

Liquid Biopsy in Veterinary Medicine

Transforming Canine Cancer Detection with Zomedica's ZM-017

Zomedica

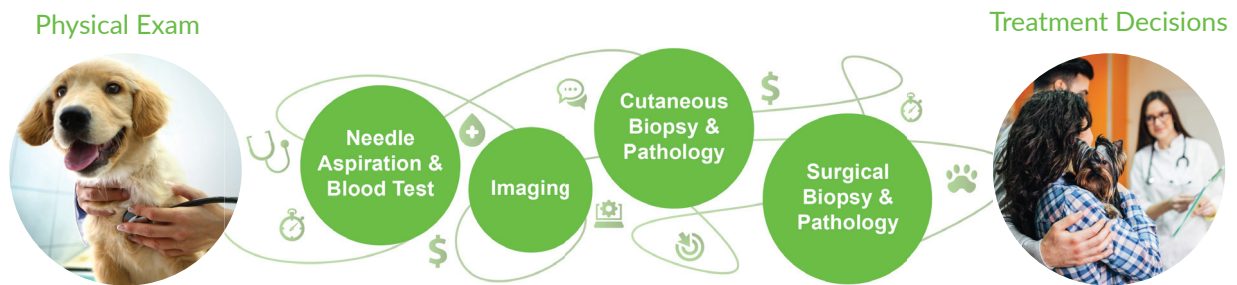


Introduction

Advances in veterinary care have increased the life expectancy of our companion animals. Canines, in particular, have benefitted from the improvements in veterinary science. However, as dogs live longer, the potential for cancer increases. Indeed, veterinarians will see more cases of canine cancer in the future.¹ Current cancer diagnostic approaches have considerable limitations. These include the need for invasive procedures, the need for multiple tests to confirm diagnosis, and the cost-prohibitive nature of these tests. Zomedica has partnered with Celsee, Inc. to develop ZM-017, a liquid biopsy circulating tumor cell (CTC) detection assay for veterinary application as a canine cancer diagnostic test. ZM-017 is less invasive, faster, and more affordable than the current standard of care. ZM-017 has the potential to not only transform the way veterinary medicine approaches canine cancer, but also positively influence clinical outcomes for canine companions.

Diagnostic Challenges for Canine Cancer

Vaccines, lifestyle changes, and other advancements in veterinary medicine have increased the life expectancy of domestic dogs. As a corollary, cancer rates in canines have risen.¹ It is projected that one of every four dogs will develop cancer in its lifetime, and almost 50% of dogs over the age of ten will die of cancer-related problems.¹ The veterinarian's ability to quickly and accurately diagnose cancer in dogs is difficult. Diagnostic procedures vary based on the specific type of cancer, are often time-consuming, and require the efforts of highly skilled laboratory staff. Any delay in diagnosing canine cancer may lead to negative outcomes for the dog and anxiety and frustration for the owner and clinic.



Currently, tissue biopsy is the gold standard for diagnosing canine cancer; however, this process is not without limitations. A tissue biopsy is an invasive procedure that most likely will require the animal to be anesthetized, which presents significant risks for elderly dogs, especially those with cancer. Other risks to the dog include bleeding, pain, and infection at

the incision site. Additionally, tissue biopsy is limited by the lack of procedural repeatability on a dog, potentially inconclusive results and/or subjective interpretation of the results. Another challenge for diagnosing canine cancer is the high cost of available diagnostic tests, including imaging and tissue biopsy, which may prevent many owners from pursuing recommended best practices for their dogs. For these reasons, it is imperative to pursue alternate diagnostic options for canine cancer that are less invasive, allow for faster analysis, and are more affordable.

Liquid Biopsy and Circulating Tumor Cell (CTC) Detection

Cancer-specific liquid biopsy tests are alternatives to surgical biopsy and continue to be an area of intense focus in human medicine. Specifically, these tests identify circulating tumor DNA/RNA (ctDNA and ctRNA) or CTCs in blood samples. CTC tests identify cancer cells that are shed into the bloodstream vasculature from a primary tumor and are carried throughout the circulation. Detection platforms extract CTCs from the millions of cells in the blood and identify them on a cell-by-cell basis.



Non-biopsy cancer testing methods in animal health are focused on quantifying changes in biomarkers (nucleic acids or proteins) to predict response to treatment, probability of relapse, or to identify cancer subtype. There has been some interest in the development of blood-based cancer tests that rely on approaches such as enzyme-linked immunosorbent assays for inflammatory markers and whole blood mRNA signature panels; however, these blood tests lack the necessary diagnostic utility to be used as liquid biopsy tests.

CTC detection technologies represent the most readily translatable cancer liquid biopsy tests to veterinary medicine as these approaches are not dependent on species-specific genomic research. No CTC platforms are used in the animal health market. This can likely be attributed to a number of factors, including concerns about cost and a limited amount of veterinary-focused research. Certainly, the less invasive nature of liquid biopsy makes it a highly attractive option for the diagnosis of canine cancer. Avoiding more invasive procedures such as tissue biopsy reduces stress on both the pet and owner. Peripheral blood draws facilitate consistent, repeat sampling that will support long-term follow-up in dogs with cancer.

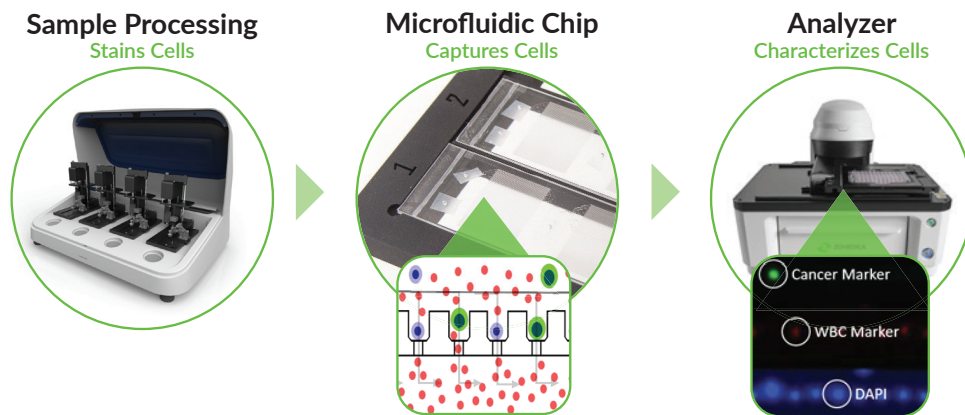
Introducing ZM-017: Transforming Standard of Care

Zomedica partnered with Celsee, Inc.—an innovator of progressive rare cell isolation and characterization in the emerging field of liquid biopsy—to revolutionize how veterinarians diagnose cancer in canines. ZM-017 is a new diagnostic solution for reference laboratories founded on Celsee’s CTC cell capture and analysis platform. Combined with a canine-specific assay developed by Zomedica, ZM-017 will require only a peripheral blood draw at the veterinarian’s clinic to effectively support a diagnosis of cancer in dogs.

For a CTC technology to be considered for commercial diagnostic applications in the veterinary field, the platform should:

- Accurately enumerate CTCs using size-based capture of CTCs
- Perform capture and analysis of CTCs using low-cost consumables
- Provide results within 24 hours of blood draw
- The ZM-017 platform checks all of these boxes**

The ZM-017 platform is comprised of two components: the cell capture system and the analyzer for image analysis. The cell capture system uses a microfluidic slide with 56,320 individual isolation chambers. The chambers are designed to isolate CTCs based



on differences in size and deformability and enable cellular and genomic analysis at the single-cell level. The analyzer imaging station automatically captures bright field or fluorescence images of cells, while its software allows specific analysis and reporting of the results. A recent study by Gogoi, et al. in human patients with cancer confirms the high sensitivity (94%) and specificity (100%) for CTC detection using the Celsee Genesis System.²

CTC detection technologies are considered leading-edge in human medicine and are supported by a significant body of published evidence on their effectiveness in targeted tumor cell detection. The experts at Zomedica intend to introduce their technology to veterinary medicine to facilitate the efficient and effective diagnosis of canine cancer, with the goal of enhancing animal outcomes. Zomedica's ZM-017 platform is uniquely positioned for success in the veterinary market for canine cancer detection as it enables automated cell enrichment, characterization, and single-cell capture and analysis at lower costs than currently available diagnostic approaches. ZM-017 requires only a simple in-office blood draw, which minimizes stress on the dog, owner, and staff. Importantly, the laboratory will be able to provide confirmatory results within 24 hours of sample receipt, providing veterinarians and owners with the opportunity to make treatment decisions sooner.

The New Frontier in Canine Cancer Detection

The ZM-017 is a reference laboratory blood test for canine cancer detection that is faster, more affordable, and less invasive compared to the current standard of care, which can be expensive and cost prohibitive for owners. The ZM-017 automated quantitative sample-to-result liquid biopsy platform exceeds current efficiency standards and reduces the complexity involved in the capture and counting of CTCs.

“Telling a family their dog may have cancer is one of the most difficult conversations a veterinarian can have. Liquid biopsy provides a new tool for veterinarians to help their clients through this emotional time, to make the best decisions as early and as cost-effectively as possible.”

- *Stephanie Morley, DVM, Zomedica Co-founder*

Zomedica is dedicated to bringing this highly sophisticated technology to veterinary medicine so that veterinarians can diagnose canine cancer with confidence and more quickly communicate treatment needs to pet owners, the ultimate decision-makers when it comes to their pet's care.

Disclosures and Acknowledgments

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REFERENCES

1. Kidd C. The many challenges of veterinary oncology. *Can Vet J.* 2008;49(11):1132-5
2. Gogoi P, Sepehri S, Zhou Y, et al. Development of an automated and sensitive microfluidic device for capturing and characterizing circulating tumor cells (CTCs) from clinical blood samples. *PLoS One.* 2016

