Chapter 8

An Insightful Model to Study Innate Immunity and Stress Response in Deep-Sea Vent Animals: Profiling the Mussel *Bathymodiolus azoricus*

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Additional information is available at the end of the chapter

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Abstract

Deep-sea environments are, in some cases, largely unexplored ecosystems, where life thrives driven by the geochemical features of each location. Among these environments, chemosynthesis-based ecosystems, in the Mid Atlantic Ridge, have an exclusive combination of high depth, high sulfur, and high methane concentrations. This is believed to modulate the biological composition of vent communities and influence the overall vent animal transcriptional activity of genes involved in adaptation processes to extreme environments. This opens, thus, the possibility of finding gene expression signatures specific to a given hydrothermal vent field. Regardless of the extreme physicochemical conditions that characterize deep-sea hydrothermal vents, the animals dwelling around the vent sites exhibit high productivity and thus must cope with toxic nature of vent surrounding, seemingly deleterious to the animals, while developing surprisingly successful strategies to withstand adverse environmental conditions, including environmental microbes and mechanical stress whether ensuing from animal predation or venting activity. The deep-sea vent mussel *Bathymodiolus azoricus* has adapted well to deep-sea extreme environments and represents the dominating faunal community from hydrothermal vent sites in the Mid-Atlantic Ridge, owing its successful adaptation and high biomasses to specialized exploitation of methane and sulfide sources from venting activity. Its extraordinary capabilities of adapting and thriving in chemosynthesis-based environments, largely devoid of photosynthetic primary production and characterized by rapid geochemical regime changes are due to symbiotic associations with chemosynthetic bacteria within its large gills. In an attempt to understand physiological reactions in animals normally set to endure extreme deep-sea environments, our laboratory has undertaken, for the