Scientists find protein critical for tissue regeneration

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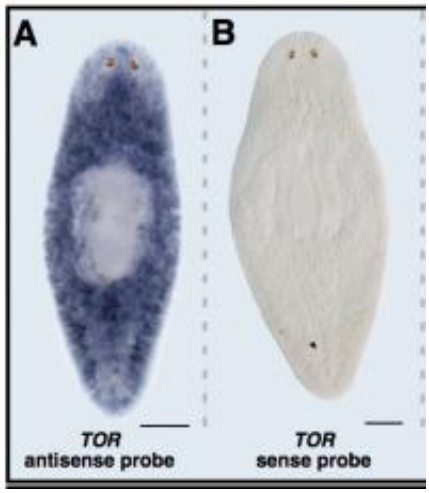

The planarian on the left is expressing the gene TOR. The planarian on the left is not, the result of a genetic manipulations that disrupts gene expression. Image: UC Merced

A flatworm known for its ability to regenerate cells is shedding more light on how cancer could be treated and how regenerative medicine could better target diseases, according to researchers at the University of California, Merced.

In research published online in the Journal of Cell Science, biology Professor Néstor Oviedo has shown that signaling by a protein called Target of Rapamycin (TOR) — found in humans and most other mammals — is crucial for planaria's unique tissue regeneration.

Disabling the protein prevents the flatworm's regrowth, a sign that disabling it in abnormal cells could prevent the growth of a cancer.

"It's a new model in which we can study stem cell behavior by manipulating the signaling pathways," Oviedo said.

Researchers have recognized that the TOR protein plays a role in cancer, aging and degenerative diseases, but they haven't figured out how it works.

Oviedo's lab is approaching this question using tiny flatworms known as planaria. Long relegated as a scientific oddity, the planarian is now among the species that could be crucial in understanding the role of stem cells. The worm's ability to repair itself is unparalleled, and its secrets could help combat cancer and degenerative diseases.

For this study, Oviedo's lab disabled the TOR protein in planaria and then amputated parts of the flatworm. Under typical circumstances, the organism would be able to repair itself.

But researchers discovered the planaria's stem cells recognized they needed to regrow tissue but were unable to regenerate it in the correct place and instead formed tissues in abnormal places. This kind of regeneration hasn't been reported before. Additionally, the planaria with the disabled protein were unable to grow, even if nutrients were available.

In addition to stopping cancer, understanding TOR and its role in regulation could lead to the development of medicines to encourage tissue regeneration and to fight degenerative diseases, such as Alzheimer's.

Graduate student Harshani Peiris, who was the lead author on the paper,

said the planaria gives researchers the ability to look at the reactions of an entire organism, rather than just looking at cells in a Petri dish.

"We have a cutting-edge look into what's happening at the system level," Peiris said.

More information: jcs.biologists.org/content/ear …/jcs.104711.abstract

Provided by University of California, Merced