

Researchers find links between human, canine brain tumors

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Texas A&M School of Veterinary Medicine & Biomedical Sciences (VMBS), Baylor College of Medicine, and Texas Children's Hospital researchers have discovered that meningiomas—the most common type

of brain tumor in humans and dogs—are extremely similar genetically.

These newly discovered similarities will allow doctors to use a classification system that identifies aggressive tumors in both humans and dogs while also opening the door for new and exciting collaborations between human and animal medicine.

Until now, the lack of reliable and viable experimental models has been a barrier to understanding the biology of and developing effective treatments for these brain tumors.

"The discovery that naturally occurring canine tumors closely resemble their human counterparts opens numerous avenues for exploring the biology of these challenging tumors," said Dr. Akash Patel, an associate professor of neurosurgery at Baylor College of Medicine and principal investigator at the Jan and Dan Duncan Neurological Research Institute (Duncan NRI) at Texas Children's Hospital.

"It also provides opportunities for developing and studying novel treatments applicable to both humans and dogs."

The study, published in [Acta Neuropathologica](#), was led by Patel; Dr. Jonathan Levine, a VMBS professor and head of the Department of Small Animal Clinical Sciences (VSCS); and Dr. Tiemo Klisch, assistant professor at Baylor College of Medicine and principal investigator at Duncan NRI. VSCS assistant professor Dr. Beth Boudreau was a key collaborator.

For the project, the team analyzed 62 canine meningiomas from 27 dog breeds and discovered that the tumors shared remarkable similarities to the same kinds of tumors when they occur in humans. This is the largest study to date of the gene expression profiles of canine meningiomas.

Watching the signs

The new discovery was made possible by building on recent work conducted by Patel's team, as well as previous work by Levine and Boudreau that explored gliomas, another type of brain tumor.

In 2019, Patel and others at Baylor College of Medicine and Texas Children's Hospital found that they could classify meningiomas in humans into three biologically distinct subtypes—MenG A, B, and C—by analyzing their RNA. The new classification system can predict patient outcomes with greater accuracy than the standard tissue sample analysis.

"Because RNA shows how a tumor's genes activate, it allows researchers to accurately predict how a tumor will behave—whether it will be aggressive or if it's going to respond to certain therapies," Levine said.

In 2020, Levine, Boudreau, and colleagues at the VMBS and the Jackson Laboratory for Genetic Medicine found [genetic similarities between gliomas](#)—the second most common type of [brain tumors](#)—in humans and dogs.

Armed with a new way of detecting [aggressive tumors](#) and the knowledge that dogs and humans share some brain tumor traits, Patel reached out to Levine about applying the findings to study meningiomas.

"We ended up agreeing to provide Patel with canine tumor samples we had worked years and years to archive, to see if he could isolate the RNA, which is not always easy to do," Levine said. "He was able to produce this very robust dataset that showed a similar pattern structure to human tumors. Our team also provided Dr. Patel with key clinical outcome data, including responses to certain treatments."

Moving to clinical trials

Now that the researchers have established a connection between tumors across the two species, they can begin preparations for clinical trials, which can take several years to plan and fund.

"We're really interested in creating wins for both human and animal medicine," Levine said. "For example, we hope to give dog owners access to therapy that's not available anywhere else in the world through [clinical trials](#). At the same time, that information will also inform the next step of human trials."

Incidentally, a separate group of researchers from the University of California, Davis, conducted a similar study with matching conclusions about meningiomas in dogs and people and published its work in the same journal. The two research groups look forward to collaborating in the future to develop tumor treatments for both species.

"I think there is a terrific opportunity for the teams at Baylor, Texas A&M, Texas Children's, and University of California to collaborate to create a clinical trial," Levine said.

"If we do one trial, we'd be able to enroll patients a lot more quickly, which would make it easier to get larger datasets, resulting in stronger findings. So, we have a lot of interest in doing a collaborative trial," he said. "We really see the team out in California as potential partners."

For now, the next step is looking through the data from both studies to see if there are clues that will lead to new therapies.

"One of the benefits of this project is that we already have all this genetic data that we can use to decide what might make a good treatment," Levine said. "Part one has set us up very well to work on part

two."

More information: Akdes S. Harmanci et al, Aggressive human MenG C meningiomas have a molecular counterpart in canines, *Acta Neuropathologica* (2024). [DOI: 10.1007/s00401-024-02692-3](https://doi.org/10.1007/s00401-024-02692-3)

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