Prokaryotic Intracytoplasmic Inclusions

I. Causative Agent and Disease

Unlike bivalve molluscs, there are fewer reports of prokaryotic intracytoplasmic inclusion bodies in crustaceans of which 13 cases were caused by rickettsia-like organisms and one other by chlamydia-like bacteria. All infections produced intracytoplasmic inclusions or microcolonies infecting a wide range of tissues in both freshwater and marine crustaceans. The organisms are either confined to the hepatopancreatic epithelium or are systemic and vary in their significance from mildly to seriously pathogenic causing cell enlargement with organ and tissue necrosis including demonstrated or suspected mortality. However, in several of these cases other serious pathogens were also present which may have contributed to the mortality and the observed disease syndrome.

II. Host Species

The single documented chlamydia-like agent was reported from a large Dungeness crab mortality in Puget Sound, Washington. Rickettsia-like agents have been reported from crustaceans in the United States from Florida, Hawaii and Washington, and from British Columbia, Canada, France, Sweden, Mexico, Ecuador, Madagascar, China, Malaysia and Australia. Host species have included wild freshwater amphipods and cultured crayfish, at least five wild and cultured species of penaeid shrimp, one species of wild pandalid shrimp, and one cultured and three wild crab species including a 1984 report of one blue king crab from the eastern Bering Sea near St. Lawrence Island. Later studies (1990) in southeast Alaska reported a similar rickettsial agent infecting one blue and one golden king crab held captive after collection from Glacier Bay and Lynn Canal near Haines, Alaska.

III. Clinical Signs

Clinical signs vary from normal in appearance to lethargy with mortality and tissue discolorations. King crabs infected by rickettsial organisms may have arrested ovarian development, become lethargic and die when held for prolonged periods of time. Infected tissues in king crabs have included the epithelial cells of the antennal gland and hepatopancreas that become indurated and friable. Histological examination of infected tissues demonstrates enlarged cells with intracytoplasmic inclusions composed of microcolonies of rod-shaped bacteria causing disseminated granulomatous foci and caseous necrosis of the tissues.

IV. Transmission

Certain rickettsia-like organisms in cultured and wild shrimp have been transmitted horizontally by cannibalism and via seawater exposure. Similar studies with other rickettsias either have not been successful or the mode of transmission is unknown.

V. Diagnosis

Histological examination of infected tissues reveal the typical enlarged cells containing microcolonies of organisms. Confirmation of typical rickettsial or chlamydial morphology is by transmission electron microscopy. PCR may be available for certain agents described in the literature. None of these agents have

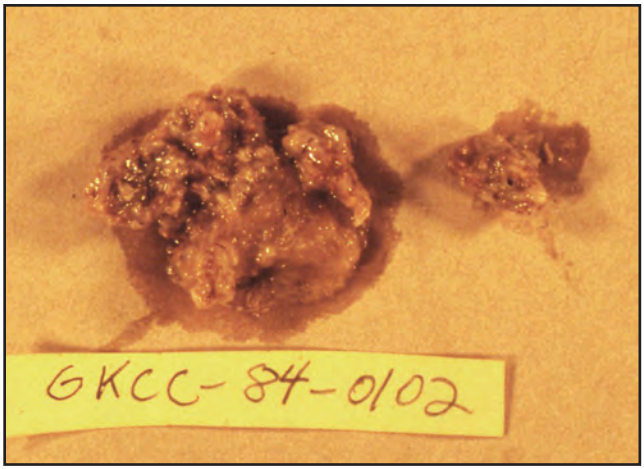
been isolated in culture using conventional methods.

VI. Prognosis for Host

Infections can be light and insignificant but low to high mortality has also been reported for both wild and cultured shrimp and crabs.

VII. Human Health Significance

There are no known zoonotic human health concerns regarding infection of crustaceans by these poikilothermic organisms which are different from similar organisms causing diseases in higher animals.



Caseous necrosis of hepatopancreas from golden king crab infected with a rickettsia-like organism that has destroyed hepatopancreatic tubules

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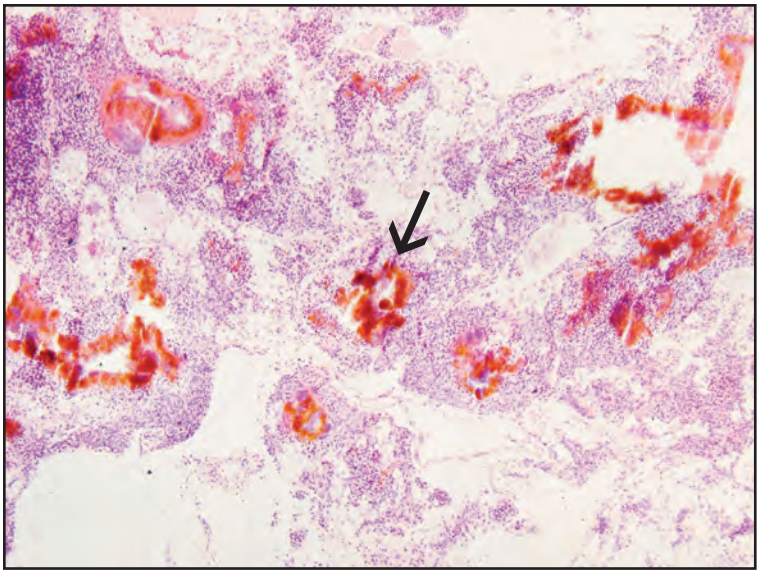
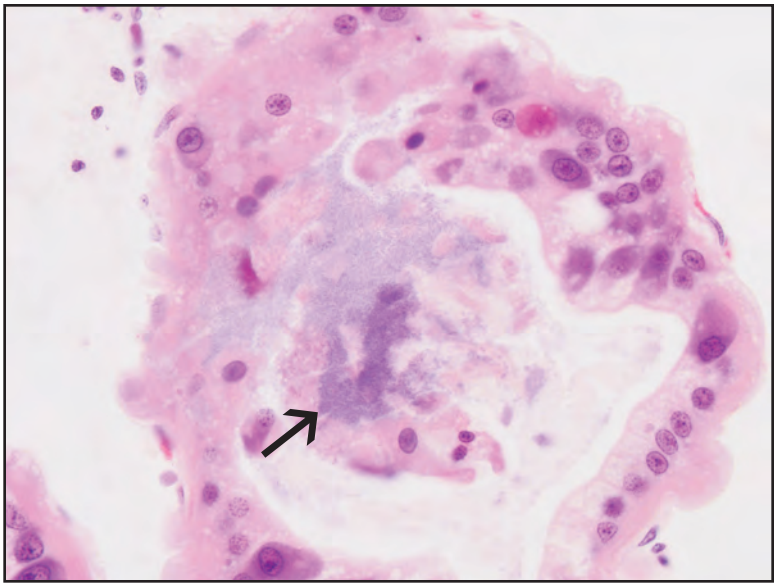
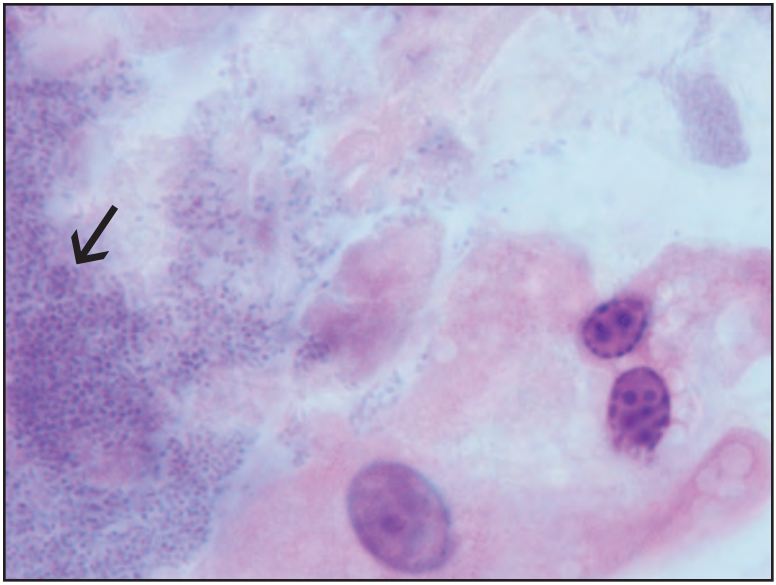


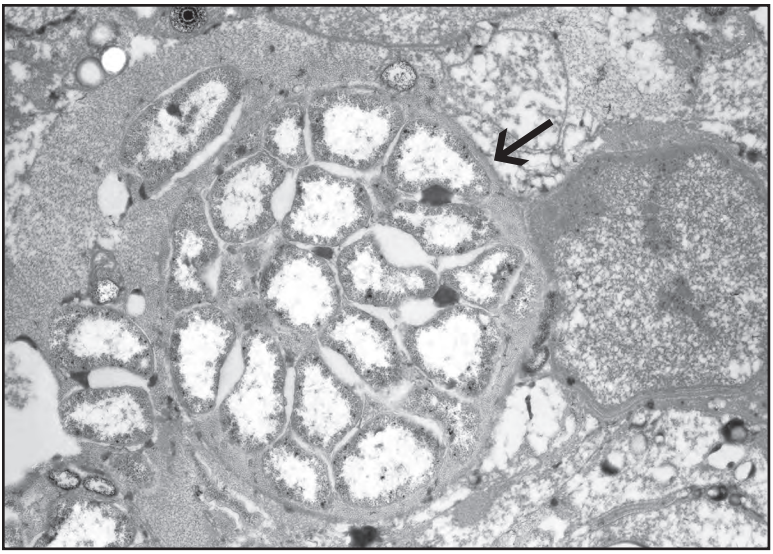
Histological section of tubular necrosis (arrow) and intense host inflammatory infiltration caused by infection with rickettsia-like organisms



Histological section of infected hepatopancreas epithelium showing microcolonies (arrow) of rickettsia-like organisms



Higher magnification of rickettsia-like organisms (arrow)



TEM of an infected hepatopancreatic cell showing a colony of rickettsia-like organisms (arrow)