

Herpesvirus

I. Causative Agent and Disease

Herpesviruses are icosahedral, quasi-spherical viruses that have a lipid envelope. They are members of the family Herpesviridae and contain a genome of linear double stranded DNA with a particle size of 102-200 nm in diameter. There are approximately 120 herpesviruses infecting a wide range of vertebrates and invertebrates including marine bivalve molluscs. Herpesviruses can be serious pathogens of hatchery reared juvenile oysters and clams while significant mortality in nature may require the presence of environmental stressors.

II. Host Species

Herpes and herpes-like viruses have been reported worldwide in several bivalve mollusc species in North America, Mexico, Europe, South America, Australia, New Zealand and Asia. Infected bivalve hosts include 7 species of cupped and flat oysters, Manila clam, carpet shell clam and French scallop. In Alaska, herpesvirus-like particles associated with Cowdry Type A intranuclear inclusion bodies have been observed by transmission electron microscopy (TEM) in mantle epithelium of rock scallops and in the digestive gland epithelium of native littleneck clams from several sites throughout the state. Typical inclusion bodies have also been observed in the mantle epithelium of juvenile Pacific oysters from the southeast panhandle. Because herpesviruses in vertebrates are typically very host specific, bivalve herpesviruses may be comprised of several different genotypes. However, at least one virus, OsHV1, is capable of infecting several bivalve species.

III. Clinical Signs

Juvenile animals may exhibit slow or no growth with high mortality approaching 100% when seawater temperatures are 25-26°C. Infection is usually associated with intranuclear inclusion bodies and necrosis of host cells including connective tissues of the gills, interstitial cells around the digestive gland, epithelium of the mantle and the velar epithelium and hemocyte precursor cells in larvae. Occasional secondary bacterial infection of larvae and seed may further contribute to the severity of the mortality and confound the true etiology. However, no mortality of wild or cultured bivalve molluscs in Alaska has yet been associated with a herpesvirus infection.

IV. Transmission

Transmission is horizontal from animal to animal via ambient seawater or vertical transmission to progeny from infected parents.

V. Diagnosis

Diagnosis is based on histological observation of margined chromatin and eosinophilic Cowdry Type A inclusion bodies within hypertrophied nuclei of infected cells, although this cytopathology is not always present. Association of typical virus particles in infected cells is confirmed with TEM and PCR primers for certain strains of the virus are available for definitive identification. There are no bivalve cell lines available to culture these viruses which will not replicate in the existing cell lines that are available.

VI. Prognosis for Host

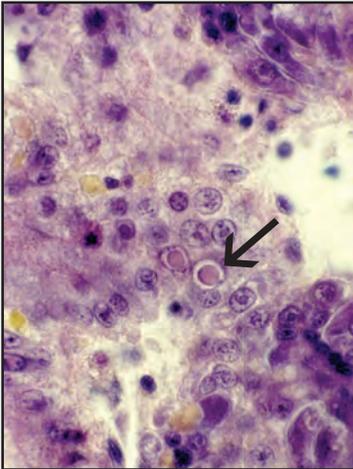
There is no treatment for systemic

virus infections except avoidance and prevention of virus introduction with infected shellfish stocks. Herpesvirus infection may result in high mortality of juvenile bivalve molluscs. Juvenile survivors and exposed adult animals become carriers of latent virus which may cause additional mortality during periods of stress and seawater temperature extremes. Seawater temperature has been lowered to reduce juvenile mortality in certain cultured bivalve species

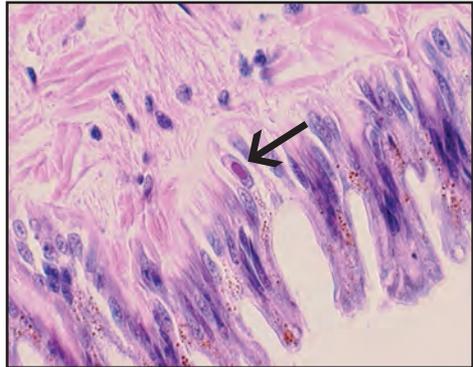
or spat deployment to infected culture areas has been avoided during periods of high seawater temperatures. In Alaska, optimum seawater temperatures for virus replication and high mortality may only occur in rare circumstances.

VII. Human Health Significance

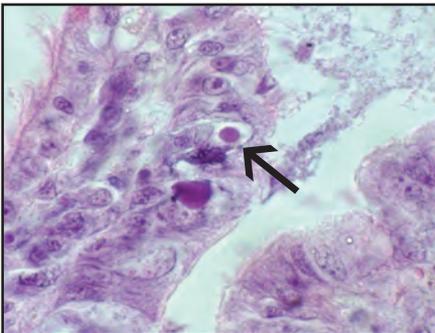
There are no zoonotic human health concerns regarding herpesvirus infections of bivalve molluscs.



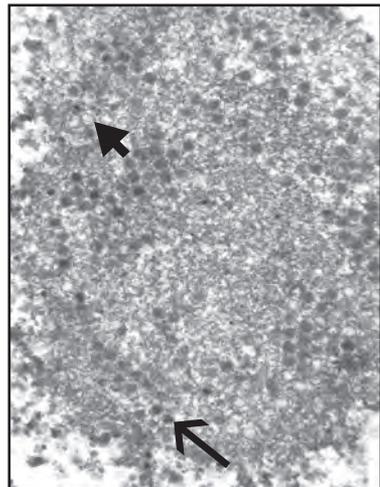
Histological section of Cowdry Type A intranuclear inclusion bodies (arrow) in the digestive epithelium of littleneck clam



Histological section of inclusion body (arrow) in the mantle epithelium of purple-hinged rock scallop



Histological section of intranuclear inclusion bodies in the mantle epithelium of Pacific oyster



Ultrastructural section of a Cowdry Type A inclusion body in a digestive tubule epithelial cell from littleneck clam showing nucleocapsids (arrow) and empty capsids (arrowhead) of herpes-like virus particles