Biologists decode turtle genome

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Credit: Steve Dolan

A group of 50 researchers from around the globe, including biology professors Daniel Warren, Ph.D., from Saint Louis University and Leslie Buck, Ph.D., from the University of Toronto, have spent the last several years sequencing and analyzing the genome of the western painted turtle and the results of their research point to some important conclusions that may be important for human health.

The western painted turtle, one of the most widespread and well-studied turtles, exhibits an extraordinary ability to adapt to extreme physiological conditions and it is that adaptability that might have a direct relevance to human health conditions, particularly those related to oxygen deprivation and hypothermia and longevity.

Warren, an assistant professor in SLU's Department of Biology, shared the background of the research and its importance in medical treatments.

"This remarkable turtle has the ability to survive without oxygen longer than any other air-breathing vertebrate for as long as four months when they overwinter under the ice of their frozen ponds," Warren said. "Many human diseases, however, involve tissue damage caused by oxygen deprivation, such as occurs with stroke and heart attack."

"Our contribution to the *Genome Biology* study was to carry out an experiment here at SLU, to identify genes in the turtle's heart and brain that might account for the abilities to avoid this tissue damage," Warren added. "We focused our efforts especially on those genes that are also present in our own human genome."

Buck, associate chair of Graduate Studies in the department of Cell and Systems Biology at the University of Toronto, and co-investigator on the study, said the painted turtle's ability to survive without oxygen has important implications related to the use of anesthetics on human patients.

"The turtle's brain naturally survives without oxygen (anoxia) during this period and this makes it a great model to study the ways we can protect human brain from the debilitating effects of stroke," Buck said. "And there's more. When faced with low oxygen conditions it rapidly lowers metabolism by over 90 percent, similar to the effect of anesthetics during human surgeries. It may therefore also be a natural anesthetic model in which we can explore safer forms on anesthesia."

"Our RNA sequencing data in the genome paper reveals over 13000 genes in common with humans and 19 genes that increase their activity in turtle brain and 23 in heart following 24 hours of anoxia. One even increases 130 fold above controls giving us excellent leads to follow in our study of the mechanisms underlying natural anoxia tolerance," Buck added.

More information: genomebiology.com/2013/14/3/R28/abstract

Provided by University of Toronto