Small fish provide major insight into how organisms adapt to change

A team of scientists that includes Lung Biology Center investigators Bruce Stanton and Thomas Hampton have identified the genes and regulatory networks that enable organisms to alter themselves physically in response to changes in their environment.

The paper was published in the journal *Molecular Biology and Evolution* and was named one of the “papers of the month” by the National Institute of Environmental Health Sciences.

The research team studied how the Atlantic killifish, a common, small fish, modifies its gills to live in freshwater or saltwater. While some of the structures used to maintain salt balance were already known, this new study sheds light on how the killifish coordinates the many changes necessary for their gills to transition from one form to the other.

The team found a surprising level of uniformity among individual fish in the genetic response to changing salinity, indicating that the genes and regulatory networks involved have been tightly controlled by evolutionary processes.

Joe Shaw, Ph.D., associate professor at the School of Public and Environment Affairs at Indiana University, and former postdoctoral fellow at Dartmouth, led the study along with co-author Bruce Stanton, Ph.D., professor of microbiology and immunology at the Geisel School of Medicine at Dartmouth.

To track changes in genetic activity during the study, the researchers added arsenic to the fish’s water. Previous studies of fish living in polluted environments had demonstrated that arsenic interferes with the fish’s ability to acclimate to changing levels of salinity. Stanton and Shaw conducted some of those studies at the Callahan Mine Superfund site in Brooksville, Maine.