

Exploring How Cancer-Fighting Cells Get Reprogrammed to Help Cancer Grow — in Humans and Dogs

Research by University of Colorado Cancer Center members at CSU's Flint Animal Cancer Center could benefit both people and dogs.

September 9, 2025 By University of Colorado Cancer Center and Mark Harden

New research by [University of Colorado Cancer Center](#) members and a PhD student at Colorado State University's renowned small-animal cancer facility may lead to a better understanding of which genes make cancers adept at evading the immune systems of both dogs and people — and, potentially, of how to make cancer immunotherapies work for a larger percentage of patients.

It's the latest example of how scientific collaboration between the CU Cancer Center and CSU's [Flint Animal Cancer Center](#) (FACC) in Fort Collins is helping to unlock cancer's secrets and point the way to better treatments for humans and animals. It's also an example of how experienced cancer researchers can support talented newcomers as they launch their science careers.

The new research involved FACC's cell lines derived from naturally occurring cancer in dogs. Study of canine cancer cases can be valuable in human cancer research due to similarities in cancer types, genetic makeup, and immune systems between the two species.

The new study focused on tumor-associated macrophages — a type of immune cell found in the tumor microenvironment that's supposed to fight cancer. But some cancers can “reprogram” these macrophages to help the tumor grow instead of fighting it.

FACC scientists wanted to figure out which genes in cancer cells make them good at this reprogramming trick.

→ [Renowned CSU Research Center Fights Cancer in Both Pets and People](#)

Tricking macrophages

[A poster on the work](#) was presented in April at the annual meeting of the American Association for

Cancer Research (AACR) in Chicago. The abstract was co-authored by CU Cancer Center members [Doug Thamm](#), VMD, DACVIM (Oncology), the Barbara Cox Anthony Professor of Oncology at CSU and FACC's director of clinical research; and [Dawn Duval](#), PhD, professor in CSU's College of Veterinary Medicine and Biomedical Sciences and assistant department head for research in the Department of Clinical Sciences.

But Thamm says the project was “largely the work of a very talented PhD student” in his lab who recently joined the faculty of the University of California, Davis: Rachel Brady, DVM, PhD, DACVIM (Oncology). It was Brady who presented the work at AACR.

While Brady was in Thamm's lab, “all of her different projects centered around this theme of tumor-associated macrophages, which are one of the most abundant non-tumor cells in most kinds of cancer,” Thamm says. He adds that macrophages “can be sucked into the tumor from the bloodstream and then tricked into helping that tumor survive, grow, and potentially spread. And on this project, she was asking the question: What are the things about tumor cells that help them to turn macrophages into “tumor helpers”?”

A little piece of the puzzle

Brady says the project emerged from a brainstorming session with Thamm. “It's a complex thing — the immune system is complex and the tumor is complex,” she says. “So with this project, we were thinking, can we simplify this very complex environment down to where we can try to unravel some of those things that make it so hard to figure out which patients will respond to which immunotherapy? It's such a big problem, and we thought, what's one little piece of the puzzle we could start chipping away at?”

The research relied on the work of Duval's lab, which has assembled what is believed to be the largest collection in the world of cell lines derived from naturally occurring canine tumors.

Duval emphasizes that the cancer being studied is not induced in dogs. “These are canine patients that carry spontaneous tumors,” she says. “We're trying to help them and help human patients, too.”

She says the FACC's cell lines are ideal for this kind of research because they are carefully profiled through DNA sequencing and tested to avoid contamination, so they are highly reliable in research use.

→ [Studying the Oral Cancer Immune Landscape in Dogs](#)

Juice of the tumor

Using 25 different canine cancer cell lines, the team collected the tumor-conditioned medium (TCM) from each of the cell lines. TCM contains various distinctive secretions from the tumors.

Brady calls TCM “the juice of the tumor.”

Researchers took healthy macrophages from three different dogs, exposed the cells to the 25 different samples of TCM, and measured how much the macrophages changed their behavior in each case. They then compared the genetic profiles of the cancer cells to see which genes were turned on or off.

“One of our interesting observations was that, even within a given tumor type, some individual tumor cells were much better than others” at switching macrophages from “good” to “bad,” Thamm says.

Among other findings, when they looked at the cancer cell lines that were better able to reprogram macrophages, they found that a gene called MVB12A was highly active in stimulating macrophages to produce vascular endothelial growth factor (VEGF), a protein that can promote tumor growth and metastasis by facilitating blood vessel formation.

MVB12A helps package toxic substances into tiny bubbles called exosomes that get sent to macrophages. When the researchers removed these exosomes from the TCM, they found there was a significant decrease in VEGF production, and other genes involved in immune suppression were turned on.

“It seems like the MVB12A is helping to put some kind of signal into the exosomes that encourages the macrophages to make VEGF,” Thamm says.

‘A ton of work’

Improved understanding of which gene signatures make cancers good at manipulating the immune system could eventually lead to ways to identify novel biomarkers and improve immunotherapy targeting among different groups of patients, the researchers say.

“Maybe at some point, this could be yet another tool in our personalized medicine toolbox,” Thamm says. “If we see that this particular gene is really high in this particular tumor, that’s a good indication maybe a macrophage-directed therapy might work better in this case than in another case.”

Thamm and Duval say the CU Cancer Center-CSU partnership is invaluable to furthering cancer research that can help both humans and animals.

For one thing, says Duval, “as we’re developing these canine cell lines, we’re depositing them with the tissue culture center at CU Anschutz, so that as people down there do research, they can look for things in our cell lines as a starting-off point.” And Thamm notes that their new microphage project relied on the CU Cancer Center’s Genomics Shared Resource for DNA sequencing. “Access to those core services is so critical to do this work,” he says.

For Brady, being able to present the results of “a ton of work” at AACR at this point in her career was “very satisfying. I have presented at a lot of veterinary conferences, which is a big deal for me, but this was my first human conference, and one of the biggest in the world. It was very exciting for me.”

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<http://beta.docker.tusaludmag.com/article/exploring-cancerfighting-cells-get-reprogrammed-help-cancer-grow-humans-dogs>