Veterinarians, physicians, and researchers are continually collaborating at the UC Davis School of Veterinary Medicine (SVM) and the Comprehensive Cancer Center (CCC) to discover new ways to help patients fight cancer. Whether those patients have two legs or four, the university is committed to providing the most cutting-edge medicine. Having highly ranked veterinary and medical schools in such close proximity fosters a unique environment in which innovation thrives.

**Mapping lymph nodes**

When you hear that cancer has spread to the lymph nodes, it doesn’t matter whether the patient is a dog or a human, you know it can’t be good. Involvement of lymph nodes can be important in the spread of many cancers for both species. Being able to predict which lymph nodes are most likely to be affected by cancer can make a big difference in catching cancer early and directing appropriate treatment.

Veterinary cancer surgeon Dr. Michele Steffey has been working to determine the best protocols and techniques for sentinel lymph node mapping—widely used in human cancers—in her canine patients to answer the critical question of which nodes may be involved in cancer’s spread.

“That knowledge will help us make important decisions in choosing which nodes to biopsy and how best to target the disease with the most appropriate treatments,” Steffey said. “The main point is to identify earlier and more accurately where a particular cancer is going to spread first in the lymphatic system if it is going to metastasize. Our goal is to catch cancer early, and to do it as minimally-invasively as possible, which translates to better outcomes for our animal patients.”

Steffey is getting close to her goal of developing the best way to map lymph nodes potentially involved with canine cancer. As a result, sentinel lymph node mapping techniques, that identify the first lymph node the cancer is likely to spread to, are now available to a wide variety of cancer patients at the UC Davis veterinary hospital.

**UC Davis awarded NCI grant**

In a shift toward greater recognition of the role of canine models for human cancer, the National Cancer Institute (NCI) recently announced funding for five projects focused on canine cancer immunotherapy. One of those grants—for $2.7 million—was awarded to a collaborative team at UC Davis led by veterinary oncologist Dr. Rob Rebhun at the SVM and surgical oncologist Dr. Robert Canter with the CCC.

“This is a big deal in the veterinary world for the NCI to invest money in a dog model for immunotherapy and fund five places to specifically do canine immunotherapy work,” Rebhun said. “We’re one of those places. I believe our collaborative team is the reason we were selected to move forward with their investment.”

Rebhun explained this latest round of grants is part of the Cancer Moonshot initiative created by the NCI to fund projects that could be transformative. UC Davis was selected in part based on immunotherapy work underway with funds from a P30 grant from the NCI, as well as previous research conducted by several members of the team in looking at non-killer cells in dogs.

**3D printing improves and personalizes radiation therapy**

In radiation therapy, the goal is always to maximize the dose on the tumor and minimize radiation going to normal tissues. One way to do this is to use bolus material for tumors that are near the surface of the body and skin. Boluses act as an artificial tissue that absorb radiation doses. A bolus can be made of many types of materials—water-soaked gauze, a modeling compound like Play-Doh, or prefabricated sheets of artificial “skin.” None of these are ideal because they do not mold directly to the surface, are not the same density of the tissue, and can leave air gaps where the body surface changes shapes. These air gaps interfere with the radiation dose. For example, a flat sheet cannot completely cover a curved part of a body, such as over the nose. Now, UC Davis has a solution to better treat these patients—a newly acquired 3D printer.

After a patient has a CT scan of the area to be treated, a bolus can be “drawn” on the surface. This can then be imported into other software which allows for the creation of a 3D structure that can be printed using a rubbery material that exactly conforms to the patient and is placed on them before each treatment. Each bolus takes between six and 12 hours to print, depending on the thickness and size.

“The 3D printer allows oncologists to make a bolus that is the exact shape as the contour of the patient,” said Dr. Michael Kent, radiation oncologist at the UC Davis veterinary hospital. “This eliminates air gaps and helps change how the dose distributes to the tissue. This is a great example of how practical translational research can quickly be brought to the clinic and impact our patients.”