5.2.6 Nocardiosis of Pacific Oysters

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A. Name of Disease and Etiological Agent

Nocardiosis is caused by an actinomycete bacterium that belongs to the genus *Nocardia*, but of uncertain species designation. The disease has previously been referred to as "focal necrosis" and "fatal inflammatory bacteremia." It is also likely synonymous with a condition described as multiple abscesses in Japan.

B. Known Geographical Range and Host Species of the Disease

1. Geographical Range

Found in Matsushima Bay, Japan; discontinuously on the west coast of North America from Tomales Bay, California to British Columbia, Canada, and including oyster culture areas in Willapa Bay and Puget Sound, Washington.

2. Host Species

Occurs in Pacific oyster *Crassostrea gigas*. A morphologically similar condition has been reported in European flat oysters *Ostrea edulis* cultured in areas where the disease is enzootic in the Pacific oyster.

C. Epizootiology

The mortality rate due to this disease has not been accurately measured. However, the severity of the disease in individual oysters and the high prevalence in some populations suggest that it is a significant mortality factor. In one study it was reported to occur in about 30% of oysters sampled from south Puget Sound, Washington during September and October. The widespread geographic occurrence of the disease suggests that it potentially occurs wherever the Pacific oyster is cultured and that the causative bacterium is possibly ubiquitous and acquired from the environment. In Puget Sound, areas that appear to have the most frequent and severe occurrence of the disease are shallow bays that are subject to warm summer temperatures. In British Columbia, the disease has been found in areas other than warm shallow embayments such as on firm, rocky, and sand bottoms. The disease is found in Puget Sound in oysters from both mud and gravel-bottom bays. The disease is a summer and fall phenomenon, typically observed from August through November. The disease may be present in some populations at other

times of the year but at a lesser intensity.

D. Disease Signs

Formation of yellow pustules up to 2 mm in diameter on the surface of the mantle, gill, and typically in the vicinity of the adductor muscle and heart in animals with advanced cases of the disease (Figure 1). It must be noted that similar lesions apparently result from a variety of other infections in oysters and are reported to represent a generalized host response to certain infectious agents. In nocardiosis, clumps of branching bacteria may be visible in wet mounts made from the pustules.

E. Disease Diagnostic Procedures

1. **Presumptive Diagnosis**
   Presumptive diagnosis is based on observation of gram-positive branching colonies in stained impression smears made from the pustular lesions described above.

2. **Confirmatory Diagnosis**
   Confirmatory diagnosis is based on characteristic histological signs of the disease: dense clumps of deeply staining, basophilic, gram-positive, PAS-positive, branching bacteria in vascular spaces of the connective tissues near the stomach, style sac, and intestine and in gonadal follicles and ducts (Figure 2). The bacteria elicit a marked infiltration of host hemocytes around the bacterial cells. In histological sections, it is typical to observe accumulations of hemocytes in which the core of eliciting bacteria is not visible. In advanced infections, the hemocytic infiltration may occupy most of the connective tissue of the oyster, and the connective tissue degenerates into densely staining tissue.

F. Procedures for Detecting Subclinical Infections

Observation of the characteristic lesions by histological examination.

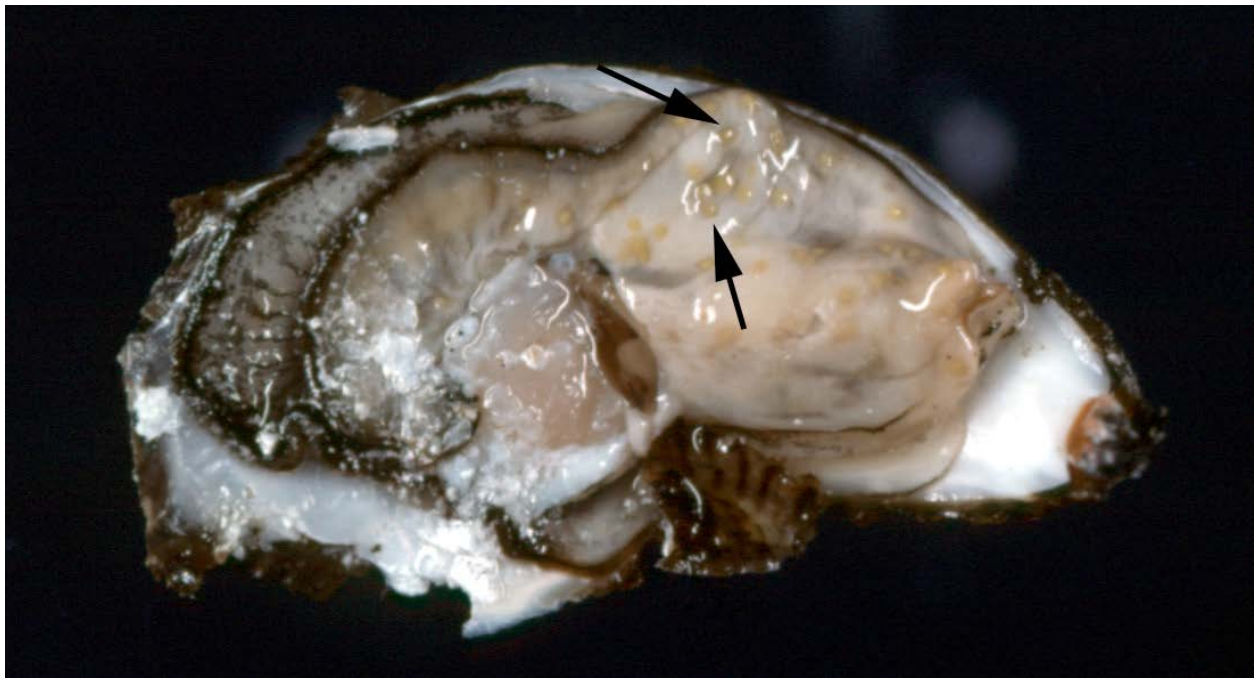

Figure 1. Pacific oyster with nocardiosis. This disease as well as others such as Denman Island disease is characterized by the formation of yellow to green pustules on the mantle and other surfaces as shown here (arrows). From Elston et al. 1987, with permission.

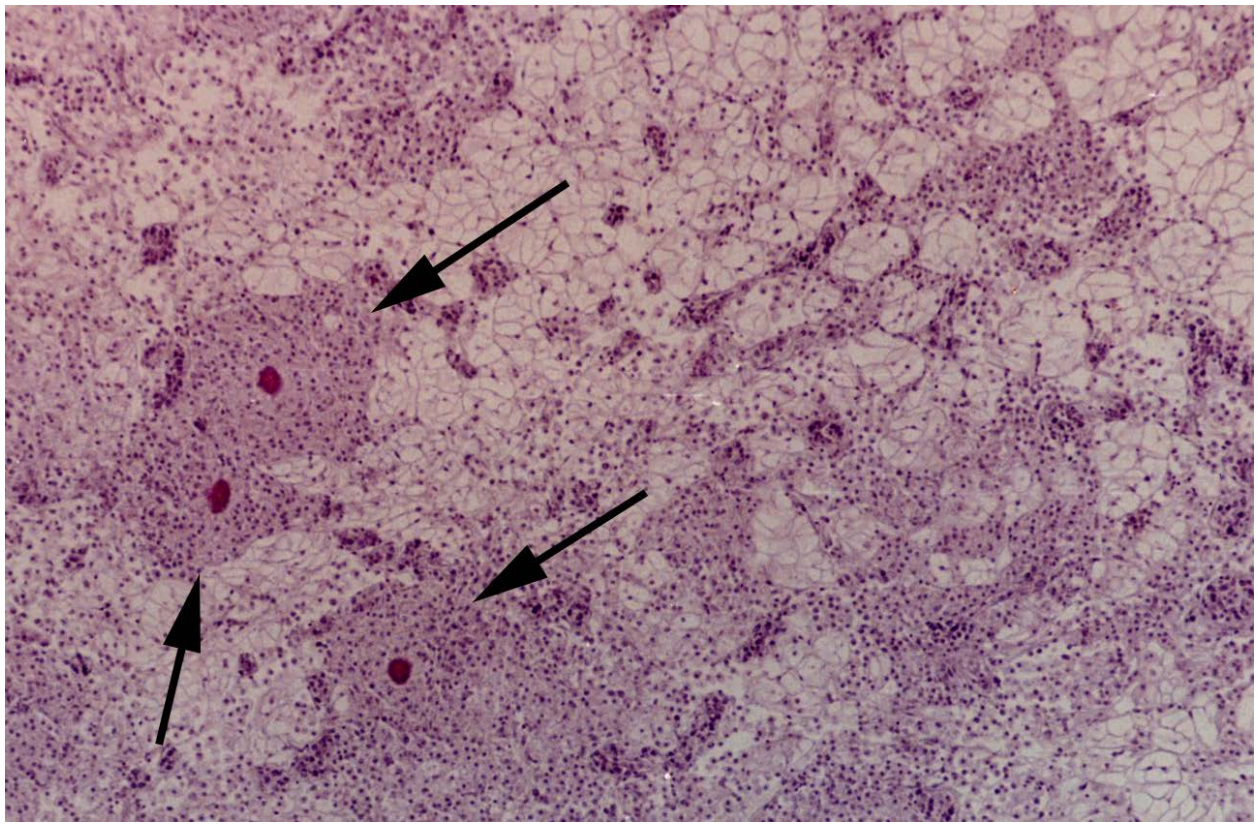

Figure 2. Low magnification of vesicular tissue of Pacific oyster with several foci of *Nocardia* sp. (arrows) surrounded by prominent zones of oyster hemocytes. The other zones of hemocyte infiltration in which the foci of bacteria are not seen in the histological section are typical of the disease, 90X.

References

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