Are There Salinity Stress Proteins?

Carole R. M. Gonzalez and Brian P. Bradley
University of Maryland Baltimore County, U.S.A

Seasonal densities of *Eurytemora affinis*, a calanoid copepod in the Chesapeake Bay, seem to be controlled by temperature and salinity. Median survival time of *Eurytemora* was assayed across a range of salinity/temperature regimes. *Eurytemora* survived equally well in all salinities (2-20 ppt) at the control temperature of 15°C. However, at a temperature of 25°C, survival was impaired at all salinities, especially 2, 15 and 20 ppt. These results agree with the known natural distribution of *Eurytemora* and other laboratory data.

To further examine the role of osmotic stress, we analyzed protein synthesis under various conditions of temperature and osmotic stress. Adult females were exposed, in groups of 5-10, for 5 hours to different temperature and salinity regimes in the presence of isotope labeled amino acid. Newly synthesized (stress) proteins could be separated and identified using denaturing polyacrylamide gel electrophoresis and autoradiography.

The protein profiles occurring in copepods experiencing osmotic shock alone were different from those of control animals. Copepods transferred to lower (2 and 5 ppt) and higher (15 and 20 ppt) salinities showed differences in the up- and down-regulation of specific proteins. Animals transferred from 10 ppt to lower salinity expressed new proteins of 24 and 26 kilodaltons (kD) in size. However, a 30 kD protein band was unique to animals transferred from 10 ppt to higher salinity. A protein band in the 37-39 kD range appeared to indicate extreme osmotic stress, occurring in animals treated at 2, 5 and 20 ppt.

Concurrent heat stress changed these protein expression patterns. Animals experiencing osmotic and heat shock at the same time exhibit enhanced expression of another set of proteins which is the same, regardless of salinity. A 37-39 kD protein band appears to be a heat shock protein, as well as a new 60-63 kD band.

Variation in induced proteins occurred among individuals. Significant effects of temperature and salinity should be identifiable in natural populations. It will be necessary to be able to distinguish such effects from those of xenobiotics if stress proteins are to be applied as a biomonitoring tool, an avenue under investigation by this lab and others.