

# TGen and Ohio State collaborate on landmark precision medicine canine cancer study

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Despite those velvet paintings of poker-playing dogs smoking pipes, cigars and cigarettes, our canine friends really don't use tobacco. But like many humans who have never smoked, dogs still get lung cancer.

And, like many women who develop a particular type of breast cancer, the same gene—HER2—also appears to be the cause of [lung cancer](#) in many [dogs](#), according to a promising new study of pet dogs led by the Translational Genomics Research Institute (TGen), an affiliate of the City of Hope, and The Ohio State University.

Published today in the journal *Clinical Cancer Research*, this study could have significant implications for people who have never smoked.

TGen and Ohio State found that neratinib—a drug that has successfully been used to battle human breast cancer—might also work for many of the nearly 40,000 dogs in the U.S. that annually develop the most common type of canine lung cancer, known as canine pulmonary adenocarcinoma, or CPAC.

Neratinib inhibits a mutant cancer-causing form of the gene HER2, which is common to both CPAC and HER2-positive human breast cancer patients.

"With colleagues at Ohio State, we found a novel HER2 mutation in

nearly half of dogs with CPAC. We now have a candidate therapeutic opportunity for a large proportion of dogs with lung cancer," said Dr. Will Hendricks, an Assistant Professor in TGen's Integrated Cancer Genomics Division, Director of Institutional Research Initiatives, and the study's senior author.

Based on the results from this study, a clinical trial using neratinib is planned for dogs with naturally occurring lung cancer that have the HER2 mutation.

"This is the first precision medicine clinical trial for dogs with lung cancer. That is, the selection of cancer therapy for a particular patient is based on the genomic profile of the patient's tumor and matched with agents that are known to specially target the identified mutation," said Dr. Wendy Lorch, an Associate Professor in the Department of Veterinary Clinical Sciences at The Ohio State University College of Veterinary Medicine, who also will run the study's clinical trial.

"Our team at The Ohio State University has worked for years to find treatments for canine lung cancer. This breakthrough shows the value of these studies for dogs, as well as humans with lung cancer who never smoked," said Dr. Lorch, who also is the study's lead author.

CPAC is an aggressive disease that clinically resembles human lung cancer among never-smokers. There is no standard-of-care treatment for CPAC and—prior to the work performed by the TGen-Ohio State team—little was known of the disease's genetic underpinnings.

"These results are the first example of our efforts to adapt genomics tools from the human world, such as gene sequencing and liquid biopsies, to generate novel insights in canine cancers, with [mutual benefit](#) for both," said Dr. Muhammed Murtaza, Assistant Professor and Co-Director of TGen's Center for Noninvasive Diagnostics, and one of

the study's contributing authors.

While the sequencing of hundreds of thousands of human cancer genomes has driven the transformational development of precise targeted cancer treatments for humans over the past decade, relatively few canine cancer genomes have undergone similar profiling. The canine cancer genomic discovery and drug development efforts of the TGen-Ohio State team are pieces of a larger puzzle that could similarly transform veterinary oncology, while creating bridges between canine and human cancer drug development.

"This study is groundbreaking because it not only identified a recurring mutation in a canine cancer that had never been found before, but it actually led directly to a clinical trial," said Dr. Jeffrey Trent, TGen President and Research Director, and one of the study's contributing authors. "This clinical translation from dog to human and back is the holy grail of comparative cancer research."

Lung cancer is the leading cause of cancer death in the U.S., annually taking the lives of more than 154,000 Americans.

"This study is really exciting to us because, not only have we found a recurrent hot-spot mutation in a canine cancer that had never been found before, but it actually has direct clinical translational relevance. For humans, we already have drugs that can inhibit many dysregulated proteins. We hope to show that we can provide the same benefit for dogs with canine cancers," Dr. Hendricks added.

No dogs were harmed in this study. Only pet dogs with naturally occurring cancer were examined.

This study—Identification of recurrent activating HER2 mutations in primary canine pulmonary adenocarcinoma—lays the foundation for

potential rapid translational development. Follow-up clinical and genomic studies have been funded in part by a \$300,000 grant investment from the Petco Foundation made possible through their 10-year Pet Cancer Campaign in partnership with Blue Buffalo. Susanne Kogut, President of The Petco Foundation, said her organization's investment in the next phase of TGen-Ohio State studies is part of a larger effort to improve the health and welfare of pets everywhere.

"We are so excited to be a part of this study of canine [lung cancer](#), which we hope will rapidly benefit our pet, and pet-parent, communities worldwide," said Kogut, who in 2016 was named one of 25 "women of influence" by Pet Age magazine.

**More information:** Gwendolen Lorch et al, Identification of recurrent activating HER2 mutations in primary canine pulmonary adenocarcinoma, *Clinical Cancer Research* (2019). [DOI: 10.1158/1078-0432.CCR-19-1145](#)

Provided by The Translational Genomics Research Institute

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