Cancer: Kill the messenger

June 12 2012

A small molecule developed at the Weizmann Institute prevents a cancer-causing message from entering the cell nucleus.

What's good news in one setting might spell disaster in another. In cancer for instance, when a certain cell is commanded to grow and divide without restraint, it's a welcome message for the cell itself but a tragedy for the person who harbors this cell in his or her body. Weizmann Institute scientists have managed to decipher and block one type of molecular message that prompts unbridled cellular growth.

The molecular message first arrives at the cell's membrane, but its ultimate destination is the cell's nucleus, which contains the DNA. It's a huge distance for the message to cross, equivalent to 50 kilometers for a human being. To reach the nucleus quickly, the message is relayed by a chain of chemical messengers, from one molecule to another. More than two decades ago, Prof. Rony Seger of the Weizmann Institute's Biological Regulation Department took part in the discovery of one such chain – one that participates in the induction of numerous types of cancer; among other molecules, it includes the enzymes MEK1, MEK2, ERK1 and ERK2.

At first, Seger studied the transmission of molecular messages by these enzymes in the cell's cytoplasm. Only four years ago, did he and his team succeed in revealing the details of the later, most crucial step: the entry of the message into the cell's nucleus. The scientists identified a segment called NTS in the enzymes. NTS undergoes a change, through the addition of phosphorus molecules, which makes the enzymes' entry into

the nucleus possible. When they created a small peptide mimicking NTS, the message was blocked, failing to reach the nucleus. As a result, the cell stopped growing: Apparently, the peptide had intercepted the "enter the nucleus!" command. In experiments with mice, the peptide effectively blocked the development of several types of cancer, particularly melanoma: Not only did the tumors stop growing, they disappeared entirely.

Seger's findings are currently being considered for future biotechnological applications.

Provided by Weizmann Institute of Science