Precision medicine approach has successfully treated bone cancer in dogs

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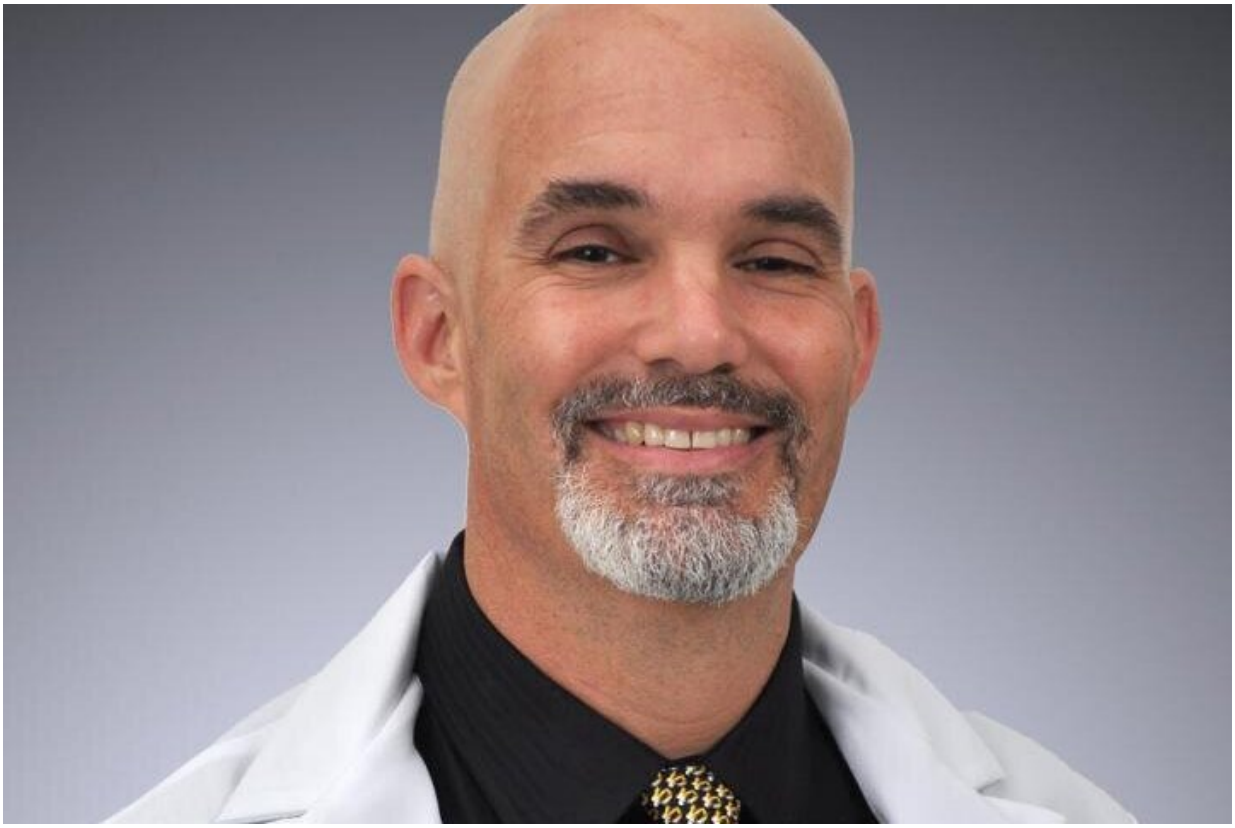

Jeffrey Bryan is a professor in the MU College of Veterinary Medicine. Credit: MU College of Veterinary Medicine

Osteosarcoma, a common bone cancer in dogs, affects more than 10,000 dogs in the U.S. each year. While chemotherapy is generally effective at

killing some of the cancer cells, the numerous side effects can be painful and often a subset of cancer cells exist that are resistant to chemotherapy.

To offer an alternative, Jeffrey Bryan, a professor at the University of Missouri's College of Veterinary Medicine, and the veterinary oncology team collaborated with ELIAS Animal Health to create a vaccine from a dog's own tumor to target and kill cancer cells in dogs suffering from osteosarcoma. Now, the success of this treatment in dogs has led the Food and Drug Administration (FDA) to grant a rare fast-track designation for ELIAS Animal Health's parent organization, TVAX Biomedical, to use the ELIAS immunotherapy approach to treat glioblastoma multiforme, a tumorous brain cancer in humans.

"This precision medicine approach uses the patient's own tumor to make a vaccine, which stimulates the immune system against the abnormal proteins specific to the patient's tumor, causing the body to generate white blood cells, called lymphocytes," said Bryan, who also serves as the associate director of comparative oncology for the Ellis Fischel Cancer Center and a faculty research lead for the NextGen Precision Health Institute. "We then harvest and expand these lymphocytes outside the body, which activates them so they are highly aggressive toward their target. By infusing them back into the patient's body they can seek out and destroy the harmful cancer cells."

A just-completed clinical trial at MU's College of Veterinary Medicine found that dogs receiving this therapy had more than 400 days of cancer survival compared to about 270 days for dogs receiving chemotherapy in a separate study by the National Cancer Institute. By positively impacting health outcomes in dogs with bone cancer, the FDA granted fast-track designation for this approach to be used in human trials to treat brain cancer in people.

"Both osteosarcoma in dogs and glioblastoma multiforme in people are very aggressive diseases that tend to take the patient's life quickly, and they both express mutant proteins that can be targets for the immune system," said Bryan, who serves on the scientific advisory board for ELIAS Animal Health. "The beauty of this immunotherapy approach is it can be theoretically generalized for any kind of cancer. The advancement to these human trials shows that we can apply this technology to help treat different diseases that are very deadly and have few effective therapies currently."

ELIAS Animal Health is continuing the development of this immunotherapy for osteosarcoma in pursuit of approval from the U.S. Department of Agriculture so that the treatment can be utilized on dogs across North America. Also, if TVAX Biomedical's human trials are successfully able to treat glioblastoma multiforme, the immunotherapy approach could be expanded to treat other cancers in humans.

"My hope is that one day this approach can be used to treat bone cancer in children," Bryan said. "My overall goal is to be part of discoveries that not only benefit dogs but humans as well."

Bryan's research is an example of precision medicine, a key component of the NextGen Precision Health Initiative. By partnering with government and industry leaders, the initiative will help accelerate medical breakthroughs for both patients in Missouri and beyond.

More information: Brian K. Flesner et al, Autologous cancer cell vaccination, adoptive T -cell transfer, and interleukin-2 administration results in long-term survival for companion dogs with osteosarcoma, *Journal of Veterinary Internal Medicine* (2020). DOI: 10.1111/jvim.15852

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