Infectious Hematopoietic Necrosis Virus (IHNV)

I. Causative Agent and Disease
Infectious hematopoietic necrosis virus (IHNV) is a bullet-shaped novirhabdovirus that is enzootic to the North American Pacific Northwest, Italy, France and Germany. The virus was inadvertently introduced into Japan, Taiwan and other areas of the US (Snake River Valley, Idaho) where it has become established. IHNV can infect many salmonid species and has had a severe economic impact on intensively cultured salmon and trout. IHNV in Alaska has been limited primarily to sockeye salmon and rarely Chinook and chum salmon when they are exposed to water supplies containing infected sockeye salmon. Avoidance of IHNV and culture of sockeye salmon in Alaska has been successful through rigorous use of the Department of Fish and Game sockeye salmon culture policy. The disease, infectious hematopoietic necrosis (IHN), is an acute, systemic infection affecting the kidney tissues and other visceral organs causing extensive mortality in hatchery reared sockeye salmon juveniles as well as in wild stocks of outmigrating sockeye salmon smolts.

II. Host Species
Fish species susceptible to infection and disease by IHNV include sockeye, Chinook, chum, amago, yamame and Atlantic salmon, cutthroat trout and rainbow/steelhead trout. Brook and brown trout are experimentally susceptible to infection and mortality while lake trout are intermediately so. Arctic char and grayling are resistant while coho salmon are also resistant but can carry the virus when in the presence of other susceptible virus-infected fish species. Mortality is highest in young fish and resistance to infection and disease increases with age.

III. Clinical Signs
Infected fish may exhibit lethargy, whirling behavior, cranial swelling, abdominal swelling, exophthalmia, anemia and darkened body coloration, hemorrhaging of musculature and base of fins, fecal casts, pre-emergence in sac-fry, pale liver, spleen and kidney, stomach and intestine filled with milky or watery fluid and petechial hemorrhaging of mesenteries or visceral tissues.

IV. Transmission
Horizontal transmission through water via feces or sex products or carcass degradation is the most common route of infection. Virus occurs commonly in ovarian fluids and on the surface of eggs. Rarely, vertical transmission can occur within eggs (internal) and possibly with adhesion of virus particles to sperm during fertilization. Incubation and course of the disease is reported to be strongly influenced by water temperature in the Lower 48. Optimum temperature is 10°C-12°C but losses due to IHNV have been reported above 15°C. Mortalities occur within 4-6 days post-exposure with peak mortality occurring 8-14 days post-exposure. In Alaska, the disease can cause up to 100% mortality in sockeye salmon at water temperatures as low as 1-2°C but exponential mortality may take longer to occur at these lower temperatures. No natural reservoirs of IHNV have been confirmed other than those susceptible fish species that can become carriers of the virus. However, transient detections of IHNV have been reported in organic sediments, invertebrates, and some forage species of marine fish when associated with ongoing or recent IHNV epizootics in a susceptible salmonid species.
V. Diagnosis
Susceptible fish cell cultures are inoculated with kidney and spleen tissues (whole fry if small) or ovarian fluids from fish suspected of having IHNV. Presumptive diagnosis is made when characteristic cytopathic effect (CPE) occurs in cell monolayers from virus infection and lysis of the cells. Virus can be definitively identified with PCR.

VI. Prognosis for Host
Prognosis for infected fish is poor. Survivors of epizootics and non-lethal infections probably become lifelong carriers of the virus. There is no known therapy for fish that have been infected with IHNV. In Alaskan hatcheries, all infected lots of fish are destroyed. The occurrence of the disease is avoided through preventative measures including a virus-free water supply, rigorous disinfection, isolation of egg and fish lots and containment of diseased fish.

VII. Human Health Significance
There are no human health concerns associated with IHN virus.