

A team of toxic-metal researchers at DMS found that exposure to arsenic in drinking water even at low levels can disrupt the function of certain receptors and affect hormone activity.

Heart model provides realistic feedback

Thub dub. Thub dub. A healthy heart uses a two-step motion—first relaxing, then contracting—to pump blood throughout the body. A failing heart, however, can't produce a strong, coordinated contraction—causing further damage to the organ and allowing blood to pool in other parts of the body.

Problem: A technique called cardiac resynchronization therapy (CRT) can help address this problem. But, so far, it has involved a lot of guesswork—guesswork that could be avoided, according to Justin Pearlman, M.D.

Pearlman, a Dartmouth cardiologist who's also trained as an engineer, and Heng Huang, a doctoral student in computer science, have created a computer-based model that represents “every little bump and cranny” of an individual's heart, Pearlman says. Consisting of high-resolution MRI images, the model can simulate each heart's unique motion and the stresses and strains that every square inch experiences as it pumps.

Why is this important? In CRT, pacemaker leads—tiny wires—are placed on areas of the heart that are not contracting well. By transmitting small electrical impulses, the leads help coordinate the con-

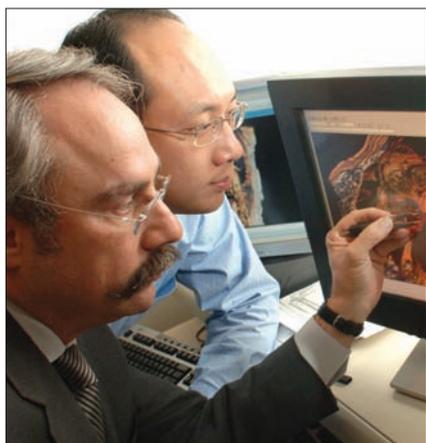
traction. For the patient, successful CRT can mean the difference “between being short of breath [while] lying in bed and being able to go shopping,” Pearlman explains. But the key to optimizing the therapy lies in finding the best spots to place the leads.

Currently, cardiologists use two-dimensional or static three-dimensional reconstructions of patients' hearts to find the best spots. But “measurements play a very small role” in that process, according to Pearlman. “With our model, we're measuring actual tissue properties, stresses and strains,” wall thickening, ballistic motions, and many other factors. And Pearlman's model even allows physicians to try placing leads in various locations. So instead of “experimenting on patients,” says Pearlman, “we can experiment on the computer copy of their heart.”

System: Pearlman and Huang's model—which uses a new mathematical system that the two invented—is just one of several innovations by Pearlman. He's also developed ways to measure how much oxygen is getting to every part of the heart. “As a heart starts to fail,” he explains, “tiny vessels can get plugged up and you can have microvascular disease. Clinically, we have no test for that.” No test other than his, that is.

Word of Pearlman's inventions is spreading, and he is seeing more and more patients from Boston. He and Huang would like to continue testing and refining their heart model—as well as Pearlman's other creations—but they're worried that a gap in funding may halt their progress. “Frankly, we've been spending our energy on the model and the medicine,” says Pearlman, “rather than on [a] sales pitch and traveling road show.”

So they will now try to keep an eye on the flow of funding—as well as the flow of blood in ailing hearts. JENNIFER DURGIN



Pearlman, left, and Huang view their 3D model.

A fine balance

New research shows that Vioxx—the blockbuster painkiller pulled from the market in 2004 because it increased the risk of heart attacks—reduces the risk of precancerous tumors in the colon and rectum. The findings,

soon to be published in *Gastroenterology*, “show once again the potential for nonsteroidal anti-inflammatory drugs, or NSAIDs, to interfere with the development of cancer in the colon and rectum,” says DMS's John Baron, M.D., who led the study. But the “serious toxicity” of Vioxx and similar drugs must be weighed carefully against their chemopreventive powers, he and his coauthors caution.



No bowl of cherries

It's not surprising to learn that women newly diagnosed with breast cancer are often worried, nervous, fearful, and depressed. But little formal research has quantified those symptoms. A new Dartmouth-led study, published in *Cancer*, helps fill that gap

in knowledge. Nearly half of newly diagnosed breast cancer patients showed high levels of emotional distress or met the criteria for psychiatric disorders, found DMS psychologist Mark Hegel, Ph.D., and his collaborators. “Future research should refine current screening procedures and develop interventions,” they say.

