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HEALTH SENSE

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Getting warmer in bid to kill tumors

By Judy Foreman | March 6, 2006

(Correction: Because of a reporting error, the surname of surgeon William B. Coley was misspelled in the Health/Science section yesterday in the Health Sense column about hyperthermia treatment for cancer.)

A year ago, when Gayle Driscoll's breast cancer spread to her skin, the 63-year-old retired teacher from Barnstable tried an experimental treatment that gave her radiation therapy some extra oomph. Every time she lay down for radiation treatment on her chest, her tumors were also heated with a special device that emitted microwaves. After six weeks, the tumors were gone.

The therapy was meant only to treat her skin -- and the cancer ultimately spread to Driscoll's bones -- but it was "psychologically important" to her to see the tumors in her skin disappear, she said.

Heating tumors has not yet been proved to save lives, but several new studies suggest that so-called hyperthermia can boost the tumor-killing power of chemotherapy and radiation. Hyperthermia, an old treatment idea that is enjoying a resurgence, uses microwaves to raise the temperature of a tumor to 104 to 106 degrees Fahrenheit.

At least eight studies in recent years have shown that adding hyperthermia to chemotherapy or radiation increases the effectiveness of those treatments against melanoma, tumors in the esophagus, cervix, head, neck, and brain, and breast cancers that have spread to the chest wall, said Dr. Mark Dewhirst, director of the hyperthermia program at Duke University Medical Center in Durham, N.C.

Scientists who have seen the effects of hyperthermia are impressed. "I'm amazed at some of the tumors that just melt away with the combination of radiation and heat," said Dr. David Wazer, chief radiation oncologist at Tufts-New England Medical Center.

Hyperthermia could turn out to be among the most powerful anticancer weapons yet. Consider this idea, now being studied at Duke: Researchers have created a tiny bubble, or liposome, with water on the inside and a ring of fat on the outside. Mixed in with the water is a chemotherapy drug, doxorubicin. The liposome is designed to be stable at body temperature but to burst when heated. By delivering the liposome into the tumor and using hyperthermia to explode it, Dewhirst has shown in mice that doctors can deliver 30 times more chemotherapy than would otherwise be possible.

Scientists think hyperthermia probably fights cancer in several ways.

"When you combine heat and radiation, the cell-killing of cancer cells is better," said Dr. Jay Harris, chairman of radiation oncology at both Dana-Farber Cancer Institute and Brigham and Women's Hospital.

Radiation works by damaging DNA. But there must be enough oxygen nearby for this damage to occur. Parts of tumors are tough to kill because they have a poor blood supply and, thus, low oxygen levels. Raising the temperature of a tumor brings more blood and, hence, more oxygen to the tumor.

With chemotherapy, drugs get inside tumor cells through small channels on the cell surface. "The heat opens these channels so that chemotherapy drugs can more easily enter in," Wazer said.

Hyperthermia also seems to "jump-start the immune response," at least in mice, said Elizabeth Repasky, an immunology professor at the Roswell Park Cancer Institute in Buffalo, who is now looking at the effects in humans. Just as a fever with the flu may boost immune response, so might hyperthermia, a kind of artificial fever.

The idea of using heat to treat cancer started more than 100 years ago when an American surgeon, Dr. William B. Cooley, noticed that some cancer patients who also had high fevers from bacterial infections had their tumors shrink. He began inducing fevers on purpose by infecting his cancer patients with bacteria.

Several decades ago, a number of medical centers, including Dana-Farber and Johns Hopkins Medical Institute, began pursuing the idea, with disappointing results. A major study about 15 years ago showed no benefit to hyperthermia. Although the study was highly flawed, "the technique was by and large abandoned," Wazer said.

In the last few years, though, new, better-designed studies "have rekindled interest" in the idea, said Harris. Insurers are now paying more for the treatment, and new instruments can deliver microwaves precisely, even to tumors deep in the body. The National Cancer Institute recently gave \$19 million to Duke to continue all of its hyperthermia research.

Among the studies turning the tide for hyperthermia is one, of 109 patients, published last year by Dr. Ellen L. Jones, a Duke radiation oncologist. Writing in the *Journal of Clinical Oncology*, her team reported that compared with patients getting radiation but not hyperthermia, those who got both had a significantly reduced risk of recurrence in patients with "superficial" tumors, chiefly breast cancers that had spread to the chest wall.

"I really trust the data coming out of this Duke group" because the team was so meticulous, said Harris, who was not involved in the study.

In another study of 68 women with cervical cancer, also published last year, Jones and Dutch colleagues showed that a triple combination -- hyperthermia, radiation, and chemotherapy -- was highly effective at lowering the risk of recurrence. A larger study comparing this triple treatment with standard treatment is underway.

Dr. Joan M.C. Bull, director of thermal therapy research at the University of Texas Medical School at Houston, is testing whole-body hyperthermia for some kind of cancers, including pancreatic cancer that has spread to other parts of the body. Bull places patients, head and all, inside a radiant heat machine that brings body temperature to that of a high fever, about 104 degrees Fahrenheit. It's very safe, she said, though patients are monitored carefully for possible side effects. Some patients get "cranky" during the treatment, she said, as they might with a fever.

Working with rats, Bull has heated the body for about six hours and found that chemotherapy's effectiveness was increased whether the hyperthermia was given before, during, or after heat treatment.

None of this research constitutes a slam-dunk for hyperthermia, but many regions now have at least one center. In Boston, it's New England Medical Center; in Providence, a center is about to open at Rhode Island Hospital.

So if you or a loved one is getting treated for cancer, it's worth asking a doctor if hyperthermia might help.

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