I. Causative Agent and Disease

Erythrocytic necrosis virus, also called viral erythrocytic necrosis virus (VENV) is caused by several similar iridoviruses having double stranded DNA and an icosahedral shape ranging in size from 130-350 nm. The viruses infect erythrocytes causing a hemolytic disease often resulting in anemia and secondary infections by other pathogens.

II. Host Species

The virus probably has several different representative strains present worldwide in the marine environment infecting a large variety of anadromous and marine fish species. In Alaska, VENV has been detected in Pacific herring from several locations but has not yet been observed in salmonids. Results from experimental infections and occurrence of epizootics in young-of-the-year Pacific herring indicate that juveniles are more susceptible than older fish of the same species.

III. Clinical Signs

Adult herring generally show no clinical signs of disease. In juvenile Pacific herring, fish are anemic exhibiting almost white gills and pale visceral organs. Livers may be green in color due to bilirubin breakdown. Hemotocrits may be as low as 2 to 10%, erythrocytes are fragile causing hemolysis of blood samples, and immature erythrocytes predominate in peripheral blood. High mortality with dead fish washing up on the shoreline accompanied by extensive congregations of predator birds may occur in areas where juvenile herring are weakened by the disease.

IV. Transmission

Transmission of this virus in the marine environment is likely horizontal from fish to fish based on experimental studies where the virus has been transmitted by waterborne exposure. Adult carrier fish of susceptible species are probably the reservoirs of virus that is transmitted to juvenile fish. Anadromous fish likely become infected during the marine segment of their life cycle.

V. Diagnosis

Diagnosis is made with blood smears and/or transmission electron microscopy (TEM). Characteristic eosinophilic inclusion bodies are present in the cytoplasm of erythrocytes when stained with Giemsa or Wright stains. Impression smears of kidney hematopoietic tissue can be used if blood is unavailable. The virus is confirmed by the observation of iridovirus particles associated with inclusion bodies using TEM. VEN viruses have not been successfully cultured in the laboratory for lack of a method to cultivate erythroid cells.

VI. Prognosis for Host

The virus in Alaskan juvenile herring caused one of the first natural epizootics to be reported associated with mass fish mortality. Chronic to subacute mortality in juvenile Pacific herring can also occur.

VII. Human Health Significance

No human health concerns are associated with VEN virus.
Anemic Pacific herring with very pale gills and green livers commonly seen in VEN

Erythrocytes of Pacific herring with large eosinophilic cytoplasmic inclusion bodies (arrow), some surrounded by pink lattice composed of virus particles

Ultrastructural section of erythrocyte showing large virus particles (arrow) comprising the lattice surrounding inclusion bodies in stained smears, TEM