THE UNIVERSITY of EDINBURGH

News Release

Issued: Thursday 15 October 2015

Tiny plant shows us how living things cope with big changes

A small freshwater plant that has evolved to live in harsh seawater is giving scientists insight into how living things adapt to changes in their environment.

The findings could help scientists better understand how species have been able to adapt to major shifts of circumstances in the past, such as transferring from water to land, or from light to dark environments.

In adapting to new surroundings, organisms must develop ways to perform everyday functions, such as securing food and oxygen, and reproducing. The latest study is one of the first to track such a significant lifestyle transition in the lab, instead of relying on fossil clues.

Researchers studied successive generations of a common freshwater algae, *Chlamydomonas reinhardtii*, in increasingly salty water. These plants have a key role in providing nutrients and removing carbon dioxide from the atmosphere, so understanding how they can evolve from freshwater to seawater aids understanding of the history and diversity of life on Earth.

They found that freshwater algae adapted to seawater in two stages. Initially, the plant was able to switch on genes that helped it tolerate low salt levels. As salt levels increased, changes enabled those genes to stay switched on – indicative of a process known as epigenetics.

Later, random changes that took place in the DNA itself during reproduction gave rise to individuals that could tolerate even higher levels of salt. As the algae multiplied, these genes became commonplace in the population, enabling the plant to thrive in seawater. The findings show the importance of genetic and epigenetic changes in adapting to new environments.

The study, published in *Evolution*, was carried out by the University of Edinburgh and McGill University in Canada, and supported by the Natural Sciences and Engineering Research Council in Canada.

Josianne Lachapelle, of the University of Edinburgh's School of Biological Sciences, who led the study, said: “Our approach enables a new way to understand how living things evolve new ways of life during major transitions. Our findings have significant potential for revealing more about the processes that underpin change during evolution.”

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