Why don't we get cancer all the time?

December 19 2007

The seemingly inefficient way our bodies replace worn-out cells is a defense against cancer, according to new research.

Having the neighboring cell just split into two identical daughter cells would seem to be the simplest way to keep bodies from falling apart.

However that would be a recipe for uncontrolled growth, said John W. Pepper of The University of Arizona in Tucson.

"If there were only one cell type in the group, it would act like an evolving population of cells. Individual cells would get better and better at surviving and reproducing," said Pepper, a UA assistant professor of ecology and evolutionary biology and a member of UA's BIO5 Institute.

"When cells reach the point where they divide constantly, instead of only when needed, they are cancer cells."

Instead, multicellular organisms use a seemingly inefficient process to replace lost cells, Pepper said. An organ such as the skin calls upon skin-specific stem cells to produce intermediate cells that in turn produce skin cells.

Although great at their job, the new skin cells are evolutionary dead ends. The cells cannot reproduce.

Losing the ability to reproduce was part of the evolutionary path single-celled organisms had to take to become multicellular, Pepper said.

What was in it for the single cells?

"Probably they got to be part of something more powerful," Pepper said. "Something that was hard to eat and good at eating other things."

Pepper and his colleagues published their paper, "Animal Cell Differentiation Patterns Suppress Somatic Evolution," in the current issue of PLoS Computational Biology. Pepper's co-authors are Kathleen Sprouffske of the University of Pennsylvania in Philadelphia and the Wistar Institute in Philadelphia and Carlo C. Maley of the Wistar Institute.

The National Institutes of Health, the Pennsylvania Department of Health, the Pew Charitable Trust and the Santa Fe Institute funded the research.

Pepper became curious about the origins of cooperation between cells while he was a postdoctoral fellow at the Santa Fe Institute in New Mexico.

"Organisms are just a bunch of cells," he said.

"If you understand the conditions under which they cooperate, you can understand the conditions under which cooperation breaks down. Cancer is a breakdown of cooperation."

Pepper and his colleagues used a kind of computer model called an agent-based model to compare different modes of cellular reproduction.

The results indicate that if cells reproduce by simply making carbon-copies of themselves, the cells' descendants are more likely to accumulate mutations.

In contrast, if cellular reproduction was much more complicated, the cells' descendants had fewer mutations.

Suppressing mutations that might fuel uncontrolled growth of cells would be particularly important for larger organisms that had long lives, the team wrote in their research report.

Source: University of Arizona

Citation: Why don't we get cancer all the time? (2007, December 19) retrieved 26 April 2024 from https://medicalxpress.com/news/2007-12-dont-cancer.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.