



# A look to the future of cancer diagnosis

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Global leaders in companion animal oncology discuss best practice and the latest progress in cancer detection and diagnosis.

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'Cancer' is a highly emotive word and a diagnosis can be life changing. However, rapid advancements in oncology mean that some types of cancer are now treatable, manageable and possibly even preventable.

Cancer no longer has to be the worst-case scenario. Early detection is arguably one of our most powerful tools in veterinary oncology and powerful progress is being made.

Imagine a future where a simple blood test could enable early screening and monitoring of at-risk or affected pets – a world where we could detect a potential relapse before it's clinically evident. Innovators developing new molecular diagnostic technologies are turning this into a reality.

So, how could this change the face of veterinary oncology? And, what are the potential uses of such technologies?

We brought together a panel of leading experts in companion animal oncology to help find some answers to these questions and explore the potential of this ground-breaking arena.



# Introducing the panel



**Dr. Sue Ettinger**

Dr. Sue Ettinger is a practicing veterinary cancer specialist, international speaker, book author, and vlogger. She's one of around 450 board-certified specialists in medical oncology in North America and practices at the Veterinary Referral and Emergency Center in Norwalk, Connecticut. Sue is co-founder and Chief Medical Officer of Fidu, a teleconsulting company bringing together general practice veterinarians and boarded veterinary specialists.



**Dr. David Vail**

Dr. David Vail is Professor of Oncology, Barbara A. Suran Chair in Comparative Oncology and Director of the Barbara A. Suran Comparative Oncology Research Institute. He has published over 120 peer-reviewed scientific manuscripts and 50 book chapters in the field of veterinary and comparative oncology and is co-editor of the textbook, Small Animal Clinical Oncology.



**Dr. Tim Fan**

Dr. Timothy Fan, DVM, PhD, serves as the principal investigator of the Comparative Oncology Research Laboratory housed in the Department of Veterinary Clinical Medicine and as a core member to the Anticancer Discovery from Pets to People theme in the Carl Woese Institute for Genomic Biology. He received his Doctor of Veterinary Medicine Degree at Virginia-Maryland College of Veterinary Medicine.



**Prof. Heather Wilson-Robles**

Prof. Heather Wilson-Robles DVM, DACVIM, is a well-established veterinary medical oncologist specializing in canine models of human cancer. She is a Professor of Oncology, Fred and Vola Palmer Chair of Comparative Oncology and Chief Medical Officer at Volition Veterinary Diagnostics Development LLC. Her research over the past 12 years has focused on improving canine models of pediatric and adult cancers and translating these findings to the mutual benefit of both species.



# A new age in cancer diagnosis – are molecular diagnostics the key?

The first step to successfully managing cancer is to find it. In humans, screening for certain types of cancer or associated indicators is routine – a luxury that is not yet available for the majority of pets.



Instead, veterinary professionals are often reliant on the development of clinical signs to deploy diagnostic tests, which are often expensive and invasive.

Molecular tests conducted following a simple blood test could provide a non-invasive way to identify molecular and genetic markers of disease. In turn, this can enable earlier detection of disease, as well as guide further therapeutic decisions.

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*“Cancer is a molecular, genetic disease so having molecular or genetic biomarkers or molecular tests will greatly improve our ability to diagnose and act upon our diagnosis quickly.”*

– Dr. Timothy Fan

The panel agreed that molecular testing could help veterinarians to:



Detect cancer sooner, increasing the potential for early intervention



Detect cancer non-invasively, often via a simple blood test



Identify cancer in more pets and enable routine cancer screening



Assess and monitor the success of therapy



Monitor recurrence or spread



Make screening and monitoring more widely available



More effectively discuss diagnostic, treatment or monitoring recommendations with clients

## Discussing the potential for early diagnosis of hard to find tumors:

Nasal tumors, anal sac tumors, osteosarcomas and hemangiosarcoma are all some of the examples of difficult to find tumors.

With current technology, **hemangiosarcoma** is usually diagnosed at a late stage. The panel agreed that early diagnosis of such occult diseases would be useful.

For easier to diagnose cancers such as **lymphoma**, it was suggested that molecular testing could be most useful in providing a simple non-invasive test to aid with monitoring for recurrence and treatment planning.

*“Can you detect cancer earlier in such a way that you can take an action that will result in extended quantity or quality of life for that patient?”*

– Dr. David Vail

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*Everybody wants to be able to find cancer earlier but it's what we do with that information [that counts]. How will it make an impact?”*

– Dr. Sue Ettinger

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*A potential use for a cancer detection assay would be to use it once you have initiated therapy to: One, determine if therapy is working in an easy and inexpensive way; Two, to determine whether you need to continue therapy, and; Three, to be able to pick up recurrence or spread of the cancer as early as possible so you can hopefully manage it.”*

– Dr. David Vail

## Key takeaway:

Molecular diagnostic tests could revolutionize the way veterinarians approach cancer diagnosis in pets, offering a non-invasive screening and monitoring tool to detect cancer and cancer recurrence at an earlier stage. This could be invaluable for occult cancers and for monitoring and planning treatment for those cancers that are generally easier to detect. Making screening and monitoring simpler and more affordable, will enhance cancer management and quality of life for companion animals.



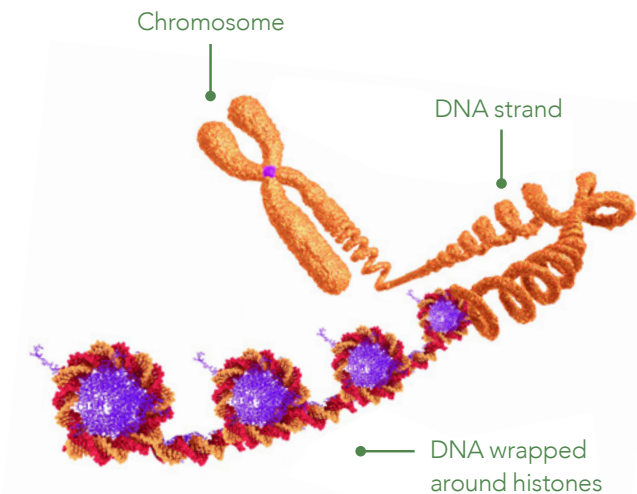
# Recent technological advances – a different approach to molecular diagnostics

## A modern understanding of cancer: the critical importance of epigenetics

Cancer develops when there is either abnormal or uncontrolled cell growth. It can result from changes to genes (genetic mutations), which causes them to malfunction. But it's now believed epigenetic changes are as important as genetics (DNA) in causing cancer. Therefore, it's not just the DNA but the full chromosome that is key.

Epigenetics are instructions that tell cells which genes to activate or deactivate without changes to the underlying genetic code, meaning that our bodies can make different cell types from the same DNA. There are several signals that tell a cell which genes to activate and by how much – nucleosomes are one such epigenetic signal.

Nucleosomes help package DNA to fit in a cell – strings of DNA wrap around proteins, called histones, like beads on a string.



# Identifying epigenetic changes that indicate cancer

Nucleosomes in cancer cells differ in structure from those in healthy cells. Changes to nucleosomes in cancer cells lead to inappropriate or over-activation of genes that accelerate cell growth or silencing of genes that put the brakes on cell growth.

These nucleosome changes happen early and drive the development of cancer. So newer molecular diagnostics are looking for these epigenetic changes rather than looking for mutations in the DNA itself.

Cancer causes cells to die and break up, which releases nucleosomes into the blood. Revolutionary advances in molecular technology are enabling detection of these nucleosomes from cancer cells with a simple blood test. Measuring nucleosome levels and modifications in circulation have the potential to be both prognostic and diagnostic markers for disease.

Volition Veterinary Diagnostics Development LLC is driving these advances and is now developing its Nucleosomics™ platform for canine cancer detection and in particular lymphoma and hemangiosarcoma detection.



# Introducing the Nu.Q® Vet Cancer Screening Test

Data presented in two abstracts<sup>1,2</sup> at the Veterinary Cancer Society Conference 2020 showed that nucleosome levels trend with clinical disease and that whilst nucleosome levels were consistently low in normal dogs, the Nu.Q® Vet Cancer Screening Test gives good clinical discrimination for both lymphoma and hemangiosarcoma.

The studies were carried out at Texas A&M University on 334 samples (Healthy Control n=134, Lymphoma n=126, Hemangiosarcoma n=76) which included a variety of breeds, genders, weights, ages and different cancer stages.

At the recommended cut off the results for Nu.Q® Vet Cancer Screening Test gave an Area Under the Curve (AUC) of **87.8%** and **92.9%** respectively for lymphoma and hemangiosarcoma. At 95% specificity this provides **80%** detection of lymphoma and **86%** of hemangiosarcoma.

*Prof. Wilson-Robles commented, "These positive findings provide us with real confidence as we move forward towards the launch of our first product, the Nu.Q® Vet Cancer Screening Test. I believe that early diagnosis using a non-invasive diagnostic such as this has a huge potential to help improve the treatment and the quality of life for dogs as well as providing valuable additional information to inform the clinical decision-making process."*

The ambition is to have a whole platform of tests to enable broader screening with research underway in histiocytic sarcoma and other hematopoietic cancers. The flexibility of the platform and diversity of modifications enables the development of disease specific panels. The assay also picks up severe inflammation, which may be useful for non-cancer diseases in the future. Initial results also show promise for use during treatment and remission.

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*Volition's platform is very exciting. These are very stable biomarkers that can be found in circulation and bringing this technology to the veterinary market is a very important first step. I look forward to seeing Volition adapt to the needs of the clients, pets and pet-owners that will benefit from this diagnostic test."*

– Dr. Tim Fan

## Key takeaway:

New epigenetics technology developed and tested by Volition Veterinary (Nu.Q®) enables animal health professionals to detect cancer at its earliest stage through a simple blood test. Initial results also show promise for use during treatment and remission.





# A simple blood test could change how veterinarians collaborate...

In the U.S., there are...



450 oncology specialists



90,000 primary care veterinarians



6 million cancer diagnoses each year<sup>1</sup>

This is far too many diagnoses for oncology specialists to support alone.

There is a clear need for general practitioners and specialists to work together. The panelists felt that molecular diagnostic technologies could aid collaboration when it came to managing veterinary cancer patients.

*"There are too many pets with cancers for [specialists] alone to be treating them, so we need the help of general practitioners to manage these cases or at least work them up and get more cases to oncologists."*

– Dr. Sue Ettinger

The panelists agreed that specialist oncologists might be well placed to provide support to general practitioners around suitability and use of molecular tests.



*"[Specialists] just cannot perform all the follow up that each patient requires. By keeping the general practitioner in the loop, the client could go back to their general practitioners for serial testing to determine; is the dog still in remission? and, how are we doing therapy-wise?"*

*This would be really instrumental."*

– Dr. David Vail

Experts were of the same mind, that every cancer case should be looked at in totality and not hinge on a single diagnostic or screening test. Each test should be used to create a complete picture, which general practitioners and specialist oncologists work together to complete.

Key takeaway:

Access to simple, affordable cancer screening and monitoring tools could facilitate seamless collaboration among general practitioners and oncology specialists.



1. Fetchacure.org. Facts. What is cancer? Available from: <https://fetchacure.org/resource-library/facts/> (accessed October 2020).

# Changing the way we talk about cancer

Communication is the cornerstone of a successful veterinary practice, and arguably never more important than when it comes to discussing cancer. With a greater focus on earlier detection and the introduction of new technologies, veterinarians may need to update the way they communicate with clients and colleagues.

Panelists discussed how being able to more easily screen for certain cancers could add a new dimension to a pet's annual health check appointment. This will potentially make conversations about cancer more commonplace and veterinarians will need to hold the knowledge and tools to help explain these tests to owners.

*"If this is something we want to get veterinarians and pet-owners interested in, we're going to have to do in a way that is easy to digest, and fun. We want to save lives, help our pets and help our clients."*

– Dr. Sue Ettinger

Results from a simple molecular test could also help support diagnostic, treatment or monitoring recommendations, aiding client conversations. Plus, increased collaboration between general practitioners and oncology specialists will require more extensive communication about the practicalities of using such tests to manage patients.

The importance of education in relation to any new test was unanimous among the panel, and it was agreed that oncology specialists play a key role in communicating the biology and correct use of a test to general practitioners. Thorough training ensures tests are in capable hands and used appropriately, as well as enabling information to be accurately filtered down to the pet owners, ensuring expectations are met and informed decisions are made.

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*As an oncologist, I have to explain [the test] to my clients in the exam room. If it's a test that's more exclusive for oncologists I still have to explain it to the general practitioner when I give them a call or write them a letter."*

– Dr. Sue Ettinger

## Key takeaway:

The adoption of simple cancer screening, monitoring and diagnostic tests will open up dialogue around pet cancer, requiring vets to explain highly complex concepts in a digestible manner that owners can understand. Clinicians play a key role in educating general practice veterinarians and supporting them with client communication.



# A new and exciting time for cancer screening in companion animals

The future of cancer diagnosis in companion animals looks bright and is moving at speed.



Epigenetics are at the forefront of cutting-edge research. New technological advancements in this arena could revolutionize cancer diagnosis in companion animals.



While cancer screening is not as commonplace in animal health as it is in human health, emerging blood tests, such as the Nu.Q® Vet Cancer Screening Test, could transform how we manage cancer in pets.



There is a big opportunity not only for early detection of cancer but also for treatment monitoring and disease recurrence.



Building a collaborative approach between specialists, general practitioners and pet owners, and focusing on education of all these stakeholders, will be vital for the introduction of new diagnostic and monitoring tools.



This panel of key industry experts was brought together by Volition Veterinary Diagnostics Development LCC, a subsidiary of Volition. Volition is a multi-national epigenetics company developing simple, easy to use, cost-effective blood tests to help diagnose a range of cancers and other diseases in both humans and animals.

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or email [AskNu.QVet@volition.com](mailto:AskNu.QVet@volition.com)

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