Genome replication may hold clues to cancer evolution

March 4 2015

The more copies of an organism's genome in its cells, the more those cells seem to benefit in terms of growth and adaptation.

So says a study completed with the help of Creighton University microbiologist Anna Selmecki, Ph.D., which will be published in the journal *Nature* this month. Using populations of yeast, Selmecki and a team of researchers from around the country determined that polyploidy—having more than two copies of an organism's genome in one cell—greatly aids in the cells' ability to adapt to their environments. The study may have implications for the study of cancer cells, which are often polyploid and aneuploid (having an abnormal chromosome number).

"Having extra copies of the genome does seem to allow for faster adaptation in yeast," said Selmecki, who began this research as a postdoctoral fellow at the Dana-Farber Cancer Institute and Harvard Medical School. "It seems like such a simple study, but we were able to compare the rate of adaptation of diploid cells, like those which make up most of the human body, to genetically identical polyploid cells, and then sequence the entire genome of about 75 individuals to see how they adapted during the experiment."

Selmecki said she was fascinated by the multiplicity she observed in the yeast populations that started out polyploid. In cancer, she said many tumor cells undergo a genome doubling, and become tetraploid (having four copies of the genome). From there, many mutations can manifest, often with irregularities that develop quickly. Getting a handle on those adaptations could help in cancer diagnosis and treatments.

Using genomics, cell biology, evolutionary theory, and mathematical modeling, Selmecki's research captured the attention of the American Cancer Society, which helped fund a portion of the present project through a postdoctoral fellowship. Selmecki's long-term scientific goal is to continue researching genome evolution to aid in finding new treatments for cancer and other diseases.

"It's very interesting to see the diversity that unfolds in our experiment," she said. "There are still many questions out there: Why has evolution seen fit for mammals to be mostly diploid and other species, like plants, to become polyploid? How often does genome doubling occur in other organisms and what are the consequences? We're continuing to take this research into that next series of explorations."

Provided by Creighton University

Citation: Genome replication may hold clues to cancer evolution (2015, March 4) retrieved 2 May 2024 from https://medicalxpress.com/news/2015-03-genome-replication-clues-cancer-evolution.html

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.