

# Erythrocytic Inclusion Body Syndrome (EIBS)

## I. Causative Agent and Disease

Erythrocytic inclusion body syndrome (EIBS) is caused by an unclassified icosahedral virus (70–80 nm) that infects erythrocytes of several salmonid fishes in fresh and seawater. Typically, EIBS presents with single or multiple pale, basophilic inclusions (0.4–1.6 µm) in the cytoplasm of erythrocytes in stained peripheral blood smears. Affected fish may be asymptomatic, but more often have varying degrees of anemia and secondary bacterial and fungal infections. In severe cases of uncomplicated anemia, cumulative fish mortality over 20% has been reported with hematocrits less than 20%.

## II. Host Species

EIBS has been found in Chinook, coho and Atlantic salmon in the Pacific Northwest, Japan, Norway and the British Isles. Other salmonid species showing variable susceptibilities by experimental injection with infected blood homogenates include cutthroat trout, masou salmon and chum salmon.

## III. Clinical Signs

Fish are lethargic, anorexic and anemic with chronic mortality often associated with secondary infections by other pathogens. Five stages of EIBS have been described: preinclusion, inclusion body formation, cell lysis with low hematocrits, recovery with increasing hematocrits and full recovery.

## IV. Transmission

The disease can be transmitted horizontally while surviving fish generally recover and develop an acquired immunity against reinfection that is transferable by passive immunization.

## V. Diagnosis

Isolation and replication of the virus in available fish cell lines has been unsuccessful. Thus, diagnosis is by observation of the small pale blue inclusion bodies in the cytoplasm of infected erythrocytes with confirmation by transmission electron microscopy (TEM). The virus is found free in the cytoplasm or more commonly occurs in membrane bound cytoplasmic inclusion bodies within erythrocytes.

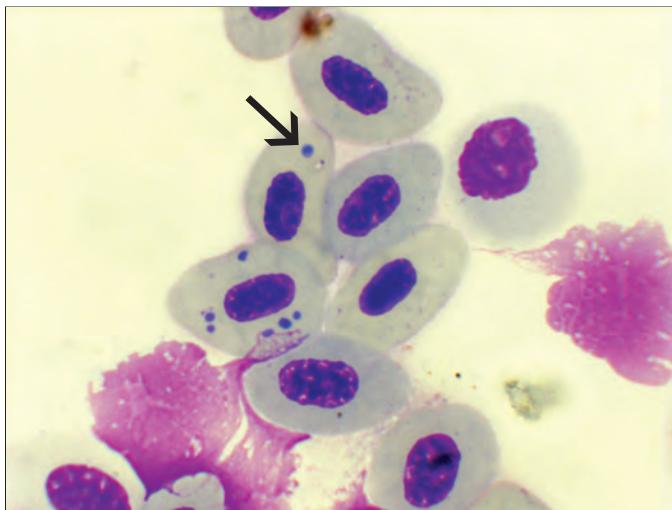
## VI. Prognosis for Host

Severe fish losses caused directly by EIBS are rare. However, fish become weakened from the anemia and mortality from other associated environmental stressors or secondary pathogens can be significant. The disease generally is self-limiting with recovery and immunity in survivors.

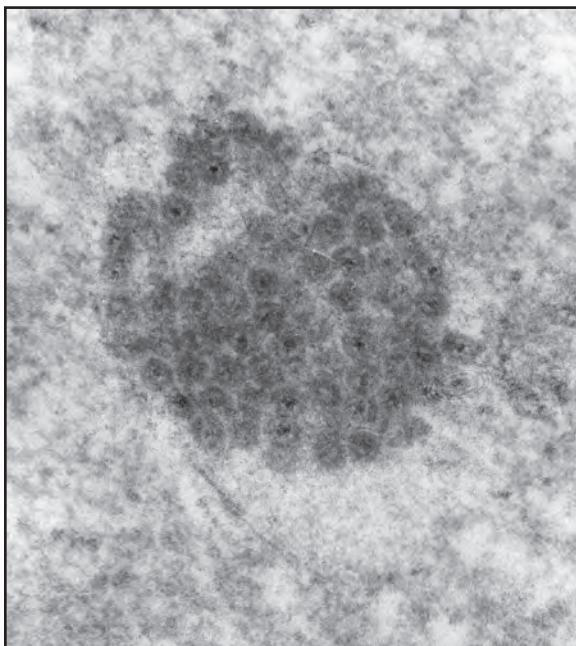
## VII. Human Health Significance

There are no human health concerns with the EIBS virus.

NOTE: In Alaska, only one case of EIBS has been reported in 2004 affecting juvenile Chinook salmon in seawater netpens. Subsequent studies have shown that EIBS in Japanese farmed coho salmon may be caused by a strain of Piscine Orthoreovirus (PRV-2). Molecular studies have determined that PRV is present in Alaskan coho and Chinook salmon. See PRV chapter for more detail.



Erythrocytes of Chinook salmon with small basophilic cytoplasmic inclusion bodies (arrow) typical of EIBS, X 1000.



EIBS inclusion body (not membrane-bound) composed of virus particles in the cytoplasm of an erythrocyte; transmission electron microscopy, X 56,400.