A turn-off for cancer: Scientists discover an ancient 'switch' in plants that could halt cancer metastasis

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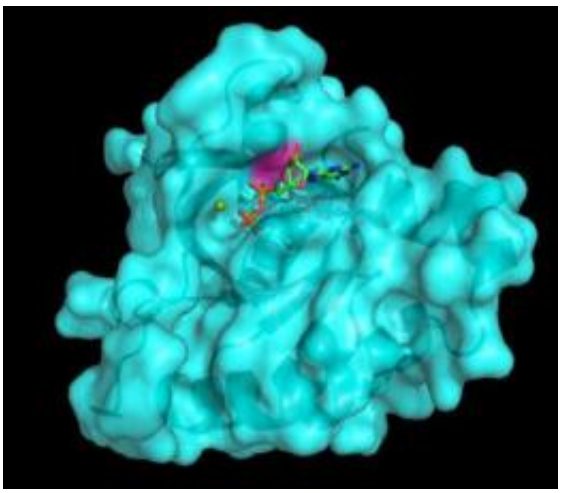

An ROP protein binds to a GDP molecule. The area colored in pink indicates where the fat molecule binds. Credit: AFTAU

Although plants and animals are very different organisms, they share a surprising number of biological mechanisms. A plant biologist at Tel Aviv University says that one of these mechanisms may be the answer for turning off cancer growth in humans.

Prof. Shaul Yalovsky, of the Molecular Biology and Ecology of Plants Department at Tel Aviv University, has identified a "switch" that can turn on cell growth in plants. Now, in a laboratory setting, he can apply

the mechanism to reshape cells, grow new tissues, and respond to bacterial or viral invaders.

The switch is actually a fat molecule that modulates a group of proteins called ROPs. Reported in the scientific journal Current Biology, Prof. Yalovsky's research group, in collaboration with Prof. Yoav Henis and Dr. Joel Hirsch of TAU's Departments of Neurobiology and Biochemistry, has determined that this fat molecule is required for ROP activity. Proteins very similar to ROPs exist in humans and provide chemical signals that tell cancer when to metastasize. Now that they know how to regulate ROPs in plants, the researchers believe they are one step away from turning this ROP-like switch off in humans -- a process which could prevent tumor growth.

An ancient secret revealed

"We've stumbled upon an ancient mechanism that regulates the function of these proteins, proteins which are found in both plants and humans," says Prof. Yalovsky, explaining that this mechanism already regulates the immune response to pathogen invaders in the human body. ROP-like proteins are also involved in wound healing and development of nerve cells in the brain.

"When these proteins are turned 'on,' they can initiate processes like cell division and growth," says Prof. Yalovsky. "Through our genetic engineering, these proteins could be manipulated in humans to speed up tissue healing, or turned off to slow or stop the growth of tumors."

ROPs bind to a small molecule called GTP, which then breaks up into another molecule called GDP. When bound to GDP, ROPs become inactive, a known concept in the plant sciences community. Going one step further, Prof. Yalovsky has created a second type of mutant molecule that prevents ROP proteins from binding to the GTP molecule,

creating an inhibitory effect.

A new line of defense

The team's research could also be applied in agriculture to reduce the need for chemical pesticides, they say. The mutant molecule they've devised induces plants to respond as though they are being attacked by pathogens. They then create a biological defense that protects them from infection.

In the research paper, the Tel Aviv University scientists describe how these mutations and mechanisms work, providing a new mechanism to control metastasis in cancer, or stop the deterioration of certain nerve cells in the brain. And in a broader sense, the researchers have created a long-desired platform to test the function of proteins.

"It is common for plant and animal geneticists to identify proteins, but remain unaware of their functions. We now have a mechanism to test our hypotheses," adds Prof. Yalovsky.

Provided by Tel Aviv University

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