

A Sweet Solution to Breast Cancer?

While Dr. Ekaterina Dadachova's anti-melanoma strategy uses targeted antibodies (see page 3), she's taking a different approach against breast cancer. Here her 'targeting agents' are not antibodies but rather simple sugars.

Rapidly-dividing cancer cells have a great appetite for the energy molecule glucose—a fact routinely exploited when PET scanning is used for cancer detection. If a woman's breast cancer is suspected of having spread, for example, she will be injected with FDG, an imaging agent consisting of glucose molecules attached to a radioactive isotope of fluoride.

The FDG molecules are preferentially taken up by the tumor's rapidly dividing cells and soon irradiate the tumor with subatomic particles called positrons, each of which promptly decays into two photons. An hour after the injection, when the woman undergoes a whole-body PET (positron emission tomography) scan, the photon-emitting tumors will show up as dark regions on the scan. (The half-life of FDG is only 110 minutes, so virtually all the radiation decays away within a few hours.)

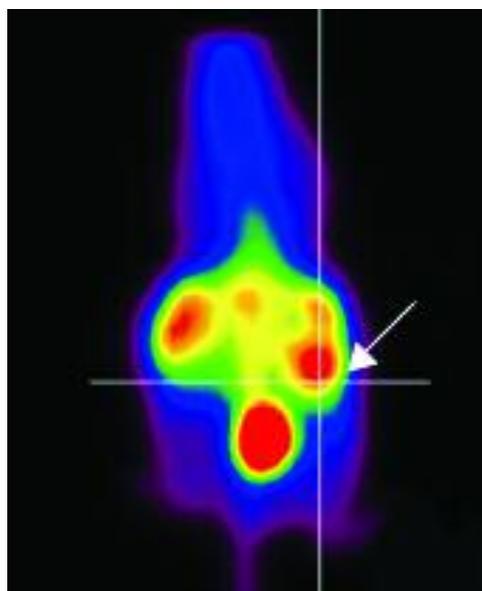
"Since FDG in low doses can detect tumors, I wondered if higher doses might work for treating them," says Dr. Dadachova. Her recent research on an

animal model for breast cancer suggests that she's onto something.

In the first phase of this work, using genetically engineered mice that develop multiple breast tumors at 10 weeks of age, she showed that FDG treatment destroyed tumor cells without harming the animals' organs. More recently, she showed that tumor-bearing mice treated with FDG lived significantly longer than untreated controls (see illustration below).

Dr. Dadachova and her colleagues are now talking to Food and Drug Administration officials about testing FDG in humans. Their clinical trial would include women with advanced breast cancer and people with other cancers where rapidly dividing cells readily take up FDG, including lung cancer and head and neck cancer.

"When treating patients, we would first give a standard PET scan, to see if there are multiple metastases that are capable of taking up the FDG," says Dr. Dadachova. "Then we would administer FDG at a therapeutic level calibrated to body weight and other factors. It will be a challenge to prevent FDG uptake by the brain, which could cause damage. But we're hopeful that FDG therapy will seek out and destroy metastatic tumors anywhere they exist in the body without harming normal tissues." ■



Female mice received injections of mouse breast-cancer cells under the skin of their right flanks. One week later—after the breast cancer cells had multiplied to form a tumor—some of the mice were injected with the PET scan imaging agent FDG, made of glucose molecules attached to a radioactive isotope of fluoride. As shown by this PET scan, the tumor (marked with an arrow) actively took up the FDG (the red color corresponds to the highest radioactivity uptake). All the control mice died within a week after FDG treatment began; by contrast, treated mice survived significantly longer than untreated mice—an average of 17 days—and their tumors grew significantly slower than tumors of untreated mice. (FDG is excreted in the urine, and the lower red area shows FDG radioactivity inside the bladder.)