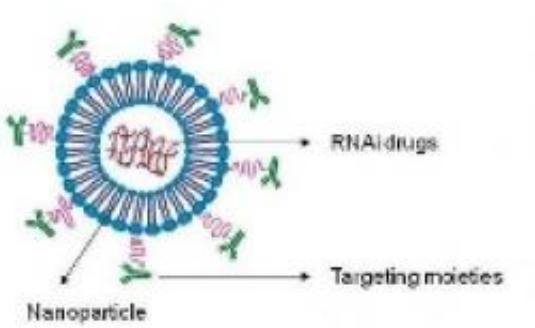
A fantastic voyage brought to life

January 15 2009



A nanoparticle decorated with targeting agents that guide it to a specific cell type, leaving healthy cells untouched. Credit: AFTAU

Ever since the 1966 Hollywood movie, doctors have imagined a real-life Fantastic Voyage -- a medical vehicle shrunk small enough to "submarine" in and fix faulty cells in the body. Thanks to new research by Tel Aviv University scientists, that reality may be only three years away.

The blueprints for the submarine and a map of its proposed maiden voyage were published earlier this year in Science by Dr. Dan Peer, who now leads the Tel Aviv University team at the Department of Cell Research and Immunology. The team will build and test-run the actual "machine" in human bodies. Dr. Peer originally developed the scenario at Harvard University.

Made from biological materials, the real-life medical submarine's

Fantastic Voyage won't have enough room for Raquel Welch, but the nano-sized structure will be big enough to deliver the payload: effective drugs to kill cancer cells and eradicate faulty proteins.

A Nano-GPS System

"Our lab is creating biological nano-machines," says Dr. Peer. "These machines can target specific cells. In fact, we can target any protein that might be causing disease or disorder in the human body. This new invention treats the source, not the symptoms."

Dr. Peer's recent paper reported on the device's ability to target leukocytes (immune cells) in the guts of mice with ulcerative colitis. Calling his new invention a submarine, Dr. Peer has developed a nano-sized carrier which operates like a GPS system to locate and target cells. In the case of Crohn's disease, for example, it will target overactive immune system cells in the gut. In other diseases such as cancer, the submarine can aim for and deliver material to specific cancer cells, leaving the surrounding healthy cells intact.

While other researchers are working in the area of nano-medicine and drug delivery, Dr. Peer's submarines are among the first to combine a drug candidate with a drug delivery system. As the submarines float through the body, they latch onto the target cell and deliver their payload, a drug based on RNAi. This new kind of drug can affect faulty RNA machinery and reprogram cells to operate in normal ways. In essence, RNAi can essentially restore health to diseased cells or cause cells to die (like in the case of cancer cells).

Learning from the Body's Own System

Large pharmaceutical companies have already expressed interest in this

research and in the area of RNAi in general. Currently, the Tel Aviv University lab is pairing its medical submarine with different RNAi compounds to target different pathologies, such as cancer, inflammation, and neurodegenerative diseases.

"We have tapped into the same ancient system the human body uses to protect itself from viruses," says Dr. Peer, who is also investigating a number of topical applications for his medical subs. "And the beauty of it is the basic material of our nano-carriers is natural," he says.

The Tel Aviv University team plans to launch their medical submarines, following FDA regulations, within three to five years. Their immediate focus is on blood, pancreatic, breast and brain cancers.

Source: American Friends of Tel Aviv University