Dermo Fact Sheet

Scientific Name: *Perkinsus marinus*
Common Name: Dermo, *Perkinsus*
Taxonomic Affiliation: Phylum = Alveolata, Family = Perkinsidae
Species Affected: *Crassostrea virginica* (eastern oyster); experimental infections in *Crassostrea gigas* (Pacific oyster) and Crassostrea ariakensis (Suminoe oyster)

Geographic Distribution:

East coast of the US from Maine to Florida and along the Gulf coast to the Yucatan Peninsula. Reports of *P. marinus* from other areas need to be confirmed as *P. marinus* with molecular assays.

History:

Dermo disease was first documented in the 1940s in the Gulf of Mexico where it was associated with extensive oyster mortalities. The causative agent was initially thought to be a fungus and was called *Dermocystidium marinum*. Based on structural characteristics the organism was reclassified *Labyrinthomyxa marina* in 1966 and as *Perkinsus marinus* in 1978. The disease was found in Chesapeake Bay in 1949 and it has consistently been present in the Bay since that time. The parasite was observed in Delaware Bay in the mid 1950s following the importation of seed from the Chesapeake Bay. An embargo of seed resulted in the disappearance of the disease from Delaware Bay for more than 3 decades. However, an epizootic recurred in Delaware Bay in 1990 and since 1991 the parasite has been found in Connecticut, New York, Massachusetts, and Maine. This apparent range extension is believed to be associated with abnormally high winter temperatures, drought conditions, and the unintentional introduction of infected oysters or shucking wastes.

In the Chesapeake Bay, Dermo disease has increased in importance since the mid 1980s. Several consecutive drought years coupled with above average winter temperatures resulted in expansion of the parasite's range into upper tributary areas and the parasite became established at all public oyster grounds in Virginia. The parasite has persisted in these areas despite a periodic return to normal salinity conditions. In addition to its baywide distribution, *P. marinus* is also present in the embayments along the Atlantic coast of Virginia.

Biology and Epizootiology:

The seasonal cycle of *P. marinus* has been well documented in Chesapeake Bay. Transmission of the parasite is direct from oyster to oyster. Waterborne infective stages are present throughout the warm months, May through October. Initial infections are typically observed in July and peak prevalences and intensities, and maximum mortalities, are observed in September and October. Prevalence in surviving oysters declines dramatically during the late winter and spring and infections may become undetectable by the standard diagnostic assay. However, low numbers of parasites remain and these parasites proliferate once temperatures increase in late spring. Infective stages of the parasite are released from infected and dying oysters, thereby initiating another infection cycle. The infective stages become waterborne and are acquired as oysters feed. Within the oyster, early infections are observed in digestive gland tissues. The most prominent stage is a single cell stage called the trophont. These cells

divide forming a multicellular stage called a meront. Meronts enlarge and rupture releasing many small trophonts. Under certain conditions, in artificial media and occasionally in moribund oysters, the parasite produces a third stage known as a biflagellate zoospore.

Infections are usually not acquired in oysters less than a year old but prevalences may be high during the oysters second year and mortality may result. Moderately to heavily infected oysters usually exhibit a reduction in growth rate, poor condition, and reduced reproductive capacity. Oyster death results as a consequence of hundreds of thousands of parasites "taking over" the oyster, lysing tissues, and occluding hemolymph vessels.

Environmental Influences:

Temperature and salinity are the two most important environmental factors influencing Dermo disease. The parasite proliferates and infections intensify above a threshold of 20°C. At temperatures above 25°C, the parasite rapidly multiplies, spreads, and kills oysters. Infections decline at temperatures below 15-20°C. In nature the most dramatic decline is observed in late winter and early spring. Abnormally warm winters may result in a higher proportion of over-wintering parasite cells.

Prevalence and infection intensities of *P. marinus* increase with increasing salinity. During drought years, elevated salinities result in an intensification of the disease. High intensity infections and high mortalities often occur in areas with salinities above 12-15 ppt. Infection intensities remain low in areas with salinity consistently below 9 ppt. Once established in a low salinity area the parasite can persist for years.

Control Measures:

Dermo disease is easily transmitted from oyster to oyster so it is imperative to avoid moving infected oysters into an area containing uninfected oysters. Holding oysters at salinities less than 9 ppt will retard disease development and restrict disease associated mortalities. If possible, let grow out areas remain fallow for one to two years before planting seed stocks.

Diagnostic Method:

Ray's Fluid thioglycollate media (RFTM) culture assay is the standard diagnostic technique. This method involves culturing small pieces of oyster tissue in FTM for 4-7 days. Following culture the tissue is stained with Lugol's iodine and examined using a light microscope. *Perkinsus marinus* cells will appear as blue to black stained spheres. Modifications of this assay exist for the examination of oyster hemolymph and total parasite burdens in whole oyster tissues. The RFTM assay is not species specific and will diagnose any *Perkinsus* sp. Species specific polymerase chain reaction (PCR) assays have been developed; however, PCR is not employed for routine diagnosis.