

Immune Responses of Bivalves to Environmental Pollution and Abiotic Stress

ABSTRACT

Bivalves are important for ecosystems providing food security for humans. Unfortunately, many bivalve fisheries are declining due to overexploitation, and attempts to culture important bivalve species are underway. However, the growth and survival of cultured bivalves are constantly challenged by various biotic and abiotic factors affecting their immune system. Hence, this paper reviews the current information about the immune response of bivalves to environmental pollution and abiotic stress. The review on environmental pollution was focused on heavy metals and harmful algae, whereas bivalves' responses to abiotic stress were focused on temperature and salinity stress. In this review, relevant scientific articles were examined to gain insights into the immune system of bivalves toward pollutants and abiotic stress. It revealed that more studies have been conducted on the effect of heavy metals and harmful algal blooms on the immune response of bivalves. In contrast, the information on temperature and salinity stress is scarce. Different bivalve species differed in their immune responses to these stressors. Total haemocyte count (THC), phagocytosis, apoptosis, lysozyme, and reactive oxygen species (ROS) were some of the immune factors activated during exposure to heavy metals, harmful algal blooms, and their biotoxins, as well as salinity and temperature stress. These factors play important roles in protecting bivalves from pollution and stress. Healthy bivalves showed an increase in THC, lysozyme, and phagocytosis and a decline in apoptosis and ROS. For successful conservation and aquaculture of bivalves, it is important to ensure that the habitats are not polluted by heavy metals or biotoxins. Although few studies were concerned about the effect of temperature and salinity stress on bivalve immune responses, they deserve attention as different bivalve species have different temperature and salinity preferences, given global warming and acidification.