The Use of Stress Protein Expression in Environmental Assessment

Drew C. Brown, Brian P. Bradley, and Michael Tedengren
University of Maryland Baltimore County,, USA
and University of Stockholm,, Sweden

A characteristic shared by inland seas is variable salinity. Marine or freshwater organisms adapting to different salinities may be constantly stressed. Salinity stress can appear as reduced scope for growth and may inhibit a successful response to additional, anthropogenic stresses. Heat shock (or stress) proteins are an evolutionarily conserved, rapid response to stress, occurring in hours. These proteins are found in all organisms and are quite similar from man to bacteria. Some respond to specific stresses, including heavy metals and organics. HSP70 is a family of 70,000 Da stress proteins that is useful as a general indicator of stress. It is induced by temperature, disease, and metals, among others. Stress proteins in general may be observed as changes in the protein profile on silver stained gels, while HSP70 can be detected by specific antibody blots. We have examined the response in *Crassostrea virginica*, the American oyster, growing in the Chesapeake Bay from 10 ppt salinity to full strength sea water (35 ppt), and in *Mytilis edulis*, the blue mussel. *M. edulis* is found as large individuals in the North Sea and in much smaller sizes in lower salinity in the Baltic Sea. Rapid salinity or temperature changes result in a change in protein profile and in levels of HSP70 in both species. North Sea mussels challenged with cadmium had high levels and multiple forms of HSP70 and lower mortality compared to Baltic Sea mussels, perhaps reflecting their relative stress levels in ambient conditions. HSP70 and other stress proteins may provide a simple diagnostic tool for use in environments such as the Chesapeake Bay and the Baltic Sea, where animals are at the limit of their adaptability and salinity stress may inhibit an adaptive response to other stressors.