Scientists discover possible building blocks of ancient genetic systems

November 9 2012

Scientists believe that prior to the advent of DNA as the earth's primary genetic material, early forms of life used RNA to encode genetic instructions. What sort of genetic molecules did life rely on before RNA?

The answer may be AEG, a small molecule when linked into chains form a hypothetical backbone for Peptide Nucleic Acids, which have been hypothesized as the first genetic molecules. Synthetic AEG has been studied by the pharmaceutical industry as a possible genesilencer to stop or slow certain genetic diseases. The only problem with the theory is that up to now, AEG has been unknown from nature.

A team of scientists from the USA and Sweden announced that they have discovered AEG within cyanobacteria which are believed to be some of the most primitive organisms on earth. Cyanobacteria sometimes appear as mats or scums on the surface of reservoirs and lakes during hot summer months. Their tolerance for extreme habitats is remarkable, ranging from the hot springs of Yellowstone to the tundra of the Arctic.

"Our discovery of AEG in cyanobacteria was unexpected," explains Dr. Paul Alan Cox, coauthor on the paper that appeared today in the journal PLOS ONE. The American team, is based at the Institute for Ethnomedicine in Jackson Hole, and serve as adjunct faculty at Weber State University in Ogden, Utah.

"While we were writing our manuscript," Cox says, "we learned that our colleagues at the Stockholm University Department of Analytical Chemistry had made a similar discovery, so we asked them to join us on the paper."

To determine how widespread AEG production is among cyanobacteria, the scientists analyzed pristine cyanobacterial cultures from the Pasteur Culture Collection of Paris, France. They also collected samples of cyanobacteria from Guam, Japan, Qatar, as well as in the Gobi desert of Mongolia, the latter sample being collected by famed Wyoming naturalist Derek Craighead. All were found to produce AEG.

Professor Leopold Ilag and his student Liying Jiang at Stockholm University's Department of Analytical Chemistry analyzed the same samples and came up with identical results: cyanobacteria produce AEG. While the analysis is certain, its significance for studies of the earliest forms of life on earth remains unclear. Does the production of AEG by cyanobacteria represent an echo of the earliest life on earth?

"We just don't have enough data yet to draw that sort of conclusion," reports Cox. "However the pharmaceutical industry has been exploring synthetic AEG polymers for potential use in gene silencing, so I suspect we have much more to learn."

More information: www.plosone.org/article/info:d … journal.pone.0049043

Provided by Weber State University

ancient-genetic.html