Cancer Research at Penn Vet’s Ryan Hospital

Penn Vet researchers strive to improve the prevention, diagnosis, and treatment of cancer in animals through novel therapies that may one day offer cancer patients, canine and human alike, a viable alternative or complementary treatment to traditional therapies.

VETERINARY CLINICAL INVESTIGATIONS CENTER
An important component to providing the finest and most cutting-edge cancer care available to pets is Ryan Hospital’s close working relationship with the Veterinary Clinical Investigations Center (VCIC), converging science and medicine, and transferring the latest research directly to the patient.

Penn Vet’s VCIC reaches out to veterinary clinics in the Philadelphia metropolitan area to offer patients access to cutting-edge clinical trials. These trials can offer owners potential diagnostic and treatment options that are not available anywhere else locally or even nationally for their pet. The VCIC provides nursing staff that dedicate 100% of their effort to helping owners and their pets navigate the course of enrolling in a clinical trial, offering them state-of-the-art care, while informing science for the benefit of future generations of pets and people alike. For example, Dr. Dottie Brown’s work with a compound derived from the Coriolus versicolor mushroom in dogs suffering from hemangiosarcoma resulted in some of the longest survival times ever reported for dogs with the disease. The mushroom compound could offer an alternative to chemotherapy or a complementary treatment to traditional cancer therapies in both dogs and humans.

The VCIC is directed by faculty who are trained in clinical epidemiology with an emphasis in clinical trials. The veterinary nurses that staff this center are certified veterinary technicians with training in the management of clinical trials including Good Clinical Practice. Through the VCIC, the high volume, high quality veterinary care of Ryan Hospital is integrated with the scientific methodology of clinical trials to design, implement, and analyze veterinary clinical studies unlike any other institution.

SHELTER CANINE MAMMARY TUMOR PROGRAM
The goal of the Penn Vet Shelter Canine Mammary Tumor Program is to advance knowledge of breast cancer in both dogs and humans. Led by Dr. Karin Sorenmo, the program provides care to shelter dogs with mammary tumors that are homeless and without access to the care they need to survive. Penn Vet covers surgery and follow-up care costs and helps facilitate adoption.
Shelter dogs provide an ideal population for studying mammary tumors because only 10 percent of animals received into shelters have been spayed or neutered. The incidence of mammary tumors in unspayed female dogs is at least four times greater than in spayed dogs.

Mammary tumors in dogs and breast cancer in women have many similarities, both in terms of risk factors and biology. Many of the dogs have multiple tumors, often in different stages of malignant transformation, and therefore provide a unique opportunity to study cancer progression.

**CANCER IMMUNOTHERAPIES**

Penn Vet’s proximity to and collaborations with Penn Medicine continue to yield innovative ways to fight cancer. Penn Vet’s Dr. Nicola Mason is working with Penn Medicine on a project to further develop cancer immunotherapies that are already showing promise in both canine and human patients. Immunotherapy describes the use of the body’s immune system to fight disease.

In collaboration with Dr. Yvonne Paterson, Professor of Microbiology at Penn Med, Dr. Mason is evaluating the effects of a genetically modified Her2/Neu-expressing listeria-based vaccine in dogs with an aggressive bone tumor known as osteosarcoma. Despite limb amputation and chemotherapy, 60% of dogs with osteosarcoma die within one year of diagnosis. Dogs with Her2/neu-positive osteosarcoma have traveled to Penn Vet from Ohio, Florida, Louisiana, and Montana to receive this novel therapy. Preliminary data from this trial indicates that the vaccine prolongs survival times when administered to dogs that have undergone amputation and follow-up chemotherapy. These findings may change the paradigm of canine osteosarcoma treatment and provide essential preliminary data to advance this approach in children with osteosarcoma and adults with a variety of different tumor pathologies, including mammary carcinoma.

Dr. Mason’s immunotherapy program also incorporates personalized medicine approaches to canine lymphoma with a soon-to-be launched clinical trial evaluating the effects of a second-generation antigen-presenting cell vaccine for dogs with B-cell lymphoma. This vaccine builds on the published success of a previous Penn Vet clinical trial that showed prolonged survival of dogs with B-cell lymphoma that received this vaccine following successful induction chemotherapy.

Another example of personalized immunotherapy being evaluated in dogs at Penn Vet is a recently launched program to develop genetically modified T-cells that can be adoptively transferred into canine patients to fight different types of cancer including lymphoma and carcinomas. This work is made possible through the generosity of the Richard Lichter Charity for Dogs. The research is in its early stages, but Dr. Mason’s lab has already shown feasibility of the approach using canine constructs, and her team hopes to advance this in canine patients who have failed currently available treatments for lymphoma in the New Year.
CANCER IMAGING SYSTEMS
Penn Vet’s Dr. David Holt has partnered with Penn Medicine to improve detection of surgical margins at the time of surgery to remove soft tissue sarcomas. Dr. Holt currently offers a surgery using dye and special imaging equipment to Ryan Hospital patients. This technique is vital in both veterinary and human surgical oncology to ensure that the entire tumor is resected.

MOLECULAR AND CELLULAR BASIS FOR TUMOR GROWTH AND METASTASIS
Remarkable advances have been made in understanding the molecular pathways that can go awry, leading to the transformation of normal cells to malignant cells. Drugs that target these pathways have been developed and, in a number of cases, have shown clinical efficacy. Important advances in medical, surgical, and radiation oncology have also improved treatment of primary tumors. So why then does cancer remain the second most common cause of death? Malignant cells in primary tumors can prove resistant to therapy and can develop the capacity to escape from the tissue of origin to other tissues and organs – a process known as metastasis, which is the most common cause of cancer-related death. In addition, environmental factors, diet, and aging present risks that contribute to the prevalence of some cancers.

At Penn Vet, Dr. Ellen Puré’s research defines the mechanisms by which the local tumor microenvironment, as well as the systemic response to tumors, can either accelerate or put the brakes on cancer cell growth and metastasis. Once pathways are defined, Dr. Puré develops mechanism-based therapeutic interventions that favor inhibition of tumor growth and metastasis and promote effective anti-tumor immunity. The goal is then to turn these complexities into new treatments for preventing or treating cancer that complement current approaches used in clinical settings.

COMPARATIVE ONCOLOGY PROGRAM
Penn Vet is a member of the Comparative Oncology Trials Consortium (COTC), which is run by the National Cancer Institute and provides access to a wide range of new cancer drugs in the early stages of testing.

The COTC is an active network of twenty academic comparative oncology centers, centrally managed by the NIH-NCI-Center for Cancer Research’s Comparative Oncology Program, that functions to design and execute clinical trials in dogs with cancer to assess novel therapies. The goal of this effort is to answer biological questions geared to inform the development path of these agents for future use in human cancer patients.