disease is bacterial invasion of the brainstem causing erratic swimming, darkened posterior body and sudden death from damage to nervous tissues, vertebral cartilage, and bone.

IV. Transmission
Transmission is horizontal through the water column and vertically through the eggs of infected adult salmonids. *Flavobacterium* sp. are also common inhabitants of aquatic ecosystems. The bacteria have been isolated from internal organs and gonadal fluids of returning adult salmon suggesting they may carry the infection during their seawater phase but reinfection upon entering freshwater is also a possibility.

V. Diagnosis
Presumptive diagnosis is made by isolation of long, filamentous, Gram-negative bacteria that are non-motile or have gliding motility from kidney tissues or typical skin lesions of fish reared in cold water. The bacterium grows well on *Cytophaga* and TYES agars, with optimum growth at 15-16°C. Typical colony morphology is bright yellow with convex centers and a thin spreading periphery resembling a “fried egg” or an entirely convex colony with no spreading periphery. Colonies turn orange-red when KOH is added indicating flexirubin pigment. Confirmatory diagnosis can be done using PCR.
VI. Prognosis for Host
Bacterial coldwater disease begins as an external infection on young fish that eventually becomes systemic and generally results in mortality. Within the hatchery, populations of fish can be treated for the infection with antibiotics.

VII. Human Health Significance
There are no human health concerns associated with *Flavobacterium psychrophilum*.