

Prof. Uri Nir

# *Out-smarting Cancer through Biotechnology*

Mina and Everard Goodman  
FACULTY of LIFE SCIENCES  
Institute for Nanotechnology  
and Advanced Materials

*"I am at Bar-Ilan because I recognize the important role it plays in bringing different kinds of people together, and introducing them to the beauty of our Jewish heritage. My interest in science is connected to my curiosity about God's creation – which I see as the ultimate source of wisdom – and my desire to make His world a better place."*

**C**ancer is an elusive killer. But while the exact cause of cancer is still a mystery, more and more is being discovered about how the disease develops at the molecular level. Prof. Uri Nir, Vice Dean of the Mina and Everard Goodman Faculty of Life Sciences, has revealed a "smoking gun," an enzyme that, in several tissue types, plays a pivotal role in cancer onset and progression.

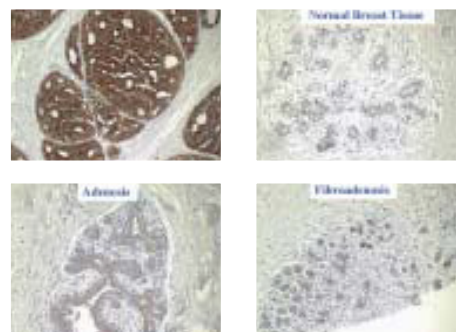
"In normal tissues, there's a balance between signals that cause cells to replicate, and other signals that induce growth arrest and programmed cell death," Prof. Nir explains. "In cancer, this balance is tipped so that cells start to replicate uncontrollably. It turns out that an important regulator of this 'tipping point' is an enzyme called 'Fer'."

"In our lab, we've identified a Fer-based process that occurs only in abnormal cells," says Prof. Nir. "This process is required for the proliferation of abnormal cells in colon, prostate and breast cancers. The fact that this same mechanism appears in all these cancers indicates that we may have found an important

molecular junction where normal tissues turn cancerous."

Prof. Nir's conclusions about what turns cancer "on" were reached using genetic techniques that allowed him to de-activate the Fer enzyme. "We've shown that, without the Fer enzyme, the proliferation of prostate carcinoma cells in tissue culture is halted. We've had similarly encouraging results using breast and colon cancer cells," says Prof. Nir. Indeed, his group recently discovered that down-regulation of Fer inhibits the progression of prostate tumors in animal models.

The most exciting thing about Prof. Nir's work is that it provides a clear target for scientists working to develop new anti-cancer drugs. "We are looking for a compound that can bind to the Fer enzyme and prevent it from interacting with other molecules," Prof. Nir says, adding that he is working on a robotic technique that screens for potential Fer inhibitors, making the whole process faster and far less expensive than conventional drug discovery methods. "If we are successful, it



▲ Fer is overexpressed in breast cancer cells. The top panel on the left- the level of Fer (seen in the brown color) in breast cancer cells, top panel on the right- level of Fer in normal breast cells, the two lower panels- levels of Fer in two non-cancerous breast abnormalities.

◀ Three dimensional model of the Fer enzyme. The main proteins which play a role in cancer progression and which interact with Fer in cancer cell are depicted as well. In blue - the protein Hsp90, and in red - the protein PP1.

may eventually be possible to use the molecule we find to 'short-circuit' the process that leads to cancer."

Prof. Nir, in collaboration with two other Bar-Ilan researchers – Prof. Geraldo Byk, an expert in combinatorial chemistry, and biophysicist Dr. Yoav Paas - is working on techniques in which anti-cancer drugs would be attached to a cancer-seeking nano-vehicle. By putting drugs exactly where they are needed, Prof. Nir explains, it will be possible to achieve

better results with lower doses, leading to a reduction in the side effects associated with chemotherapy.

"The uniqueness of our program is in the way it combines academic studies with exposure to real-life, practical work in a wide range of biotech companies," says Prof. Nir, who heads the University's graduate program in biotechnology. "Students perform research under the joint supervision of an advisor from the Faculty of Life Sciences and a supervisor from industry. Biotechnology is, by its very

nature, multidisciplinary, and the program's curriculum – which includes training in intellectual property law, ethics and business management along with straight science – prepares our graduates to be leaders in this growing area of the Israeli economy."

And for Prof. Nir, contributing to Israel – and the Jewish people – has always been a priority. "I am at Bar-Ilan because I recognize the important role it plays in bringing different kinds of people together, and introducing them to the beauty of our Jewish heritage," he says. "My interest in science is connected to my curiosity about God's creation – which I see as the ultimate source of wisdom – and my desire to make His world a better place."

And if Prof. Nir's research brings us one step closer to a cure for cancer, *Dayenu*.