Study focused on improving radiation treatment for cancers in pet dogs

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Can scientists improve cancer treatment for man's best friend?

A UNC Lineberger Comprehensive Cancer Center researcher and his colleagues have been awarded a five-year, $3.2 million grant from the National Cancer Institute to investigate how to improve radiation treatment for dogs undergoing treatment for sarcoma.

UNC Lineberger's Paul A. Dayton, Ph.D., a professor in the UNC & N.C. State Joint Department of Biomedical Engineering, and a multi-institutional team of researchers are studying whether non-toxic, oxygen-filled bubbles can help overcome problems of low oxygen, or "tumor hypoxia," which can make a tumor less responsive to radiation therapy. They hope their findings could ultimately shine light on whether their strategy could also improve radiation treatment for people.

"Because of their dysfunctional blood supply, cancer cells are hypoxic, and when cancer cells have a low oxygen supply, they are not as responsive to radiation," Dayton said. "We are investigating whether we can deliver tiny, oxygen-filled microbubbles directly to tumors to get better outcomes from radiation."

The clinical trial will be conducted in collaboration with the N.C. State College of Veterinary Medicine, the Colorado State University Flint Animal Cancer Center, the University of Colorado at Boulder, and Duke University. The dogs can receive treatment at the N.C. State College of Veterinary Medicine, as well as at other treatment centers. The study will cover some of the costs associated with the hospital stay and staging at the two veterinary schools involved in the study.

"Dogs get cancer like people do, and they are prone to certain types of cancer. One of the treatments is radiation therapy," Dayton said. "We want to see if we can get a better treatment response for patient dogs who are being treated with radiation for their cancer."

Co-investigator Gabriela Seiler, DVM, a professor of radiology at the N.C. State College of Veterinary Medicine, noted that "this grant provides an opportunity to study ways to improve cancer treatment in people, and, at the same time, potentially increase the success of radiation therapy in dogs."

Dayton's laboratory is focused on research to improve ultrasound, which uses sound waves to create images. His team has been investigating the use of microbubbles, which are already used in the clinic to increase the contrast of the ultrasound images. Dayton's most recent project examines whether filling the microbubbles with oxygen will improve radiation treatment, either by bursting the microbubbles within the tumor or just through their presence. Data from early studies in the laboratory led by Virginie Papadopoulou, Ph.D., research assistant professor in the UNC/NC State Joint Department of Biomedical Engineering, showed the bubbles could oxygenate tumors and improve radiation therapy outcome in a preclinical model.

The latest grant comes on the heels of another approximately $2.5 million NIH grant, similarly awarded in collaboration with Mark Borden, Ph.D., associate professor of mechanical engineering at the University of Colorado at Boulder, to study the use microbubbles with imaging to gauge whether a pet patient is responding to treatment for soft tissue sarcoma. They designed the microbubbles to attach to specific markers that indicate blood vessel growth to tumors to be able to tell whether the tumor is growing.

"For patients who have to be imaged frequently, risk of radiation exposure is a factor," said co-investigator Mike Nolan, DVM, Ph.D., assistant professor of radiation oncology at the N.C. State College of Veterinary Medicine. "Something like ultrasound could be used at the bedside every day."

Dayton said his lab is interested in improving upon ultrasound technology as a potentially safer and more affordable imaging option.

"Low cost, portability, safety and the improved image quality of new ultrasound devices are all reasons why I think ultrasound is going to play an increasing role in the future," he said.

Provided by University of North Carolina at Chapel Hill School of Medicine