

# Shell Disease

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## I. Causative Agent and Disease

Shell disease is a progressive degradation of the crustacean cuticle characterized externally by melanized brown to black focal lesions of varying size and severity regarding penetration of the surface exoskeleton. The disease can occur in nearly all freshwater and marine crustaceans, usually at low prevalences except when host animals are stressed by poor environmental conditions caused by intensive aquaculture, animal impoundment or waters polluted by chemicals, sewage or heavy metals. The shell erosion is largely attributed to colonization by chitinoclastic bacteria in areas of shell injury initially caused by poor environmental conditions, predation or cannibalism. Studies of shell disease in some crab species have shown that resulting shell ulcerations lead to limited septicemia by these and other opportunistic bacteria resulting in damage to internal organs and tissues. Many different bacteria have been associated with shell disease but common isolates include species from several Gram-negative genera such as *Achromobacter*, *Acinetobacter*, *Aeromonas*, *Plesiomonas*, *Pseudomonas* and *Vibrio*, all of which are commonly found on the shell surface of healthy animals. Fungal organisms are rarely encountered in the larger more severe lesions.

## II. Host Species

Shell disease has been reported to occur in many different species of crustaceans worldwide. In Alaska, shell disease has been observed in feral populations of red, blue and golden king crabs, Tanner crabs and Dungeness crabs. However, all freshwater and marine crustaceans are considered susceptible to the disease.

## III. Clinical Signs

Crustaceans with shell disease present with brown to black focal shell erosions of varying size and severity that may penetrate into the soft tissues.

## IV. Transmission

Transmission is horizontal via water containing the common flora of chitinoclastic bacteria. Initiation of the external lesions generally requires previous shell injury or degradation as a portal of bacterial invasion. In Alaska, shell disease, loss of limbs, lower fecundity and mortality in Dungeness crabs have been associated with benthic deposits of decomposing bark and sulfide at logging transfer sites.

## V. Diagnosis

Diagnosis is determined by typical shell surface lesions associated with Gram-negative bacterial rods that can be cultured on conventional media and identified by biochemical tests. Histological examination indicates varying degrees of melanization, erosion and ulceration of the shell layers with bacteria and occasional protists colonizing the surface accompanied by inflammatory exudate in the underlying dermis and epidermis. Hemocytes may form a protective pseudomembrane overlying some lesions.

## VI. Prognosis for Host

In the initial stages, shell disease is likely not fatal but mortality is known to occur from adhesion of molted shells at the lesion sites leading to incomplete withdrawal from the old exoskeleton. Mortality can also occur from secondary bacterial septicemia if shell erosion progresses to the soft underlying tissues.

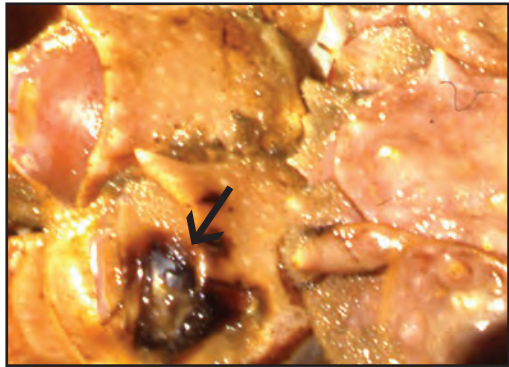
**VII. Human Health Significance**

Shell disease in crustaceans is unsightly and some of the associated vibrios and pseudomonad bacteria are known human pathogens. However, there

have been no reports on which to base any zoonotic human health concerns associated with shell disease in crustaceans.



Erosion of carapace (arrow) due to shell disease in red king crab



Erosion of carapace (arrow) due to shell disease in golden king crab



Dungeness crab from a logging transfer site with shell disease and loss of limbs (Photo: C. E. O'Clair, National Marine Fisheries Service, Juneau)