Cancer Care Still I

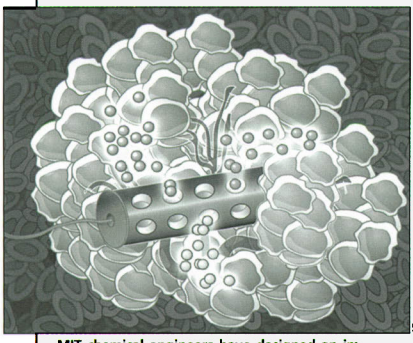
CANCER DRUGS

Implantable Device for Advance Testing

More than 100 drugs have been approved to treat cancer, but predicting which ones will help a particular patient is an inexact science at best. A device developed at the Massachusetts Institute of Technology, Cambridge, may change that.

Implantable, and about the size of a grain of rice, it can carry small doses of up to 30 different drugs. After implanting it in a tumor and letting the drugs diffuse into the tissue, researchers can measure how effectively each one kills the patient's cancer cells. Such a technique could eliminate much of the guesswork now involved in choosing cancer treatments, says Oliver Jonas, a postdoctoral student at MIT's Institute for Integrative Cancer Research and lead author of a paper describing the device in *Science Translational Medicine*.

Most of the commonly used cancer drugs work by damaging DNA or otherwise interfering with cell function. Recently, scientists have developed more-



Massachusetts Institute of Technology

MIT chemical engineers have designed an implantable device that can deliver many drugs at once, allowing researchers to determine which are the most effective against a patient's tumor.

targeted drugs designed to kill tumor cells that carry a specific genetic mutation. However, it usually is difficult to predict whether a particular drug will be effective in an individual patient.

In some cases, doctors extract tumor cells, grow them in a lab dish, and treat them with different drugs to see which ones are most effective. However, this process removes the cells from their natural environment, which can play an important role in how a tumor responds to drug treatment, Jonas indicates. "The approach that we thought would be good to try is to essentially put the lab into the patient. It's safe and you can do all of your sensitivity testing in the native microenvironment."

The device, made from a stiff, crystalline polymer, can be implanted in a patient's tumor using a biopsy needle. After implantation, drugs seep 200 to 300 microns into the tumor, but do not overlap with each other. Any type of drug can go into the reservoir, and the researchers can formulate the drugs so that the doses that reach the cancer cells are similar to what they would receive if the drug were given by typical delivery methods such as intravenous injection.

After one day of drug exposure, the implant is removed, along with a small sample of the tumor tissue surrounding it, and the researchers analyze the drug effects by slicing up the tissue sample and staining it with antibodies that can detect markers of cell death or proliferation.

CANCER INHIBITORS

Cinnamon Research Holds Promise

A compound derived from cinnamon is a potent inhibitor of colorectal cancer, indicates research conducted at the University of Arizona College of Pharmacy and Cancer Center, Tucson.

Georg Wondrak and Donna Zhang, professors in the Department of Pharmacology and Toxicology, completed a study in which cinnamaldehyde—the compound that gives cinnamon its distinctive flavor and smell—when added to subjects' diet, protected against colorectal cancer. In response to cinnamaldehyde, the cells acquired the ability to protect themselves against exposure to a carcinogen through detoxification and repair.

"This is a significant finding," says Zhang. "Because colorectal cancer is aggressive and associated with poor prognoses, there is an urgent need to develop more effective strategies against this disease."

Adds Wondrak: "Given cinnamon's important status as the third-most consumed spice in the world, there's relatively little research on its potential health benefits. If we can ascertain the positive effects of cinnamon, we would like to leverage this opportunity to potentially improve the health of people around the globe."

The next step in the research is to test whether cinnamon, as opposed to cinnamaldehyde, prevents cancer using this same cancer model. Because cinnamon is a common food additive already considered safe—it is not a synthetic, novel drug—a study in humans may not be too far off.

OVARIAN CANCER

Increasing Accuracy of Diagnosis, Prognosis

Nearly anyone touched by ovarian cancer will tell you: it is devastating. It is bad enough that cancer in almost 80% of patients reaches advanced stages before diagnosis, and that most patients are expected to die within five years—but just as painfully, roughly one-quarter of women diagnosed have no warning that they are resistant to platinum-based chemotherapy, the main line of defense, nor that they likely will have a mere 18 months to live.

The diagnosis, prognosis, and even treatment of ovarian cancer largely have remained unchanged for 30 years. The best indicator for how a woman will fare, and how her cancer should be treated, has been the tumor's stage at diagnosis.

However, scientists at the University of Utah, Salt Lake City, have uncovered patterns of DNA anomalies that predict a woman's outcome significantly better than tumor stage. In addition, these patterns are the first known indicator of how well a woman will respond to platinum therapy. The patterns were discovered by using a new mathematical technique in the analysis of DNA profiles from the Cancer Genome Atlas national database.

"We believe this is a first step toward bringing ovarian cancer into the age of precision medicine," says team leader Orly Alter, associate professor of bioengineering, adjunct associate professor of human genetics, and faculty member of the Scientific Computing and Imaging Institute.

Pending experimental revalidation in the clinic, the patterns could be the basis of a personalized prognostic and diagnostic laboratory test, which would predict both the patient's survival outlook and the tumor's sensitivity to platinum-based chemotherapy, and doctors could tailor treatment accordingly.

MULTIPLE MYELOMA

Facing Financial and Emotional Burdens

People with multiple myeloma who are experiencing financial burdens due to their cancer situation are almost two-and-one-half times more likely to be at risk for depression than those without financial burdens, according to the Cancer Support Community, Washington, D.C., an international nonprofit organization.

- People are making significant lifestyle tradeoffs to manage the cost of health care. These include cutting grocery bills, depleting savings, and borrowing against or using retirement funds.
- A large proportion of patients are experiencing significant levels of emotional burden related to financial