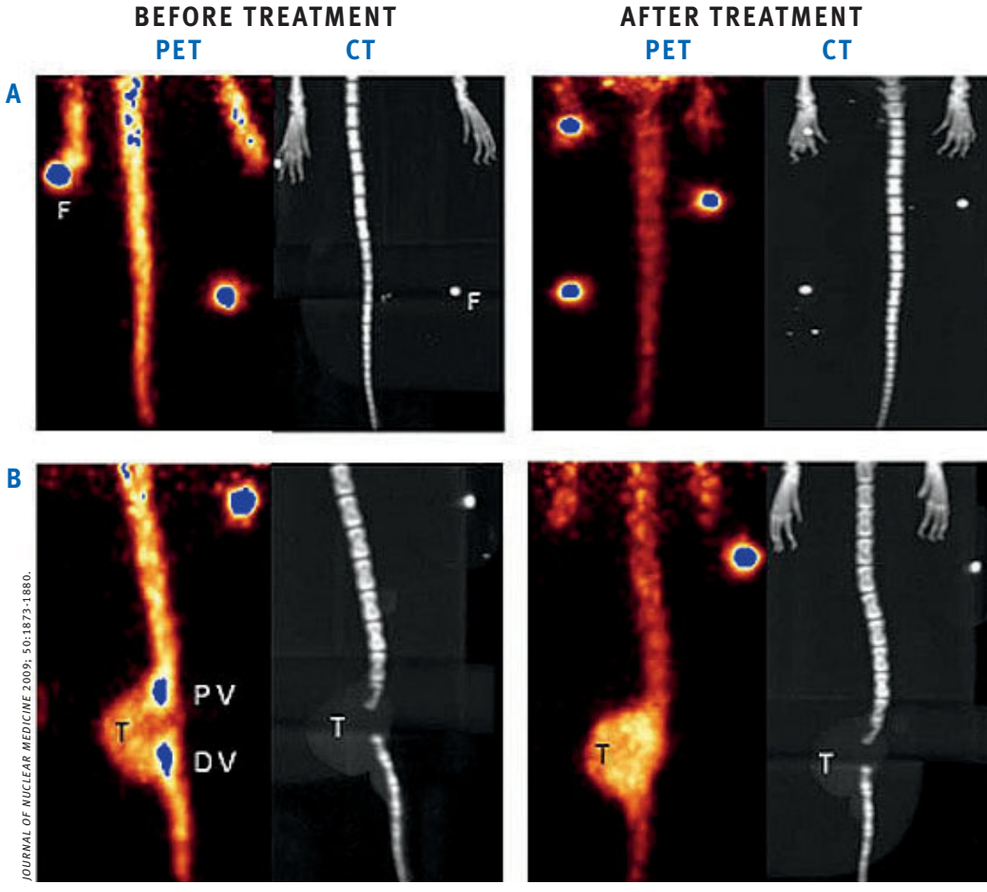
BIG SHOT

ALL THE IMAGING A BASIC CANCER RESEARCHER COULD EVER WANT

BY ELAINE VITONE



At the new Pre-Clinical PET/CT Imaging Suite, scientists can not only study a disease down to the molecule, but also follow its movements within the entire, living host. Here, we can see osteoclasts in the PET scans of mouse models A and B absorbing an imaging agent developed by Carolyn Anderson and her team. In model A, osteoclasts migrated before tumors developed; their presence may predict future bone metastases. And in the "after treatment" images, we can see less of the agent absorbed: The treatment appears to be working in both mice.

At Pitt, radiology is no small potatoes. Now ranked 11th in National Institutes of Health funding, the department has seen a number of big moments in radiologic research since its founding in 1956. Among them: Pittsburgh Compound B, a PET-scan dye that made amyloid plaque (a hallmark of Alzheimer's) visible in living people for the first time; the PET/CT, which combines detailed functional and anatomical information together in one scan (since it was first tested at UPMC some 15 years ago, it has become standard, with more than 2,000 PET/CT scanners in hospitals across the country); and Stentor, an intranet-based radiological-image storage, management, and distribution system. Stentor helped make the move to filmless radiology efficient and user-friendly.

So what's next for what may be the country's largest academic radiology department? To think small. Very, very small.

In October, the Department of Radiology and the University of Pittsburgh Cancer Institute cut the ribbon on the Pre-Clinical PET/CT Imaging Suite at Hillman Cancer Center, which was the brainchild of Kyongtae Bae, Pitt professor and chair of radiology. What's unique about it, says Carolyn Anderson, whom Bae recruited last year to lead the initiative, is that it brings together all the imaging technologies a basic cancer researcher could want—including bioluminescence for tagging molecules, as well as special PET/CT, MR, and ultrasound equipment scaled down for rodent models—all under one roof. It's a first for Pitt, and a rarity in institutions across the country, she says.

With this facility, Pitt's scientists can track how cancer interacts with its host at the cellular and molecular levels and see its interplay with the whole dynamic, living organism.

"Sometimes you see changes not so much in the cancer cells, but in the mechanisms of how the cancer is spreading," says Anderson.

For example: Other groups have shown that a particular cell type within bone marrow, known as a hematopoietic progenitor cell (HPC), arrives at the site of metastasis in advance of the colonizing cancer, signals it in, and primes the new location (the premetastatic niche, as it's called). In May, Anderson and colleagues at Washington University in St. Louis showed for the first time that it's feasible to image this cellular welcoming committee in action. Her group developed a PET agent that makes this possible.

Soon, Anderson's team will begin the process of validating these preliminary findings in a more-true-to-life model of metastasis: a rodent model of breast cancer spreading to the lungs. HPCs encourage these secondary tumors in mice just as they do in humans.

The new center makes it easier to do "nice, quantitative imaging" of a variety of possible cancer therapies, says Anderson.

Cancer research is the focus of the imaging initiative, but Radiology Department faculty members are using it to delve into other diseases, as well: For instance, Mike Modo, a PhD associate professor, uses novel MRI contrast agents to explore neuronal-stem-cell transplantation as a possible therapy for brain damage and neurodegenerative disease. Mingfeng Bai, a PhD assistant professor, is working with Chet Mathis (a PhD professor of radiology and coinventor of Pittsburgh Compound B) to develop a low-cost method of imaging neurofibrillary tangles—a marker of neuronal loss in early Alzheimer's disease.

Pitt's Nancy Davidson, director of UPCI and UPMC CancerCenter, says her team's focus is "ever more on precision cancer medicine." She's delighted to have the new resource, "which will accelerate translation of findings between the lab and the clinic to facilitate optimal individualized patient care." ■