



Research fellow Hak Soo Choi, Ph.D.

ILLUMINATING RESEARCH

MOLECULAR IMAGING

John V. Frangioni, M.D., Ph.D., can't say he has all the answers in cancer, but he is certainly shedding some light on the subject. As co-director of BIDMC's Center for Imaging Technology and Molecular Diagnostics (CITMD), Frangioni, along with his fellow researchers, invented a device that uses near-infrared light to physically expose and delineate cancer in the body during surgical procedures. Currently in clinical trials, this device will bring increased precision to cancer surgery. Doctors will be able to more accurately remove a tumor thereby greatly reducing its chance of return while at the same time protect sensitive blood vessels and nerve tissue.

While this technology offers the hope to completely and permanently eliminate cancer when surgery is still an option, Frangioni's research provides another exciting new idea: to detect cancer at its earliest development and to distinguish what type it is, its exact location, and how and where it spreads within the body. This concept is at the heart of the work of CITMD, which includes both Frangioni's team and the laboratory of Robert E. Lenkinski, Ph.D., and is already offering promising results in using molecular imaging as a way to detect, treat, and cure cancer. "If we find cancer early before it's metastasized, we can potentially cure it," asserts Frangioni.

The revolutionary field of molecular imaging uses targeting ligands, or molecules that "target" or chemically interact in discernable ways with certain cancer cells. This process will ideally allow cancer to be detected at even its smallest state. "Right now the best we can do is see cancer that's about a cubic centimeter. You can think of it as the size of a dime spun on a table—that equates to a billion cells," Frangioni says. "Clearly that's not good enough. With the technology we're developing, we hope to drive that

number down to the million ranges and maybe some day into the tens of thousand ranges." He believes the term remission, which essentially means the number of malignant cancer cells remaining in the body is somewhere between zero and one billion, would become obsolete if the cancer can be identified early enough to be removed entirely.

Frangioni is hopeful that this research will lead to ways to not only detect the smallest manifestation of cancer but to also develop more specific targeting ligands that will bind to specific types of cancer. His view is that if we can specialize the discovery, we can customize the treatment. "Using state-of-the-art robotic chemistry approaches, we're trying to create 'smart bombs' for cancer that will treat the person's cancer—not a general cancer but the specific cancer that the person has," he says. While realistic that such advances don't happen overnight, Frangioni is optimistic that the medical center has what it takes to make major breakthroughs in cancer research. "The equation is very simple," he notes. "It's leadership, time, money, and brains. We're very lucky at Beth Israel Deaconess because we have the leadership, we have the time, and we have the brains. It's really just that we're resource limited at this point."

Fortunately, the efforts of Frangioni and his colleagues have caught the discerning eye of a number of donors who see molecular imaging's promise. Knowing that even the brightest young minds can be hampered by lack of available grant funding, Harriet and Alan Lewis were inspired to make a gift of \$1 million, which will go to support a postdoctoral fellowship in the field along with equipment necessary to advance its work. "Alan and I feel that BIDMC has a great opportunity

Ask the Expert

Jean Matheson, M.D., is neurology medical director of the Sleep Disorders Center at BIDMC, one of the premier sleep disorders centers in the country. The center was the first in Massachusetts accredited by the American Academy of Sleep Medicine and remains one of the busiest sleep centers in New England, performing approximately 1,400 new patient evaluations last year.



THE QUESTION:

"I'm a 57-year-old woman. I thought once the kids were grown up and out of the house, I would be sleeping like a baby, but now all I do at night is lie awake and watch the clock. My husband is sleeping great. What's going on and how can I finally get some rest?"

THE ANSWER:

Given your age, it would be tempting for many primary care physicians to attribute your sleeping problems solely to the symptoms of menopause, but here at BIDMC we have learned not to take insomnia at face value. We see patients who have difficulty initiating or maintaining sleep for a whole variety of reasons, and it's critical to ensure that everyone is properly evaluated to determine the underlying source of the problem.

That being said, your stage of life may be contributing to your sleep difficulties. Beyond causing troublesome symptoms like hot flashes, menopause is associated with an increase in breathing abnormalities like sleep apnea in which the airway is intermittently obstructed causing sleep disturbance and often oxygen deprivation. These disorders are sometimes, but not always, associated with weight gain.

Another disorder that's more prevalent in women, particularly at your age, is restless legs syndrome, which advertising has made more familiar on a superficial level but is frequently misunderstood. Restless legs can be caused or intensified by the depletion of a person's iron stores. After several pregnancies or years of heavy menstruation, iron may be leached from the body including the nervous system,

which in turn leads to a hard-to-describe discomfort in the legs that is relieved by movement and worse at night.

Your age may also be causing problems in more behavioral ways. With the kids out of the house or perhaps a recent retirement, you may no longer have a regular daily routine. The way you sleep is really dependent on how you live your day: the time you wake, your activity level, your light exposure, your caffeine or alcohol intake, and more. We do a detailed, hour-long history on our patients to carefully examine these factors and their effects.

Lastly, women often have not only their own sleep issues to deal with but also those of their spouses. Breathing abnormalities like sleep apnea and snoring increase significantly with age in men. People can forget how loud and disturbing behaviors like these can be. Women, however, tend to be hesitant about discussing these problems openly.

The important thing is not to make assumptions about what may be causing your sleep troubles. You may not be the best person to judge what might be wrong—consult a professional. Often there are very simple treatments.

"The reality is that every cancer is different. We need to evolve the field of oncology to the point where we're treating those cancers individually and personally."



John V. Frangioni, M.D., Ph.D.

to help change the lives of patients with cancer through the development of molecular imaging," says Harriet Lewis. "It was an opportunity too good to pass up, and we are pleased and fortunate to be able to support the work of Dr. Frangioni and his team. We are very happy to invest in research because we believe that, while it can be risky, investing in talented, committed people yields great results." The Ellison Foundation of Boston took a similar view of molecular imaging, recently donating \$250,000 to support the area at BIDMC, with a specific focus on improving prostate cancer diagnosis and staging.

Frangioni knows that this kind of support will be critical to not only making scientific advances but translating them into the kind of personalized care Beth Israel Deaconess is known for. "When a patient walks in the door here, they're treated as a human being, they're treated compassionately, they're treated kindly, they're treated with state-of-the-art care," he says. "We look to the day where we'll have less toxic therapies, more specific therapies, and the ability to find the cells wherever they hide in the body to give a patient the peace of mind that we will be able to effect a cure." □