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Translational Medicine and Fido

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BY SUSAN MILLER

Since 1884 when the School of Veterinary Medicine was established by the University of Pennsylvania's School of Medicine, we have firmly believed in the concept of "One Medicine"—that human medicine and veterinary medicine are inextricably linked. As we celebrate our 125th anniversary we can look back and see clearly the tremendous contributions our faculty, staff and alumni have made in bettering the health of animals. Along the way, we have also consistently pursued the One Medicine concept so that what we learn about animal health helps us understand human disease.

MAN'S BEST FRIEND

One area where veterinary medicine is significantly effecting change is promoting the study of spontaneously occurring diseases in large animals to further the understanding of disease models. Primates, cattle, horses, cats and dogs have all contributed to our knowledge of health, yet for a very long time, mice were king. Although mouse models have many benefits, including low cost and short time to maturity, they also have significant limitations such as their clinical similarities both genetically and physically to humans making translational and pre-clinical studies less than ideal.

Research focusing on canine models of disease, in particular, is gaining momentum and for very good reasons. Studying pure breed dogs, due to the very nature of selective breeding and closed gene pools, presents extraordinary opportunity to identify potential links to genetics. Nearly half of genetic diseases reported in dogs occur predominantly, or exclusively, in one or a few breeds. Access to pedigrees simplifies following disease from one generation to the next.

Dogs have more naturally occurring inherited diseases than any other species except man. Nearly half of these diseases are common to humans. The top 10 diseases of greatest concern to dogs include cancer, epilepsy, autoimmune diseases, heart disease and diseases causing cataracts. Between humans and dogs, naturally occurring diseases tend to be similar biologically and histologically in their clinical course. Since humans and their dogs share a

common environment there is tremendous opportunity to explore significant relevance among environmental factors.

Many researchers believe cancer is the area of health where dogs may have greatest impact in accelerating our understanding and advancing therapeutics. Cancer is the most frequent canine disease, and cancer is the largest killer of dogs over age two. Since humans and dogs share similar bone cancers, skin cancers and lymphomas, comparative research between humans and canines holds tremendous potential for furthering our understanding of cancer-related disease, both in humans and in animals.

Certain breeds of dog are known to develop certain types of cancer. Osteosarcoma (bone cancer), for example, is common in the Greyhound and the Rottweiler. It is also the sixth most common cancer seen in children.

Our canine friends can teach us much about the natural progression of tumors. Research suggests that in the mechanism of tumor development there are more similarities between humans and dogs than between humans and any other model organism.

Clinical intervention can be easily studied over a condensed period of time due to the shorter life span of dogs. Survival rates for dogs suffering from cancer are detailed over a period of one year as opposed to five in human oncology. Clinical trials looking at disease progression tend to achieve fairly rapid results.

Due to similarities in the physiology of canines and humans, dogs metabolize and respond to drugs in ways very similar to humans. When diseases occur, dogs provide invaluable information to us as we move from the laboratory to veterinary and human clinics.



Photo by John Donges

FROM THE BENCH TO THE BEDSIDE

Translational medicine refers to taking discoveries made in basic science research labs and using them to very quickly develop therapies useful for treating patients—whether they are humans or animals. The goal of translational medicine is to accelerate the application of basic discoveries to clinical practice, including diagnosis and treatment of human and veterinary patients. But it is not as easy as one might think.

It is estimated that 80 percent of novel cancer drugs are never used because they fail during clinical trials. Failure is costly and time consuming. It is no wonder clinical trials testing new treatments and therapies are expanding and moving into the veterinary clinic as awareness of the potential of studies involving canine models continues to rise. Veterinary medicine and our canine friends are

being acknowledged for the tremendous potential that comparative medical models have in understanding disease and efficiently and more quickly bringing new treatments to your veterinary clinic as well as your doctor's office.

Penn, in both its schools of Medicine and Veterinary Medicine, has made significant advances in bringing together basic science researchers and clinicians. Those who treat patients on a regular basis and those who focus primarily on laboratory research have operated for years within very different cultures. However, the determination to harness the potential of translational medicine has led to new collaboration, innovation and commitment to advancing practical clinical solutions, developing better products and improving care. *One Medicine*—for humans and animals—may have seemed far-fetched just a short time ago, but thanks to our animal friends, particularly our canine friends, not for much longer. 🐾