Developing Ways to Improve Cancer Treatment
Daniel L. Gustafson, PhD, Colorado State University

RESULTS: Researchers Mine Genetic and Drug Data Used in Human Cancer Medicine to Help Canine Osteosarcoma Patients

Methods of predicting tumor response to a given chemotherapy protocol have historically focused on a few traits that could be measured in biopsy samples. Recent approaches have looked at the expression of genes within tumors, called gene signatures, to predict a tumor's sensitivity to a given drug. Because many dogs with osteosarcoma succumb to the disease in spite of treatment, a method to optimize chemotherapy selection could improve outcomes.

Funded by Morris Animal Foundation, researchers from Colorado State University evaluated gene signatures in canine osteosarcoma tumors to try and predict how individual dogs would respond to treatment with a specific drug. This project was based on evidence that the genetics of human and canine cancers are similar enough that the wealth of data on human cancer gene signatures and drug sensitivity could be mined and applied to canine cancers to aid in chemotherapy selection for dogs.

By comparing gene signatures to known outcomes of therapy, the researchers were able to gauge how accurately they could predict if a specific chemotherapeutic agent would have a positive or negative response in an individual dog based on the dog's gene signature. They found that gene-expression models to search drug databases for optimal treatments developed for human medicine could be used in a cross-species manner and could significantly predict chemosensitivity for some drugs in canine osteosarcoma cell lines and tumors. However, this model did not work for all drugs evaluated, and some predictions were more successful using dog-based data only.

The researchers also speculate that a "backward" drug screen might identify compounds with promising activity against canine osteosarcoma that are not commonly used in its treatment. This "backward" process involves screening and comparing genetic signatures of dog tumors against genetic signatures of human cancer cell lines and using data on how human cancers respond to over 10,000 compounds that have been measured for anti-cancer activity by the National Cancer Institute. The end result may help identify some drugs that work in canine osteosarcoma patients.

Follow-up research is underway to verify the study findings, which will then be used to design a clinical trial to prospectively test drug outcome predictions. If the follow-up studies are successful, canine patients could be treated with the drug that is most effective for their particular cancer. Data from these collective studies could also lead to new treatment options for dogs with osteosarcoma. This type of approach, known as personalized medicine, uses tailored therapy designed to better control cancer growth and spread while minimizing toxicity and avoiding ineffective drugs. (D13CA-044)