



# The **nu·Q** Cancer Test: vet

**Early Detection Can Save Lives**

# Section Table



**Canine Cancer:  
At a Glance**



**Cancer Screening**



**Circulating  
Nucleosomes**



**Case  
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**FAQs**

# Canine Cancer: At a Glance



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**FAQs**

## Number of pet dogs in the U.S.<sup>1</sup>



Approximately  
84 million



## Pets improve our health<sup>2</sup>

Volition 



76% of pet  
owners report  
improved health



69 million<sup>3</sup>

U.S. households have a pet dog



91% of pet owners<sup>2</sup>

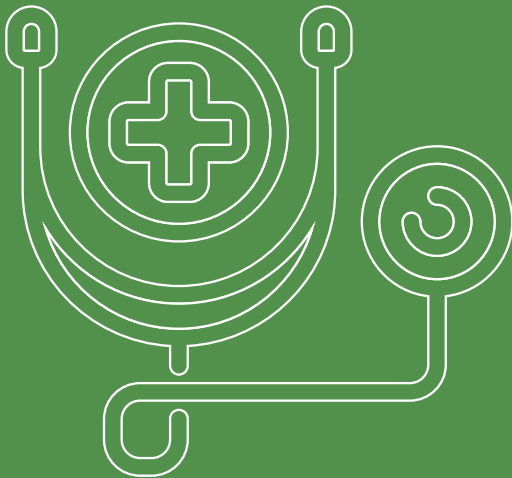
Say they would be more likely to maintain  
regular check-ups with their veterinarian

1.Larkin, M. (2021). Pet population still on the rise, with fewer pets per household. American Veterinary Medical Association. Retrieved 9 July 2022 .

2.Survey of U.S. Pet Owners | HABRI. HABRI. (2022). Retrieved 19 August 2022.

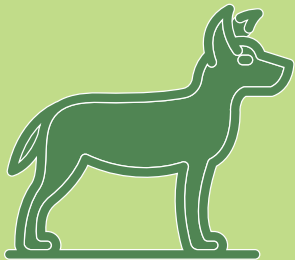
3.2022 Pet Ownership Statistics: 70 Fur Facts - Lemonade. Lemonade Pet. (2022). Retrieved 19 August 2022

# Human/Canine Cancer<sup>4</sup>



**25-40% of all humans and dogs develop cancer**

# Dogs Diagnosed with Cancer Annually<sup>5</sup>



**Approximately 6 million**



**Nearly 50%**  
Of dogs over the age of 10 will develop cancer



**Early Detection**  
Can lead to improved treatment outcomes

4.Sarver, A., Makielski, K., DePauw, T., Schulte, A., & Modiano, J. (2022). Increased risk of cancer in dogs and humans: A consequence of recent extension of lifespan beyond evolutionarily determined limitations?  
5.COP - Pet Owners - What is Comparative Oncology | Center for Cancer Research. Ccr.cancer.gov. Retrieved 9 July 2022

# nu·q vet | *Cares*



## Cancer is an emotional word

It is a disease we have all been touched by



## Early detection and treatment

Crucial to achieving the best clinical outcomes



## Our mission

To develop an accessible and affordable screening tests



## Together

We can give your pet the best chance at successful treatment



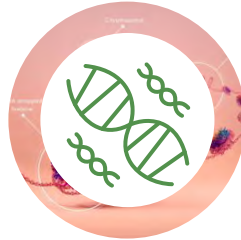
# Cancer Screening Today



**Canine Cancer:  
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**Future Products  
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**FAQs**

# What is Screening?

Screening refers to tests performed on healthy, asymptomatic patients who may have disease but do not yet have symptoms.



Screening tests have become a routine part of exams.



There are few cancer screening tests available for dogs.



Some (human) cancers that screening tests aim to identify:

Breast (Mammogram)

Colorectal (Colonoscopy)

Cervical (Pap Smear)

Prostate (PSA)



# Types of Screening: Liquid Biopsy

Liquid biopsy tests are revolutionizing oncology and large-scale human clinical studies involving hundreds of thousands of participants necessary for regulatory approval of a human screening test are in progress.



Blood is commonly sampled, urine and saliva are also used.



Liquid biopsy can be inexpensive and non-invasive.



Human cancers that liquid biopsy is currently being studied in.



Liquid biopsy is an *accessible* and *affordable* option for vets.

Lung Cancer<sup>6</sup>

Colorectal Cancer<sup>7</sup>

Breast Cancer<sup>8</sup>

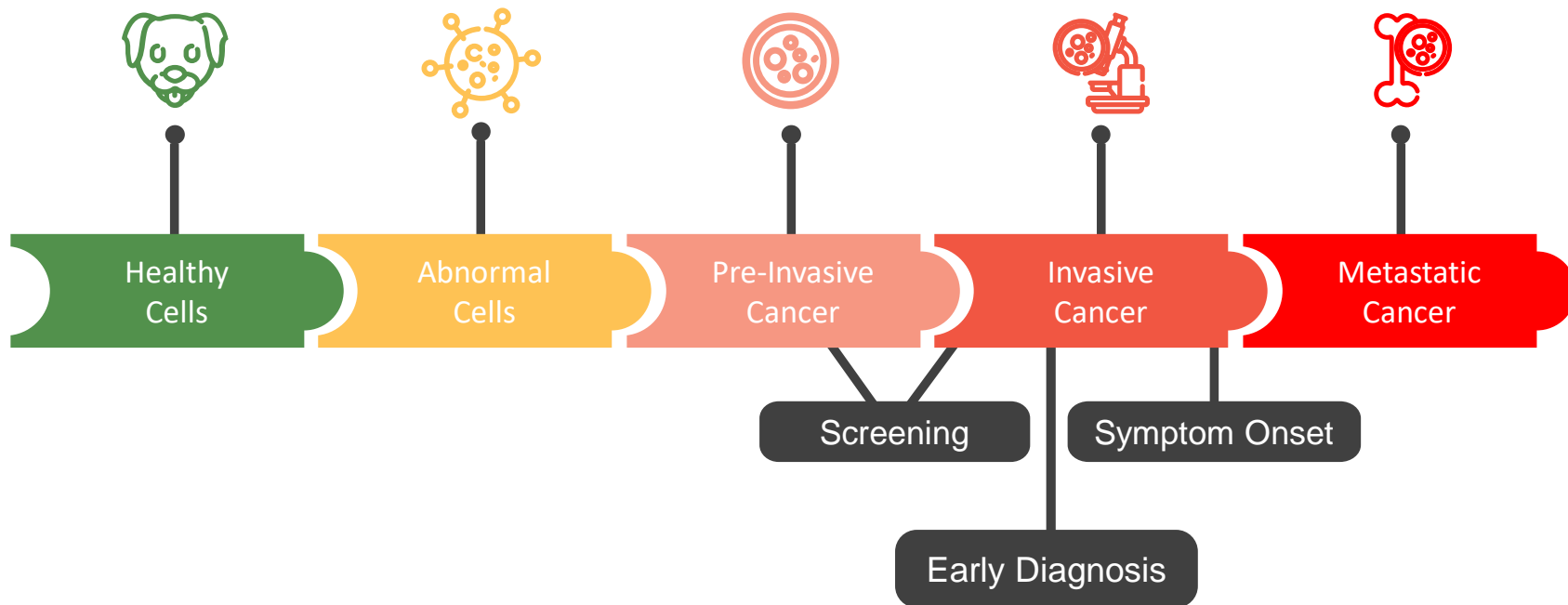
6. Li et al. 2022. Liquid biopsy in lung cancer: significance in diagnostics, prediction, and treatment monitoring.

7. Mazouji et al. 2021. Updates on Clinical Use of Liquid Biopsy in Colorectal Cancer Screening, Diagnosis, Follow-Up, and Treatment Guidance.

8. Chen & Zhao. 2019. Next-generation sequencing in liquid biopsy: cancer screening and early detection.

# The Value of Screening

Timeline of cancer development in the body, and where screening occurs within the process



# Who to Screen (and When)

Screening is recommended for healthy dogs as part of annual check-ups



Cancer screening is recommended for high-risk populations:

All dogs  
(7 years and older)

Dogs with an increased  
risk due to breed



Liquid biopsy screening can be integrated into annual wellness visits.



Screening asymptomatic patients could help identify cancer earlier.



Liquid biopsy has been studied in aggressive and common cancers.

# Circulating Nucleosomes in Cancer<sup>9,10,11,12</sup>

Nucleosomes are small fragments of chromosome composed of a segment of DNA wrapped.



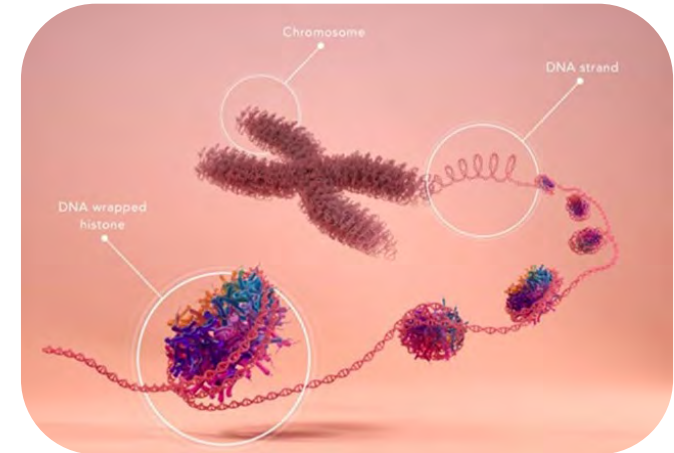
Cancer and cell death release nucleosomes into the blood.



Nucleosomes can be measured using antibodies.



Measuring nucleosome levels can prognostic and diagnostic markers for disease.



The Nu.Q<sup>®</sup> Test is a proprietary epigenetic immunoassay platform that determine levels of circulating nucleosomes.

9. Holdenrieder, S., Stieber, P., von Pawel, et al. (2004). Circulating Nucleosomes Predict the Response to Chemotherapy in Patients with Advanced Non-Small Cell Lung Cancer

10. Snyder, M., Kircher, et al. (2016). Cell-free DNA Comprises an In Vivo Nucleosome Footprint that Informs Its Tissues-Of-Origin. *Cell*, 164(1-2), 57-68.

11. Stoetzer, O., Fersching, et al. (2013). Prediction of response to neoadjuvant chemotherapy in breast cancer patients by circulating apoptotic biomarkers nucleosomes, DNase, cytokeratin-18 fragments and survivin.

12. Fahmueller, Y., Nagel, et al. (2012). Predictive and prognostic value of circulating nucleosomes and serum biomarkers in patients with metastasized colorectal cancer undergoing Selective Internal Radiation Therapy.

# Clinical Evidence<sup>13,14,15</sup>

## Nucleosome Concentrations in Healthy Dogs and Dogs With Cancer



662 dogs were included  
in this study

134 healthy and  
528 with cancer



This cohort included  
a variety of dogs

different  
breeds, weights,  
and cancer stages



7 cancers were  
evaluated in this study

Lymphoma  
Hemangiosarcoma  
Histiocytic Sarcoma

Osteosarcoma  
Soft Tissue Sarcoma  
Malignant Melanoma  
Mast Cell Tumors

13. Dolan, C., Miller, T., Jill, J., Terrell, J., Kelly, T., Bygott, T., & Wilson-Robles, H. (2021). Characterizing circulating nucleosomes in the plasma of dogs with lymphoma.

14. Wilson-Robles, H., Miller, T., Jarvis, J., Terrell, J., Kelly, T., Bygott, T., & Bougoussa, M. (2021). Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma.

15. Wilson-Robles, H., Bygott, T., Kelly, T., Miller, T., Miller, P., & Matsushita, M. et al. (2022). Evaluation of plasma nucleosome concentrations in dogs with a variety of common cancers and in healthy dogs



# The nu·Q vet Cancer Test

A simple, affordable,  
easy-to-use blood test

Localized tumors are least likely to cause elevated plasma nucleosomes

 97% specificity

 Detects 76% of  
systemic cancer

Lymphoma – 77%

Hemangiosarcoma – 82%

Histiocytic Sarcoma – 54%

# The Nu.Q<sup>®</sup> Vet Cancer Test

The Nu.Q<sup>®</sup> Vet Cancer Test is recommended for all dogs over the age of 7, and younger dogs aged 4 and older with an increased risk of cancer such as:



Labrador  
Retriever



French  
Bulldog



Golden  
Retriever



German  
Shepard



Great Dane



Miniature  
Schnauzer



Siberian  
Husky



Bernese  
Mountain Dog



Beagle



Rottweiler



Boxer



Pembroke  
Welsh Corgi



Mastiff



Irish  
Wolfhound



Flat Coated  
Retriever









Scottish  
Wolfhound

# How to Submit a Sample



Samples will be run through the Texas A&M GI Laboratory

To create an account

1.  Patients should be fasted (minimum 4 hours).
2.  Draw down 2-5mL of blood from peripheral vein.
3.  Immediately fill EDTA tube with blood
4.  Spin the sample in-house 1600xg for 10 minutes within one hour of sampling.
5.  Remove plasma place in non-additive tube (be careful to not disturb buffy coat).
6.  Ship overnight on ice Sunday to Thursday Reduced FedEx shipping is available through the GI lab website

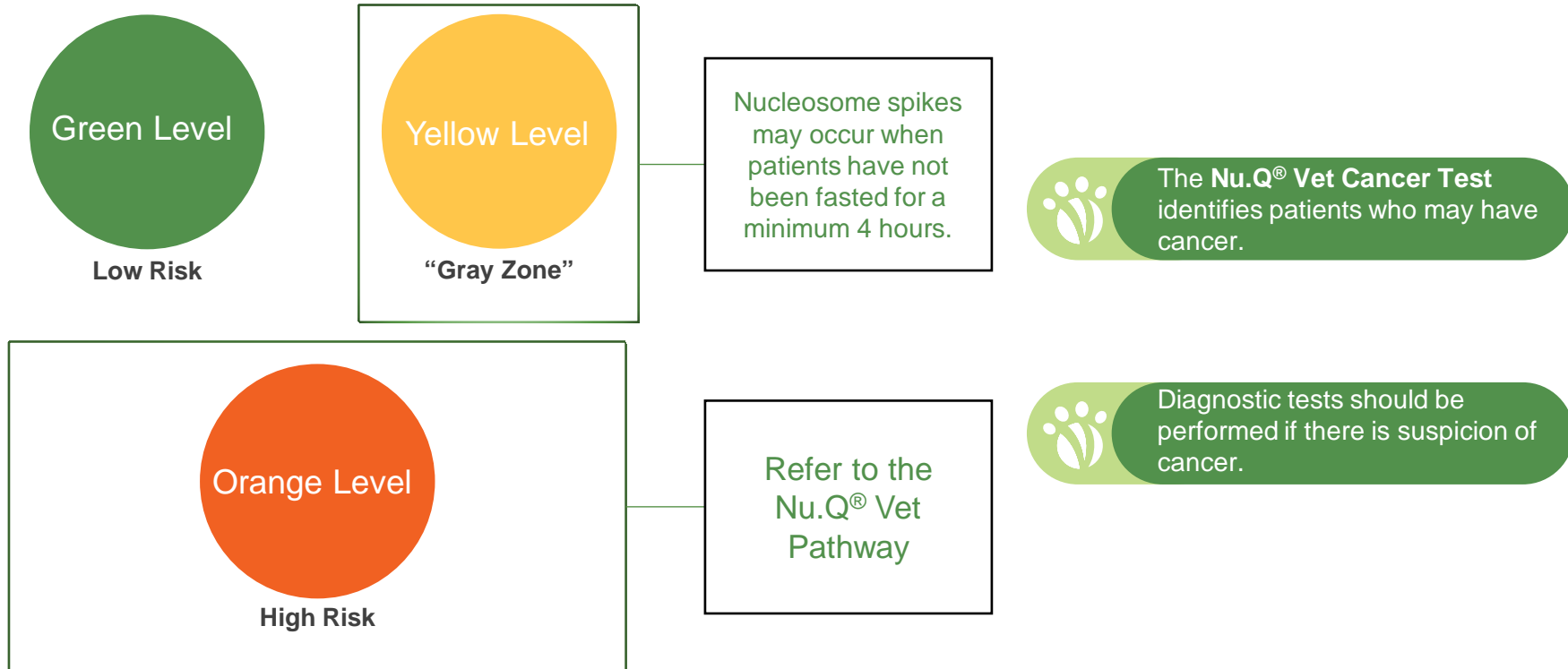
Diagnostics should be used confirm the suspicion of cancer.

Please refer to the [Nu.Q® Vet Pathway](#) for procedures that may be included in the diagnosis/staging process.



# The Nu.Q<sup>®</sup> Vet Cancer Test Results Key

Colors correspond with Nu.Q<sup>®</sup> levels, which may identify cancer is present:



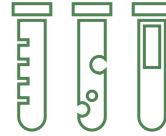
# The Nu.Q<sup>®</sup> Vet Pathway

The pathway to diagnosis and staging may include some of the following:



## Exam

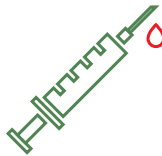
- Gathering information about the pet's history
- Physical exam to discover abnormalities
  - Masses or lesions
  - Lymph Nodes
  - Oral and rectal exam



## Laboratory Tests

- Biochemistry Panel
- CBC
- Urinalysis
- Coagulation Test\*
- Immunophenotyping

\*if liver values are elevated



## Pathology

- Fine needle aspiration (FNA)
- Biopsy



## Diagnostic Imaging

- 3-view thoracic radiograph
- Abdominal ultrasonography

Advanced Imaging (such as MRI or CT scan) may be utilized in some cases

# Summary

The Nu.Q<sup>®</sup> Vet Cancer Test is recommended for all dogs over the age of 7, and younger dogs aged 4 and older with an increased risk of cancer as a part of annual wellness exams.

## Accessible

With no special kits required, this test can be run at any time with *any* patient.



## Affordable

A routine blood draw, no sedation required.



## Reliable

At 97% specificity, the test detects 76% of systemic cancers.

Lymphoma – 77%  
Hemangiosarcoma – 82%  
Histiocytic Sarcoma – 54%



# Circulating Nucleosomes



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**FAQs**

# Canine Lymphoma: At a Glance<sup>16,17</sup>

Among the most common cancers diagnosed in dogs.



There are over 30 described types of canine lymphoma.



Some are life threatening, others are managed as chronic disease.



Performing a biopsy is the best way to diagnose



Chemotherapy is the most effective therapy for most types.



Originates in lymph nodes before spreading to organs.

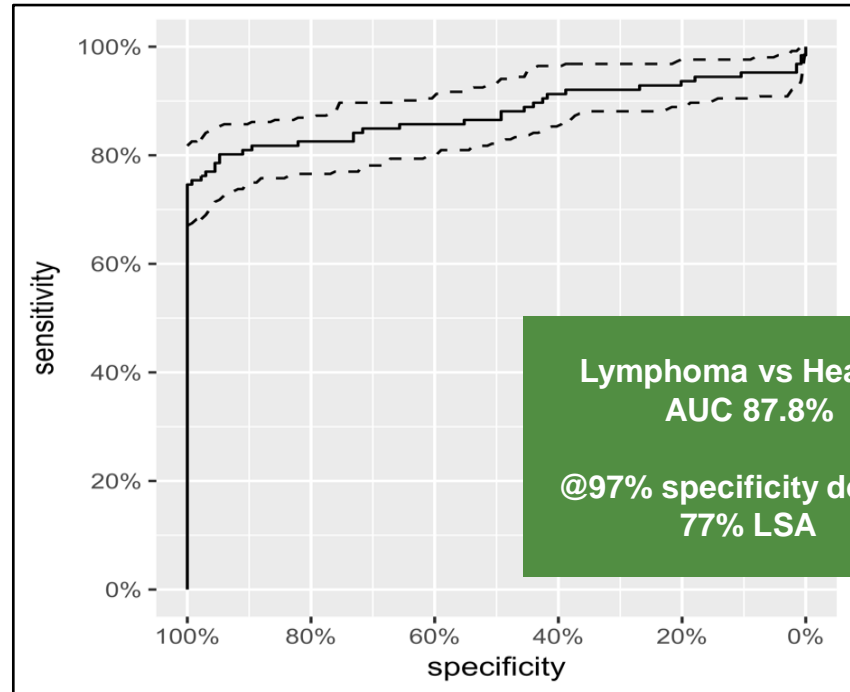
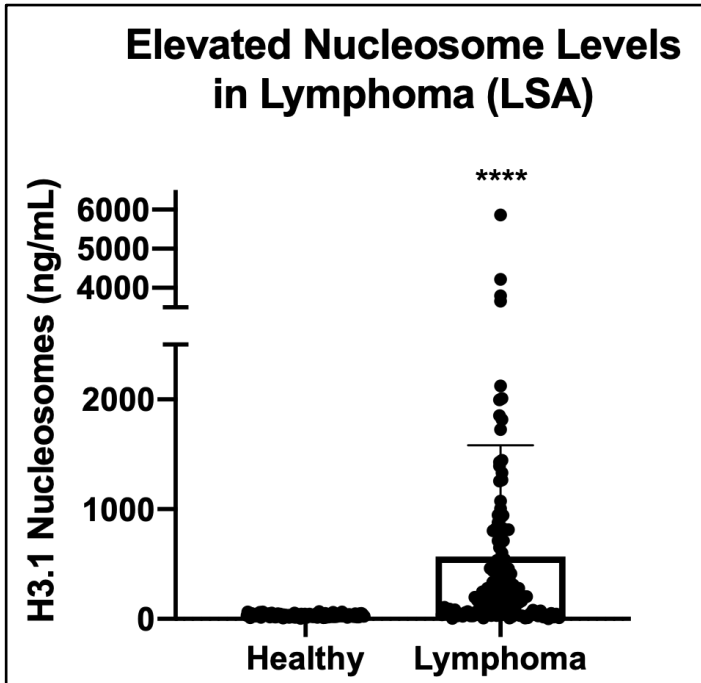


Staging tests are required to determine how far lymphoma has spread.

16. Medicine, P. (2022). Canine Lymphoma. Purdue University College of Veterinary Medicine.

17. Comazzi, S., Marelli, S., Cozzi, M., Rizzi, R., Finotello, R., & Henriques, J. et al. (2018). Breed-associated risks for developing canine lymphoma differ among countries: an European canine lymphoma network study.

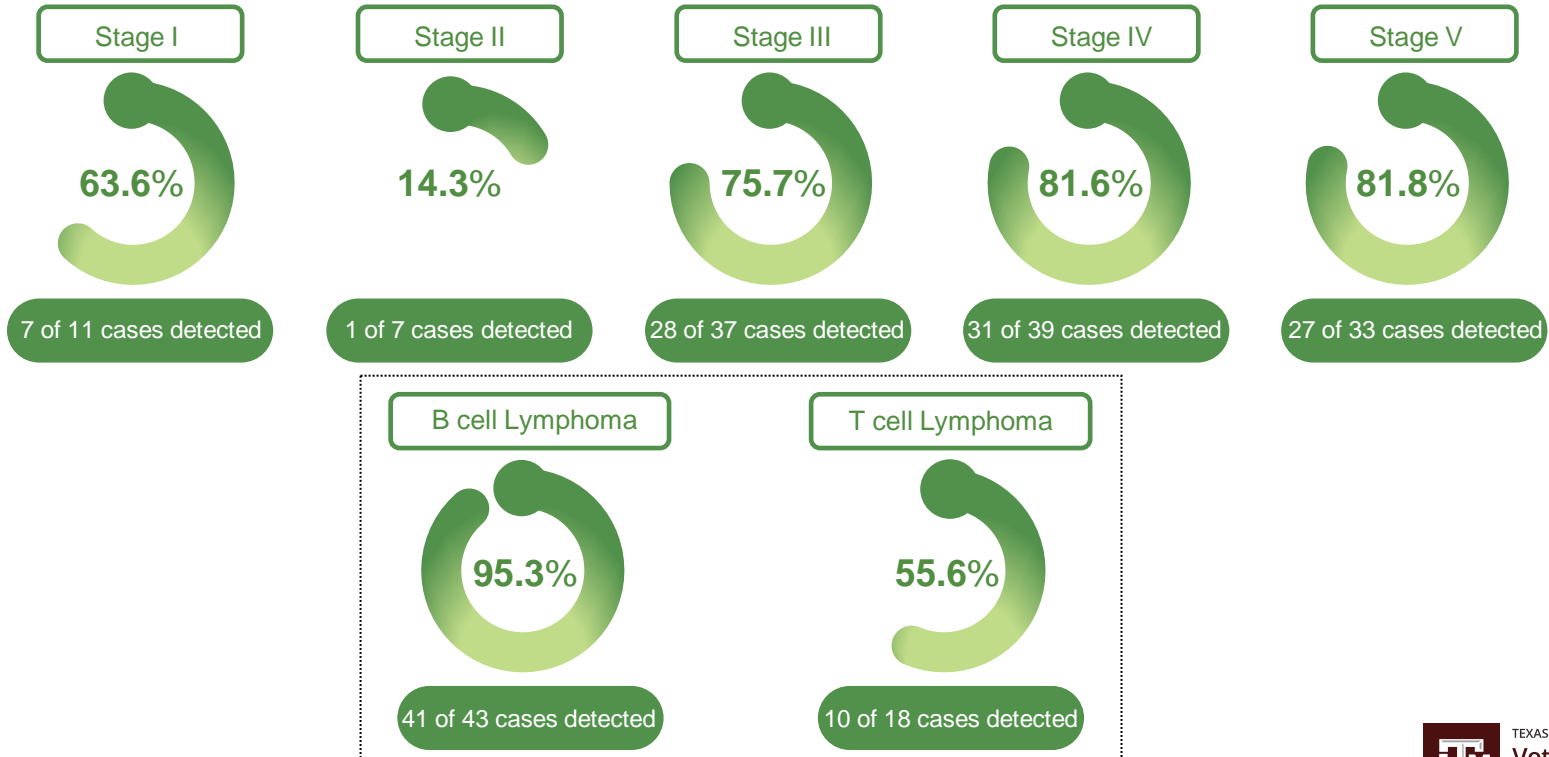
# Circulating Nucleosomes in Dogs with Lymphoma



Dolan, C, Wilson-Robles, H et al. Characterizing Circulating Nucleosomes in the plasma of dogs with lymphoma BMC Vet Res 17, 276 (2021)

# Lymphoma: Disease Type/Stage

At 97% specificity, the Nu.Q<sup>®</sup> Vet Cancer Test was able to detect 77% of lymphoma



Wilson-Robles, H., Miller, T., Jarvis, J. et al. Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma. BMC Vet Res 17, 231 (2021)

# Hemangiosarcoma: At a Glance<sup>18</sup>

A highly malignant cancer arising from cells that normally create blood vessels. It is often diagnosed via biopsy.



In most cases, the cause of hemangiosarcoma is unknown.



Superficial skin tumors appear as a red to purple colored region of skin



Any breed can be affected.



Can also appear as a bump that may bruise or bleed.



Clinical signs depend on location of disease.

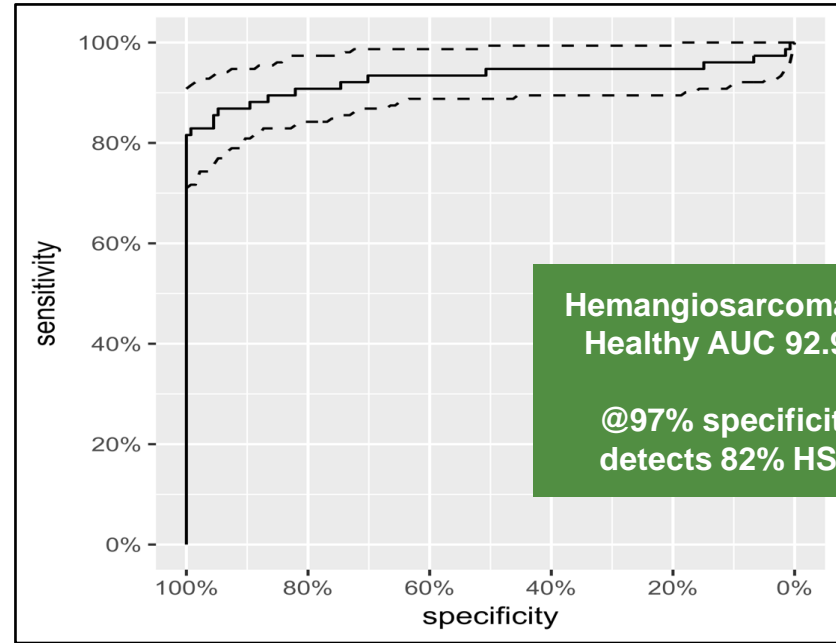
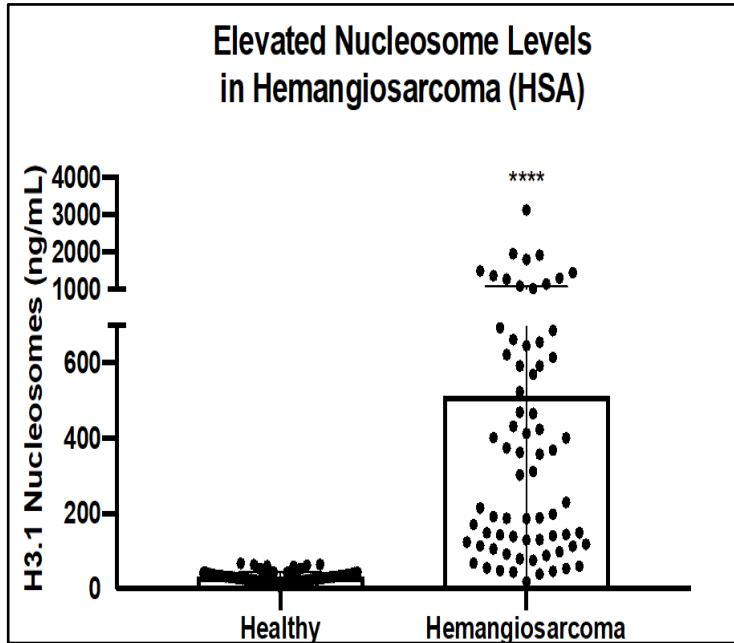


Impossible to tell if malignant or benign from appearance or feel.

18. NC State Veterinary Hospital: Canine Hemangiosarcoma - NC State Veterinary Medicine. NC State Veterinary Medicine. (2022). Retrieved 17 August 2022



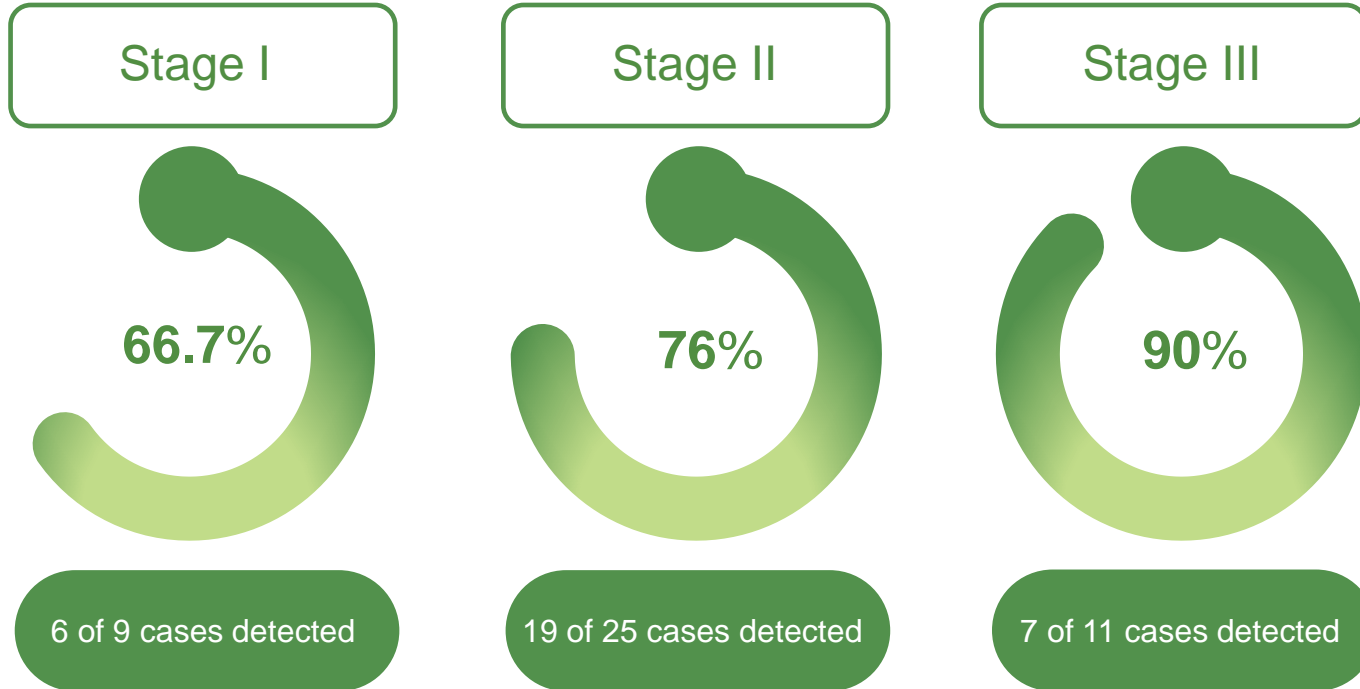
# Circulating Nucleosomes in Dogs with Hemangiosarcoma



Wilson-Robles, H., Miller, T., Jarvis, J. et al. Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma. BMC Vet Res 17, 231 (2021)

# Hemangiosarcoma: Disease Type/Stage

At 97% specificity, the Nu.Q<sup>®</sup> Vet Cancer Test was able to detect 82% of hemangiosarcoma



Wilson-Robles, H., Miller, T., Jarvis, J. et al. Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma. BMC Vet Res 17, 231 (2021)

# Clinical Staging System for Hemangiosarcoma

## Primary Tumor (T)

- T0: no evidence of tumor
- T1: Tumor <5 cm diameter & confined to primary tissues
- T2: Tumor >5 cm or ruptured, invading SQ tissues
- T3: Tumor invading adjacent structures, including muscle

## Regional LN (N)

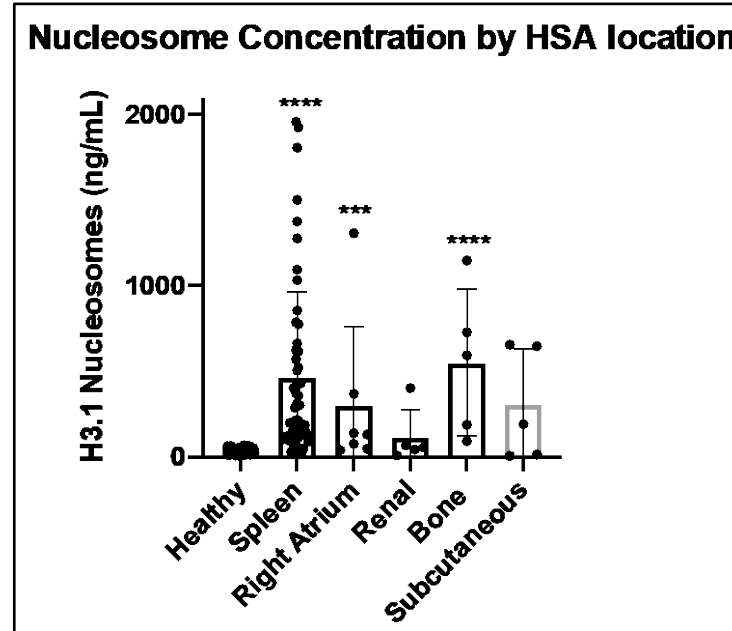
- N0: no regional LN involvement
- N1: regional LN involvement
- N2: distant LN involvement

## Distant metastasis

- M0: no distant metastasis
- M1: Distant metastasis

Stage	T	N	M
I	T0 or T1	N0	M0
II	T1 or T2	N0 or N1	M0
III	T2 or T3	N0, N1 or N2	M1

# Nucleosome Concentration by Hemangiosarcoma Location



Wilson-Robles, H., Miller, T., Jarvis, J. et al. Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma. BMC Vet Res 17, 231 (2021)

# Case Studies



**Canine Cancer:  
At a Glance**



**Cancer Screening**



**Circulating  
Nucleosomes**



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**Future Products  
in Development**



**FAQs**

# Case 1: Otis

12-year-old MN Catahoula mix

History of subcutaneous hemangiosarcoma removed 2 years ago

Presenting for an annual recheck

- Doing well at home



Physical exam:

- Moderate dental tartar
- Grade 1 murmur (new)
- Mild arthritic changes to hips & elbows



# Case 1: Otis Wellness Exam

Plan: routine blood work & Nu.Q® Vet Cancer Test



CBC:

- Stress leukogram
- Slightly thrombocytopenia: **192,000**

Chemistry panel:

- Mild hyperglobulinemia: **4.6**

Urinalysis:

- No significant findings

HW test and Fecal float:

- Negative



# Case 1: Otis



## Nu.Q<sup>®</sup> Vet Cancer Test :

- Cancer Suspicion: **High Risk**

## Interpretation:

- Plasma nucleosome concentrations **in the orange level** are consistent with common canine cancers including lymphoma and hemangiosarcoma.
- This test is not able to differentiate severe/systemic inflammation from cancer.
- Additional tests such as a CBC, chemistry, urinalysis, cytology/biopsy, and/or imaging may be needed to confirm or deny the suspicion of cancer.

**NOTE - Dogs that have not been fasted may have artificially elevated nucleosome levels and should be retested after fasting**



# Case 1 Otis: What Do You Do?

ORANGE  
LEVEL

Volition  
Veterinary



Chest  
Radiographs

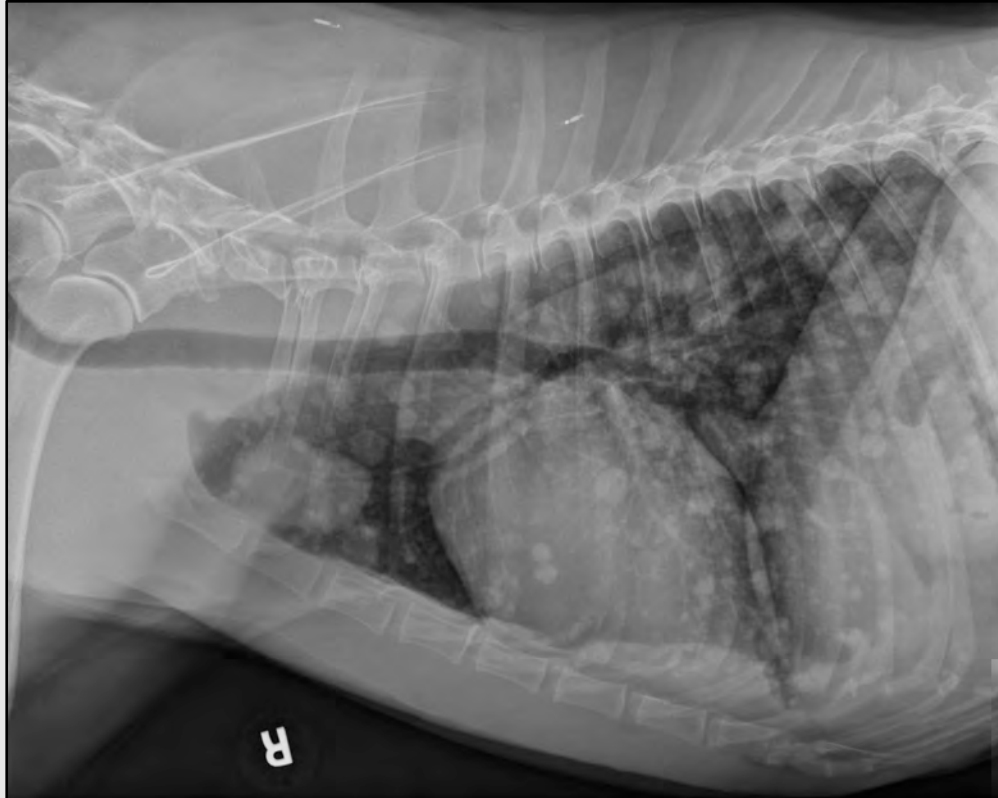
Abdominal  
Ultrasound

Advanced  
Imaging Or  
Referral

# Case 1: Otis

ORANGE  
LEVEL

Volition  
Veterinary



# Case 2: Belle

5-Year-Old FS Golden Retriever

Presenting for annual wellness exam

- Doing well at home
- Mild lethargy since they got a new puppy

Physical exam: **No significant findings**



# Case 2: Belle Wellness Exam

Plan: routine blood work & Nu.Q<sup>®</sup> Vet Cancer Test

CBC:

- Slightly thrombocytopenia: **134,000**
- Otherwise, normal

Chemistry panel:

- Mild elevation in Alk Phos: **243 mg/dL**

Urinalysis:

- No significant findings



# Case 2: Belle

## Nu.Q® Vet Cancer Test:

- Cancer Suspicion: **High Risk**

**ORANGE  
LEVEL**

## Interpretation:

- Plasma nucleosome concentrations **in the orange level** are consistent with common canine cancers including lymphoma and hemangiosarcoma.
- Test is not able to differentiate severe/systemic inflammation from cancer.
- Work up case to confirm or deny the suspicion of cancer.
  - CBC, Chemistry, Urinalysis, cytology/biopsy, and/or imaging

# Case 2 Belle: What Do You Do?

ORANGE  
LEVEL



**Abdominal  
Ultrasound**

**Chest  
Radiographs**

**FNA or Biopsy  
Or Refer to  
oncologist**

- **AUS: splenomegaly with severely mottled appearance (“moth eaten”)**
- **AUS-guided splenic aspirates: high grade lymphoma**

# Case 3: Hank

10-year-old MN Great Dane Mix

Presenting for 2-week history of progressive left forelimb lameness



## Physical exam:

- Firm painful mass associated with left carpus
- Toe touching lame to non-weight bearing
- Rest of exam unremarkable



# Case 3: Hank

Owner agrees to minimum database, **Nu.Q<sup>®</sup> Vet Cancer Test**, & sedation for carpal radiographs



## CBC

- Stress leukogram
- Mild thrombocytosis: **479,000**

## Chemistry panel:

- Mild elevation in Alk Phos: **283 mg/dL**

## Urinalysis

- USG 1.040
- 2+ proteinuria





# Case 3 Hank: Radiographs of Carpus



# Case 3: Hank

Nu.Q® Vet Cancer Test :

Cancer Suspicion: **LOW RISK**

**GREEN  
LEVEL**

## Interpretation:

- Plasma nucleosome concentrations in the **green level** are consistent with those found in **healthy animals** of over age of 1 year & all genders.
- Not all neoplastic conditions are detectable using elevated plasma nucleosome concentrations.

**Additional tests may be needed to confirm or deny suspicion of cancer in your patient**

# Case 3 Hank: What Do You Do?

**GREEN  
LEVEL**

Volition  
Veterinary



**Start  
Antifungal  
Therapy**

**Retest in  
1 month**

**FNA or Biopsy  
Or Refer to  
an oncologist**

Bone aspirate: sarcoma, ALP-stain positive

- Consistent with **osteosarcoma**

**NOTE: The current Nu.Q® Vet Cancer Test more reliably detects systemic cancers rather than soft tissue or localized cancers**

# Case 4: Percy

- 8-year-old FS Bichon Frise
- Presents for annual wellness check & doing well



## Physical exam:

- Moderate dental tartar
- Dermal mass over left lateral flank
- No other significant findings

**Plan:** routine blood work & Nu.Q<sup>®</sup> Vet Cancer Test

- Owner declines aspirate



# Case 4: Percy

## Nu.Q® Vet Cancer Test :

- Cancer Suspicion: “GRAY ZONE”

YELLOW  
LEVEL

## Interpretation:

- Plasma nucleosome concentrations at the **yellow level** can be seen in **early-stage cancer or cancers with low levels of circulating nucleosomes** including lymphoma and hemangiosarcoma.
- Test not able to differentiate severe inflammation from cancer.
- Additional tests may be needed to confirm or deny the suspicion of cancer.
- If patient is otherwise healthy, **recommend repeating test in 2 - 4 weeks**.
- If high suspicion of cancer or if Nu.Q® result remains elevated after retesting, recommend additional testing.

**NOTE - Dogs that have not been fasted may have artificially elevated nucleosome levels and should be retested after fasting**

# Case 4 Percy: What Do You Do?

YELLOW  
LEVEL

Volition  
Veterinary



Upon questioning owner, you determine **Percy was not fasted**

- Owner forgot to pull food & she was fed breakfast
- What do you do with these results?

Retest in  
1 month

Fast & retest  
later this week  
& FNA mass

Refer for a  
full work up  
with  
oncologist

# Case 4: Percy



- Repeat test and FNA: **Owner agreed to fast & bring dog back in am**
- **Nu.Q<sup>®</sup> Vet Cancer Test :**
- Cancer Suspicion: **LOW RISK**

**GREEN  
LEVEL**

## Nu.Q<sup>®</sup> Interpretation:

- **Green level** consistent with in **healthy animals** of over age of 1 year
- Not all neoplastic conditions are detectable using elevated plasma nucleosome concentrations.
- Do you have clinical suspicion of cancer? Work up

**Cytology Result: “Epithelial hyperplasia or benign neoplasia with mild mixed inflammation” - GREAT NEWS!**

**Next steps - Repeat Nu.Q<sup>®</sup> test at next Wellness visit**

# Future Products in Development



**Canine Cancer:  
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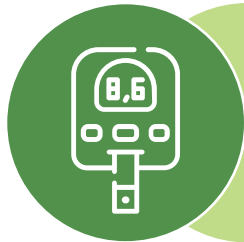
**Future Products  
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# Future Products in Development



## Point of Care Test

Volition has entered a licensing agreement with Heska.

We anticipate a launch in early 2023.



## Differential Diagnosis

We are currently working on developing additional assays to add to the Nu.Q<sup>®</sup> test to better differentiate other conditions from cancer.



## Cats

We have begun research on a Nu.Q<sup>®</sup> Vet Cancer Test for our feline friends. We hope to report data in the coming months.

# Future Products in Development<sup>19,20</sup>



## Disease Progression and Treatment Monitoring<sup>16,17</sup>

Most patients achieving clinical remission showed healthy plasma nucleosome levels i.e., “a Nu.Q<sup>®</sup> Vet test result” in the low, healthy dog range.

The Nu.Q<sup>®</sup> Vet Cancer Test may therefore be a useful tool to monitor disease response progression.

Further studies are ongoing to examine the role Nu.Q<sup>®</sup> Vet can play in Disease Progression and Treatment Monitoring.

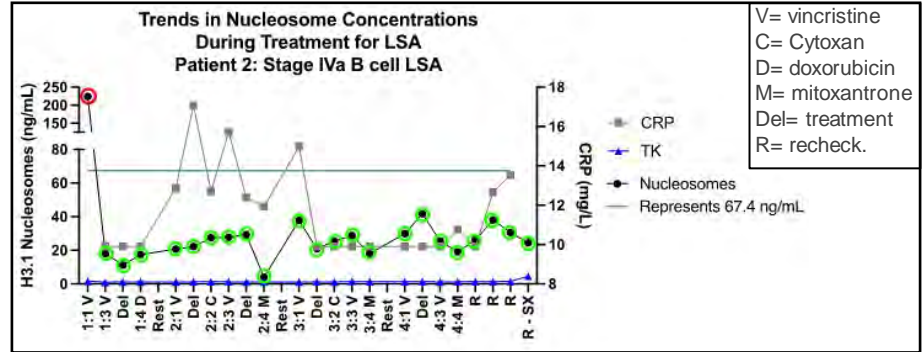
19. Wilson - Robles, H. (2022). Utility of Serial Plasma Nucleosomes Concentrations for Monitoring Treatment Response and Disease Progression In Canines with Hematopoietic Malignancies. Presentation

20. Wilson-Robles, H, Miller, T, Miller, P, Jarvis, J, Butera, T, Matsushita, M, Terrell, J, Kelly, TK. VCS 2021. Evaluation of plasma nucleosome concentrations as a tool for treatment and disease monitoring in cancer bearing dogs.

# Disease Progression and Treatment Monitoring: Case Studies

Roxy

6 year-old FS Rottweiler



- Roxy presented to TAMU in December 2019 with generalized lymphadenopathy.
- Out of remission – she had previously been diagnosed with LSA in 2018 and treated with CHOP.
- Cytology confirmed LSA, flow cytometry confirmed B cell lymphoma with high MHC class II expression.
- She was induced with CHOP Chemotherapy.

## Disease Progression and Treatment Monitoring: Case Studies

### The Chart

- Both CRP and Nu.Q® are high at diagnosis, TK-1 is not.
- By week 3 (2<sup>nd</sup> time point) – Nu.Q® is back within the reference range and she is deemed to be in **clinical remission**.
- This is her second CHOP, and due to the cumulative life-time max dose of Doxorubicin being achieved
- She was switched to mitoxantrone midway through.

### Interpretation

- CRP fluctuates throughout the protocol and the TK-1 is consistently low. The Nu.Q® value correlates better with her response and disease progress.

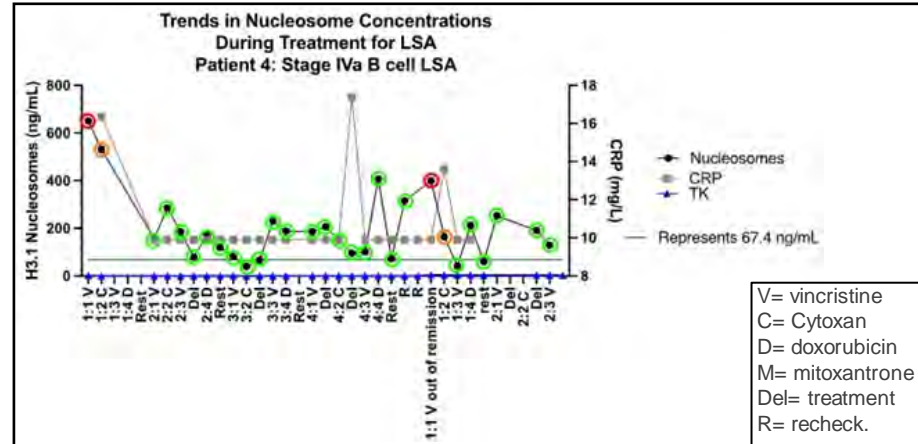
### Result

- Last recheck, she was noted to have a 7cm cavitated splenic mass on ultrasound restaging of her lymphoma. The Nu.Q® was in the normal range. She had a splenectomy, and the mass was determined to be benign.

# Disease Progression and Treatment Monitoring: Case Studies

Abbigail

5 year-old FS Miniature Schnauzer



- Abbigail presented to TAMU in 2020 with submandibular lymphadenopathy.
- Cytology diagnosed lymphoma; flow cytometry confirmed B cell lymphoma with high MHC class II expression.
- Staging determined splenic involvement (hence stage IV).

## Disease Progression and Treatment Monitoring: Case Studies

### The Chart






- Abbigail had one of the highest Nu.Q® values we have seen and continues to remain high – though she does occasionally dip below the normal range.
- She is 2.5 years and on her 3<sup>rd</sup> CHOP – so prognosis is not affected by this value. Her high Nu.Q® value is her “normal” range.
- To get Abbigail back to her “normal” Nu.Q® range, an entire cycle of CHOP was needed:  
  
Vincristine = weeks 1&3  
Cytosin = week 2  
Doxorubicin = week 4
- Abbigail gets below reference range after 2 cycles.

### Interpretation

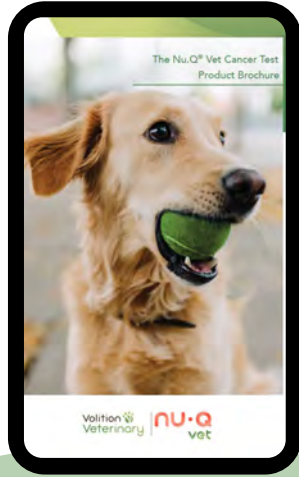
- After a rest or delay, her Nu.Q® value increases – demonstrating that we have minimal control of her disease with chemotherapy.
- At her last Doxorubicin appointment, the Nu.Q® value began to increase – but she is responsive to Doxorubicin, so the value comes back down.

## Disease Progression and Treatment Monitoring: Case Studies

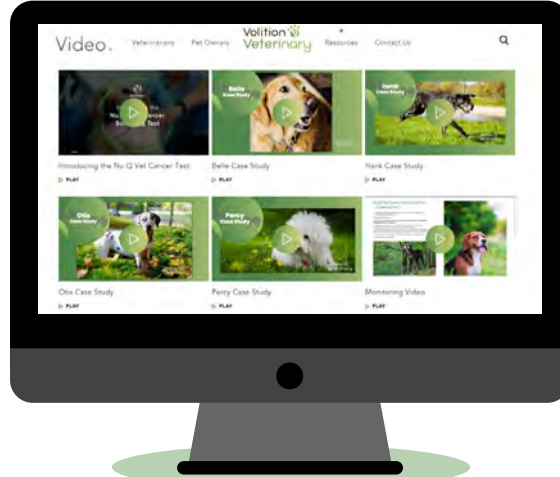
### Result

-  Abbigail's Nu.Q® value remains low at her 1<sup>st</sup> monthly recheck.
-  2<sup>nd</sup> monthly recheck, the Nu.Q® value is high – but still deemed to be in clinical remission based on PE and restaging
-  3<sup>rd</sup> monthly recheck – she is clearly out of remission and the Nu.Q® value is even higher.
-  CHOP is reinstated and her Nu.Q® value decreases again, and she goes back into remission again.
-  CRP fluctuates throughout treatment and the TK-1 is consistently low. The Nu.Q® value correlates better with her response and disease progresses.

# Materials Available for Download



Product Brochure & Case Studies



Veterinary Resources



Race Approved Webinars



# Frequently Asked Questions



**Canine Cancer:  
At a Glance**



**Cancer Screening**



**Circulating  
Nucleosomes**



**Case  
Studies**



**Future Products  
in Development**



**FAQs**

## FAQs

Will this test tell me if my dog has cancer?

No, the release of nucleosomes into the blood is common to many different types of cancers.

Additional tests are necessary to diagnose cancer and determine the source of the circulating nucleosomes

What types of cancer has the Nu.Q<sup>®</sup> Vet Cancer Test been able to detect?

At 97% specificity, the Nu.Q<sup>®</sup> Vet Cancer Test was shown to detect 76% of systemic cancers

Lymphoma – 77%

Hemangiosarcoma – 82%





Histiocytic Sarcoma – 54%

*Data also suggests the Nu.Q<sup>®</sup> Vet Cancer Test can detect some instances of Mast Cell tumors, Osteosarcoma, Oral Melanoma, and Soft Tissue Sarcoma.*







# FAQs

## Do pre-existing or other clinical conditions impact results?

### Nucleosome Spikes May Occur in the Following

-  Immune Mediated Disease
-  Systemic Inflammation
-  Sepsis
-  Trauma

### Diseases That Do Not Impact Results

-  Chronic Inflammatory Conditions
-  Systemic Inflammation  
*(being treated regularly, not flaring)*
-  Hypothyroidism
-  Renal Disease
-  Osteoarthritis
-  Mild or Moderate Pyoderma

# FAQs

## What Should I Do if My Patient has NOT Been Fasted?

Dogs that have not been fasted may have slightly elevated Nu.Q<sup>®</sup> levels.

### What to do?



Repeat the test at a later date.



Ensure patient has been fasted **minimum 4 hours**.



If levels remain high, additional testing may be necessary.

# References

1. Larkin, M. (2021). Pet population still on the rise, with fewer pets per household. American Veterinary Medical Association. Retrieved 9 July 2022, from <https://www.avma.org/javma-news/2021-12-01/pet-population-still-rise-fewer-pets-household>.
2. Survey of U.S. Pet Owners | HABRI. HABRI. (2022). Retrieved 19 August 2022, from <https://habri.org/pet-owners-survey/>.
3. Sarver, A., Makielski, K., DePauw, T., Schulte, A., & Modiano, J. (2022). Increased risk of cancer in dogs and humans: A consequence of recent extension of lifespan beyond evolutionarily determined limitations?. *Aging And Cancer*, 3(1), 3-19. <https://doi.org/10.1002/aac2.12046>
4. COP - Pet Owners - What is Comparative Oncology | Center for Cancer Research. Ccr.cancer.gov. Retrieved 9 July 2022, from <https://ccr.cancer.gov/Comparative-Oncology-Program/pet-owners/what-is-comp-onc>.
5. 2022 Pet Ownership Statistics: 70 Fur Facts - Lemonade. Lemonade Pet. (2022). Retrieved 19 August 2022, from <https://www.lemonade.com/pet/explained/pet-ownership-statistics/>.
6. Li, W., Liu, J., Hou, L., Yu, F., Zhang, J., & Wu, W. et al. (2022). Liquid biopsy in lung cancer: significance in diagnostics, prediction, and treatment monitoring. *Molecular Cancer*, 21(1). <https://doi.org/10.1186/s12943-022-01505-z>
7. Mazouji, O., Ouhajjou, A., Incitti, R., & Mansour, H. (2021). Updates on Clinical Use of Liquid Biopsy in Colorectal Cancer Screening, Diagnosis, Follow-Up, and Treatment Guidance. *Frontiers In Cell And Developmental Biology*, 9. <https://doi.org/10.3389/fcell.2021.660924>
8. Snyder, M., Kircher, M., Hill, A., Daza, R., & Shendure, J. (2016). Cell-free DNA Comprises an In Vivo Nucleosome Footprint that Informs Its Tissues-Of-Origin. *Cell*, 164(1-2), 57-68. <https://doi.org/10.1016/j.cell.2015.11.050>
9. Holdenrieder, S., Stieber, P., von Pawel, et al. (2004). Circulating Nucleosomes Predict the Response to Chemotherapy in Patients with Advanced Non-Small Cell Lung Cancer
10. Snyder, M., Kircher, et al. (2016). Cell-free DNA Comprises an In Vivo Nucleosome Footprint that Informs Its Tissues-Of-Origin. *Cell*, 164(1-2), 57-68.
11. Stoetzer, O., Fersching, D., Salat, C., Steinkohl, O., Gabka, C., & Hamann, U. et al. (2013). Prediction of response to neoadjuvant chemotherapy in breast cancer patients by circulating apoptotic biomarkers nucleosomes, DNase, cytokeratin-18 fragments and survivin. *Cancer Letters*, 336(1), 140-148. <https://doi.org/10.1016/j.canlet.2013.04.013>
12. Fahmueller, Y., Nagel, D., Hoffmann, R., Tatsch, K., Jakobs, T., Stieber, P., & Holdenrieder, S. (2012). Predictive and prognostic value of circulating nucleosomes and serum biomarkers in patients with metastasized colorectal cancer undergoing Selective Internal Radiation Therapy. *BMC Cancer*, 12(1). <https://doi.org/10.1186/1471-2407-12-5>
13. Dolan, C., Miller, T., Jill, J., Terrell, J., Kelly, T., Bygott, T., & Wilson-Robles, H. (2021). Characterizing circulating nucleosomes in the plasma of dogs with lymphoma.
14. Wilson-Robles, H., Miller, T., Jarvis, J., Terrell, J., Kelly, T., Bygott, T., & Bougoussa, M. (2021). Characterizing circulating nucleosomes in the plasma of dogs with hemangiosarcoma.
15. Wilson-Robles, H., Bygott, T., Kelly, T., Miller, T., Miller, P., & Matsushita, M. et al. (2022). Evaluation of plasma nucleosome concentrations in dogs with a variety of common cancers and in healthy dogs.
16. Medicine, P. (2022). Canine Lymphoma. Purdue University College of Veterinary Medicine. Retrieved 17 August 2022, from <https://vet.purdue.edu/pcop/canine-lymphoma-research.php>.
17. Comazzi, S., Marelli, S., Cozzi, M., Rizzi, R., Finotello, R., & Henriques, J. et al. (2018). Breed-associated risks for developing canine lymphoma differ among countries: an European canine lymphoma network study. *BMC Veterinary Research*, 14(1). <https://doi.org/10.1186/s12917-018-1557-2>
18. NC State Veterinary Hospital: Canine Hemangiosarcoma - NC State Veterinary Medicine. NC State Veterinary Medicine. (2022). Retrieved 17 August 2022, from <https://cvm.ncsu.edu/nc-state-vet-hospital/small-animal/hemangiosarcoma/>.
19. Wilson-Robles, H. (2022). Utility of Serial Plasma Nucleosomes Concentrations for Monitoring Treatment Response and Disease Progression In Canines with Hematopoietic Malignancies. Presentation
20. Wilson-Robles, H., Miller, T., Miller, P., Jarvis, J., Butera, T., Matsushita, M., Terrell, J., Kelly, TK. VCS 2021. Evaluation of plasma nucleosome concentrations as a tool for treatment and disease monitoring in cancer bearing dogs

# Additional Questions?

You can reach us online, via e-mail, DM us, our call our hotline for a free oncology consult



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