The evolution of cancer diagnostics: an update on screening and early diagnosis of canine lymphoma

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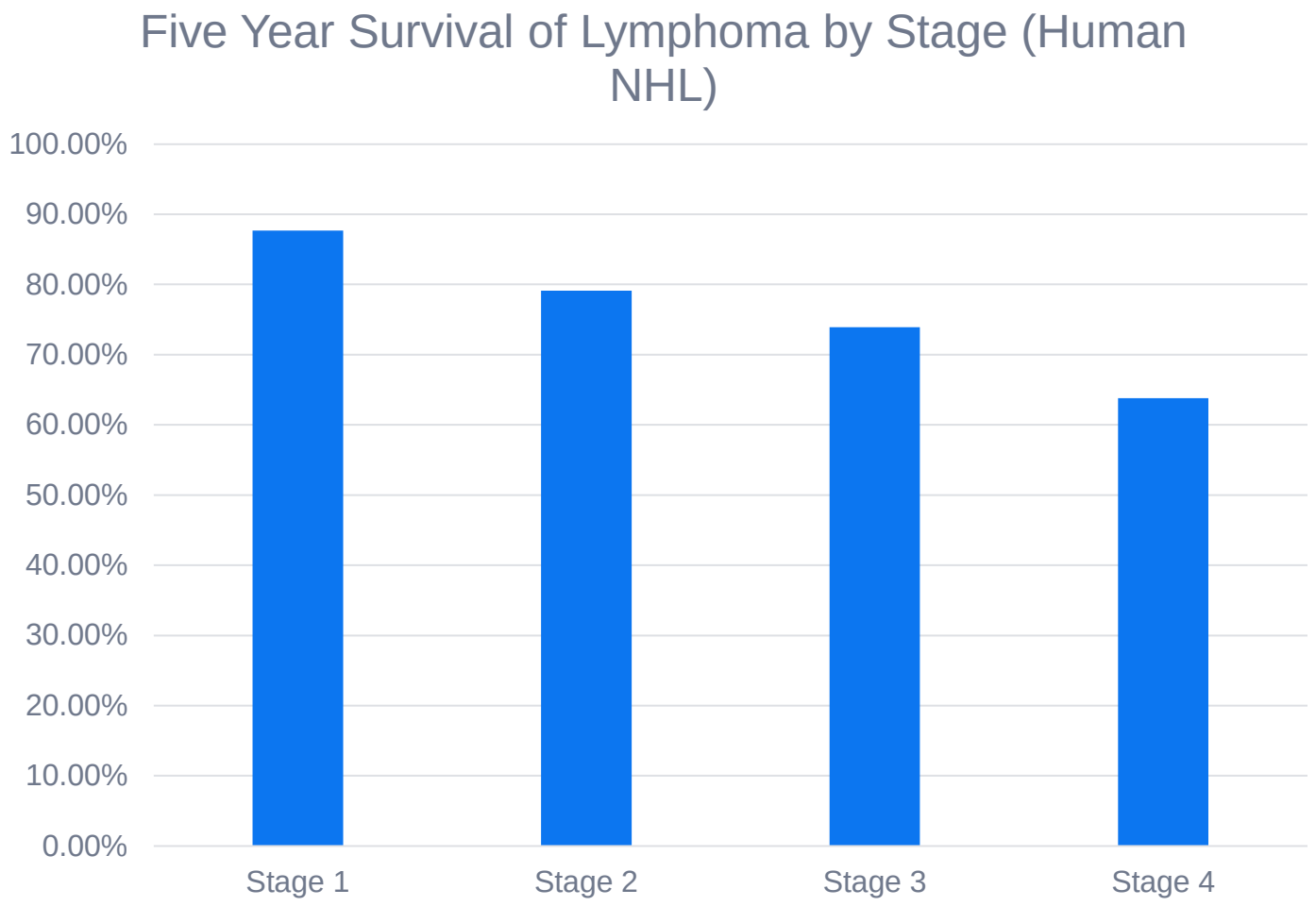
CONFLICT OF INTEREST DISCLOSURE

I have financial interest, arrangement or affiliation with:

I am a full-time employee of IDEXX

Why Early Detection Matters



35%

stage 1 or 2 diagnoses in human non-Hodgkins lymphoma

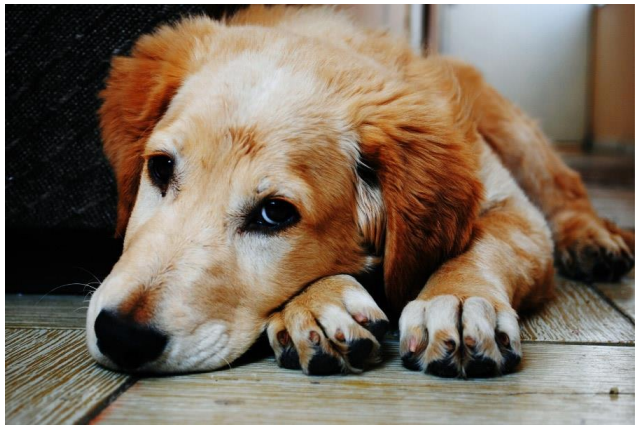
10% or less

stage 1 or 2 diagnoses in canine multicentric lymphoma

NIH National Cancer Center. Surveillance, Epidemiology and End Results Program. https://seer.cancer.gov/statfacts/html/nhl.html

Substaging of dogs with lymphoma has been shown to affect prognosis

Substage a- Dog has no clinical signs upon presentation



Substage b- Dog has clinical signs at presentation such as lethargy, gastrointestinal signs

Substage	Number of dogs	Median Survival (Weeks)	Median Remission (Weeks)
a	31	69	44
b	24	28	18
		***P*= 0.001**	***P*= 0.040**

(1)

Inappetence

Vomiting

Diarrhea

Dyspnea

Changes in attitude

Weakness

(2)

(1) Keller, E.T., MacEwen, E.G., Rosenthal, R.C., Helfand, S.C. and Fox, L.E. (1993), Evaluation of Prognostic Factors and Sequential Combination Chemotherapy With Doxorubicin for Canine Lymphoma. Journal of Veterinary Internal Medicine, 7: 289-295. https://doi.org/10.1111/j.1939-1676.1993.tb01021.x

(2) Barber LG, Weishaar KM. Criteria for designation of clinical substage in canine lymphoma: a survey of veterinary oncologists. Vet Comp Oncol. 2016 Aug;14 Suppl 1:32-9. doi: 10.1111/vco.12086. Epub 2014 Feb 23. PMID: 27508350.

Current Landscape in Cancer Care

Screening

Not currently routine in practice

Based upon risk stratification profiles

Suspicion

Most often based upon historical changes or physical examination changes

Diagnosis

Cytology

Biopsy

Diagnostic Imaging

Management

Additional surgery

Chemotherapy

Radiation therapy

Monitoring

Liquid biopsy- pioneering advances in human and vet cancer

"Liquid biopsy is a minimally-invasive sample collection method that focuses on blood or body secretions for the detection of molecular alterations, tumor cells, and metabolites."[1]

Period of Scientific Exploration
Before the 1990s

Period of Scientific Development
During the 1990s

Period of Industrial Growth
2000-2010

Period of Industrial Outbreak
2010-present

Liquid Biopsy Use in Lymphoma in Humans

Lymphoma-associated alterations 95% concordance with tissue biopsy.

Predicts progression of disease in advance of conventional imaging.

The combination of imaging and liquid biopsy is more accurate determination of treatment efficacy, risk of recurrence.

Ma, L., Guo, H., Zhao, Y. *et al.* Liquid biopsy in cancer: current status, challenges and future prospects. *Sig Transduct Target Ther* **9**, 336 (2024). https://doi.org/10.1038/s41392-024-02021-w

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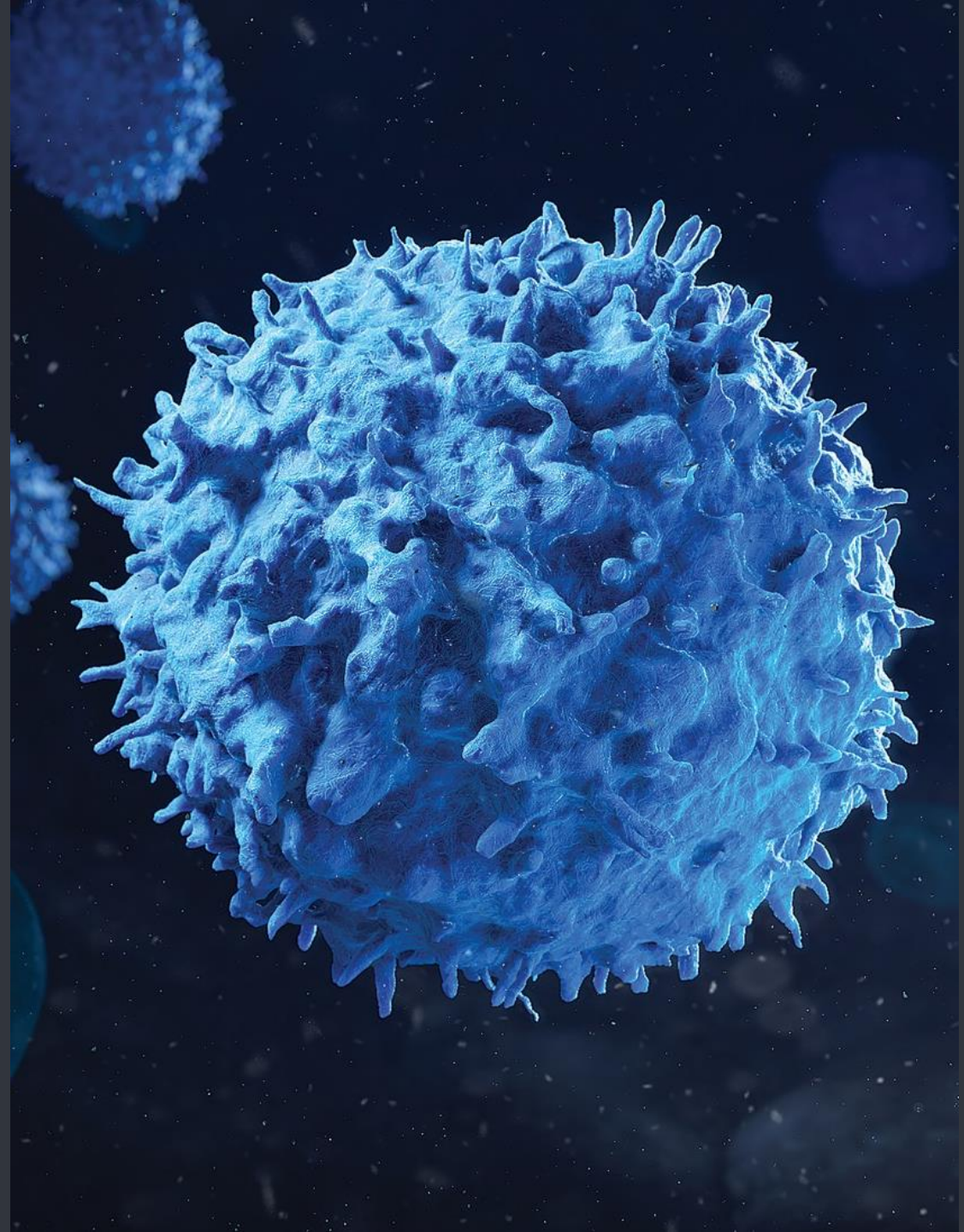
Liquid Biopsy Use in Canines

First canine genome map created in 2005.

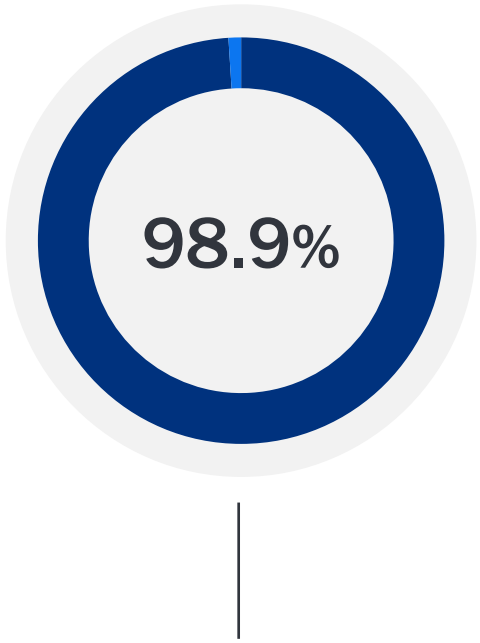
Next generation sequencing techniques and detection of tumor-specific biomarkers has been of increasing use.

Liquid biopsy technology is used for many disease processes and becoming more common in canine cancer care.

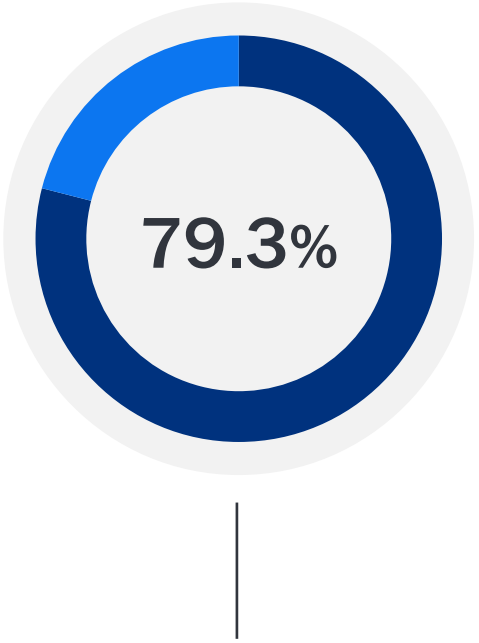
IDEXX Cancer Dx Testing
First stop: Lymphoma



Validation of Cancer Dx testing



LSA Specificity



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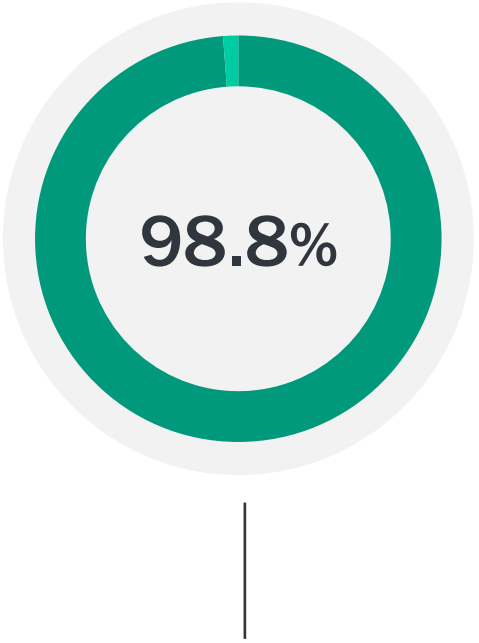
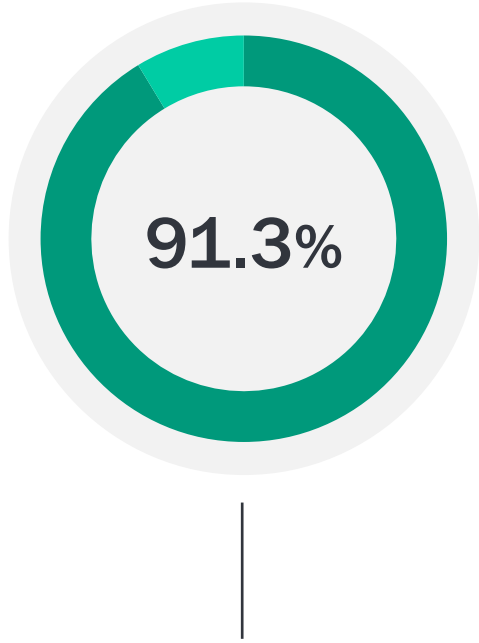


T-cell Specificity



B-cell Specificity

FP #1: Metastatic mast cell disease, PARR clonal for B-cell

FP #2: Splenic round cell tumor, suspected to be plasma cell in origin, **MUM1 positive**

56% IDEXX Cancer Dx™ positive results include a phenotype which is highly accurate at no additional cost to customer

Comparison to existing diagnostics

Where does IDEXX Cancer Dx™ fit into the diagnostic workup of a patient suspected to have lymphoma?

Metric	Cancer Dx	Cytology[1]	Lymphoma PCR (PARR)[2-4]
Sensitivity	79%	92.6%	75% - 92%
Specificity	99%	89.4%	94% - 98.7%
Turnaround Time	3-4 days*	1-5 days	10-14 days
Specimen	Serum/ Blood	Cells from lesion	Cells from lesion
Cost	$	$$	$$$

Where does IDEXX Cancer Dx™ fit into the available options for phenotyping of lymphoma?

Metric	Cancer Dx	Lymphoma PCR (PARR)[5-6]	Flow cytometry[6]
B-cell specificity	91.3%	67% - 89%	100%
T-cell specificity	98.8%	64% - 100%	98%
Specimen	Serum/ Blood	Cells from lesion	Cells from lesion
Special handling?	No	No	Yes
Cost	$	$$$	$$$

1. Martini V, Marano G, Aresu L, Bonfanti U, Boracchi P, Caniatti M, Cian F, Gambini M, Marconato L, Masserdotti C, Nicoletti A, Riondato F, Roccabianca P, Stefanello D, Teske E, Comazzi S. Performance of lymph node cytopathology in diagnosis and characterization of lymphoma in dogs. J Vet Intern Med. 2022 Jan;36(1):204-214. doi: 10.1111/jvim.16326. Epub 2021 Nov 27. PMID: 34837263; PMCID: PMC8783335.
2. Avery A. Molecular diagnostics of hematologic malignancies. Top Companion Anim Med. 2009 Aug;24(3):144-50. doi: 10.1053/j.tcam.2009.03.005. PMID: 19732733
3. Frequently asked questions. Colorado State University Clinical Hematopathology Laboratory. Accessed 2/17/2025. https://vetmedbiosci.colostate.edu/chl/faqs/
4. Waugh EM, Gallagher A, Haining H, Johnston PEJ, Marchesi F, Jarrett RF, Morris JS. Optimisation and validation of a PCR for antigen receptor rearrangement (PARR) assay to detect clonality in canine lymphoid malignancies. Vet Immunol Immunopathol. 2016 Dec;182:115-124. doi: 10.1016/j.vetimm.2016.10.008. Epub 2016 Oct 19. PMID: 27863542; PMCID: PMC5119497.
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What population of dogs would be appropriate to screen for lymphoma using IDEXX Cancer Dx?

At-Risk Breeds

- Cancer more likely to be diagnosed earlier in life
- Screen for cancer starting at 4 years of age

Senior Dogs

- Cancer risk increases for all dogs entering their senior years
- Screen for cancer starting at 7 years of age

Peer-reviewed literature guides risk stratification

Breeds at risk for cancer (overall)

Golden retriever[1]
French bulldog[2]
Beagle[3]
Boxer[3]
Miniature schnauzer[3]
Bernese Mountain dog[4]
Flat-coated retriever[4]
Scottish terrier[4]
Bullmastiff[4]

Breeds at risk for lymphoma

Labrador retriever[5]
Rottweiler[6]
Doberman[7]
English bulldog[8]

At-risk breeds starting at 4 years of age

All other dogs starting at 7 years of age[2]

1. Nelson B, Faquin W. Retrieving new clues about a dog breed's "insane" cancer risk. *Cancer Cytopathol*. 2024;132(9):541-542. doi:10.1002/cncy.22899
2. Rafalko JM, Kruglyak KM, McCleary-Wheeler AL, et al. Age at cancer diagnosis by breed, weight, sex, and cancer type in a cohort of more than 3,000 dogs: Determining the optimal age to initiate cancer screening in canine patients. *PLOS ONE*. 2023;18(2):e0280795. doi:10.1371/journal.pone.0280795
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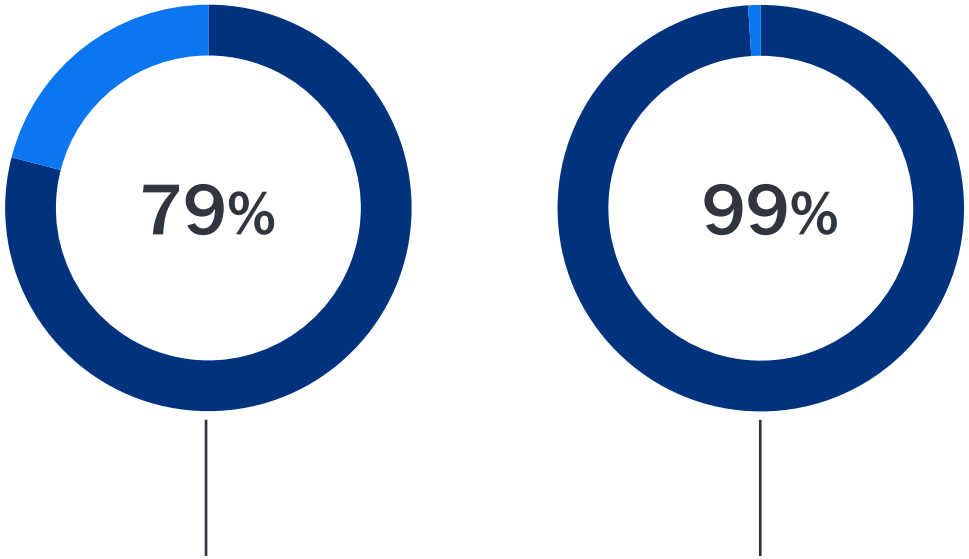
IDEXX Cancer Dx is highly specific and sensitive for detection of lymphoma with additional characterization provided in many cases

Diagnosis



Lymphoma Sensitivity

Lymphoma Specificity

Prognosis/Treatment

56% of IDEXX Cancer Dx results “Consistent with lymphoma” are delivered alongside a phenotype

- **No additional sample**
- **No additional cost**
- **No additional turnaround time**

Case Study Demonstrating Early Detection: Rose

Signalment: 11 yo FS Great Dane

Presenting Complaint: Wellness examination with blood work

Results available: CBC, Chemistry, UA, TT4, 4DX Negative

Cancer Dx Results: Consistent with lymphoma, indeterminate phenotype

Presenting Complaint: Hyporexia and weight loss for 2 weeks

Enlarged, firm peripheral lymph nodes

Results available: Fecal antigen Negative, Cytology: intermediate/ large cell LSA

ICC: CD20 (-), CD3 (-)
PARR: Immunoglobulin gene: clonal
T cell receptor gene: polyclonal

96 days later

Clinical Case: Ruger

Ruger came in for a **routine wellness examination with no abnormalities.**

His veterinarian offered a comprehensive panel including **Cancer Dx.**

(Dana)

(Dana)

Ruger's Cancer Story

Day 1 — Blood work submitted to IDEXX Reference Labs with Cancer Dx

Day 3 — Cancer Dx "consistent with lymphoma"

Day 14 — Cytology of palpably normal lymph nodes: Lymphoma

Key Value — Diagnosis before clinical suspicion. Time for planning and treatment.

If you could remove one barrier to cancer screening, what would it be?

- High cost associated with initial testing in addition to annual wellness blood work
- High volume of blood or non-routine sample needed for submission
- Long turnaround time well beyond receipt of results for annual wellness blood work
- Lack of specificity when compared to other conditions
- Inability to name cellular origin, or type of cancer

Cancer Dx removes these barriers

Affordable blood-based assay

Samples obtained during routine wellness visit and incorporated easily into existing panels

01

Small volume needed

No change to approach to appointment – no disruption of workflow

02

Stable biomarkers

Maintain integrity in shipping and ability to add on test once at lab with a 2-3 day turnaround time

03

Highly Specific

Biomarkers chosen for specificity against VBD, autoimmune, other cancers and ability to name lymphoma

04

Myth or Fact?

Cancer screening is appropriate for all wellness blood work including puppies of at-risk breeds.

Cancer Dx can be used to screen at-risk dogs for lymphoma during a routine wellness visit.

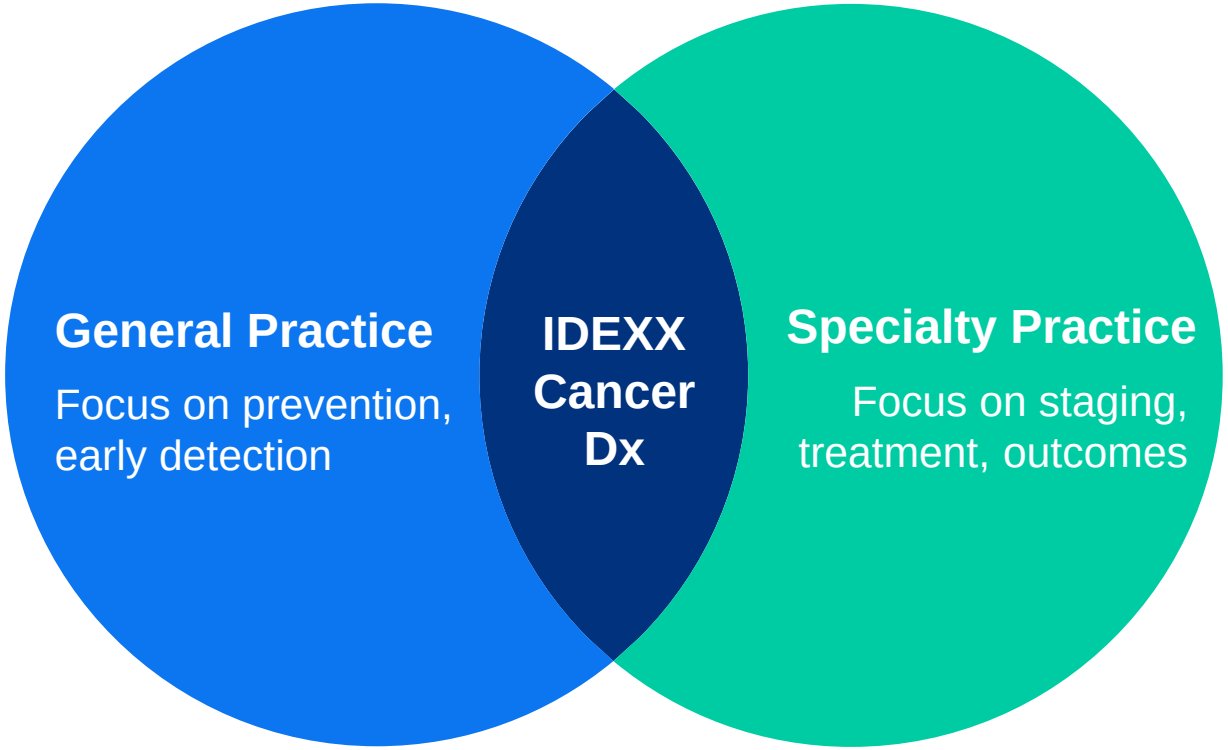
Cancer screening in dogs gives results of lifetime risk of cancer in that specific patient.

Preventive Care- Foundation of Lifelong Health

- Early detection can improve outcomes
  - Detect disease before your patient becomes ill
- Routine screening matters
  - Annual exams, blood work and cancer screening provide early insights
- Breed and age risk awareness
  - Tailor preventive care protocols to risk profiles
- Client education increases compliance
  - Clear communication builds trust

Partner with pet owners to make preventive care a priority. Consider lymphoma screening with Cancer Dx in appropriate wellness cases.

Screening is most powerful when it starts in general practice

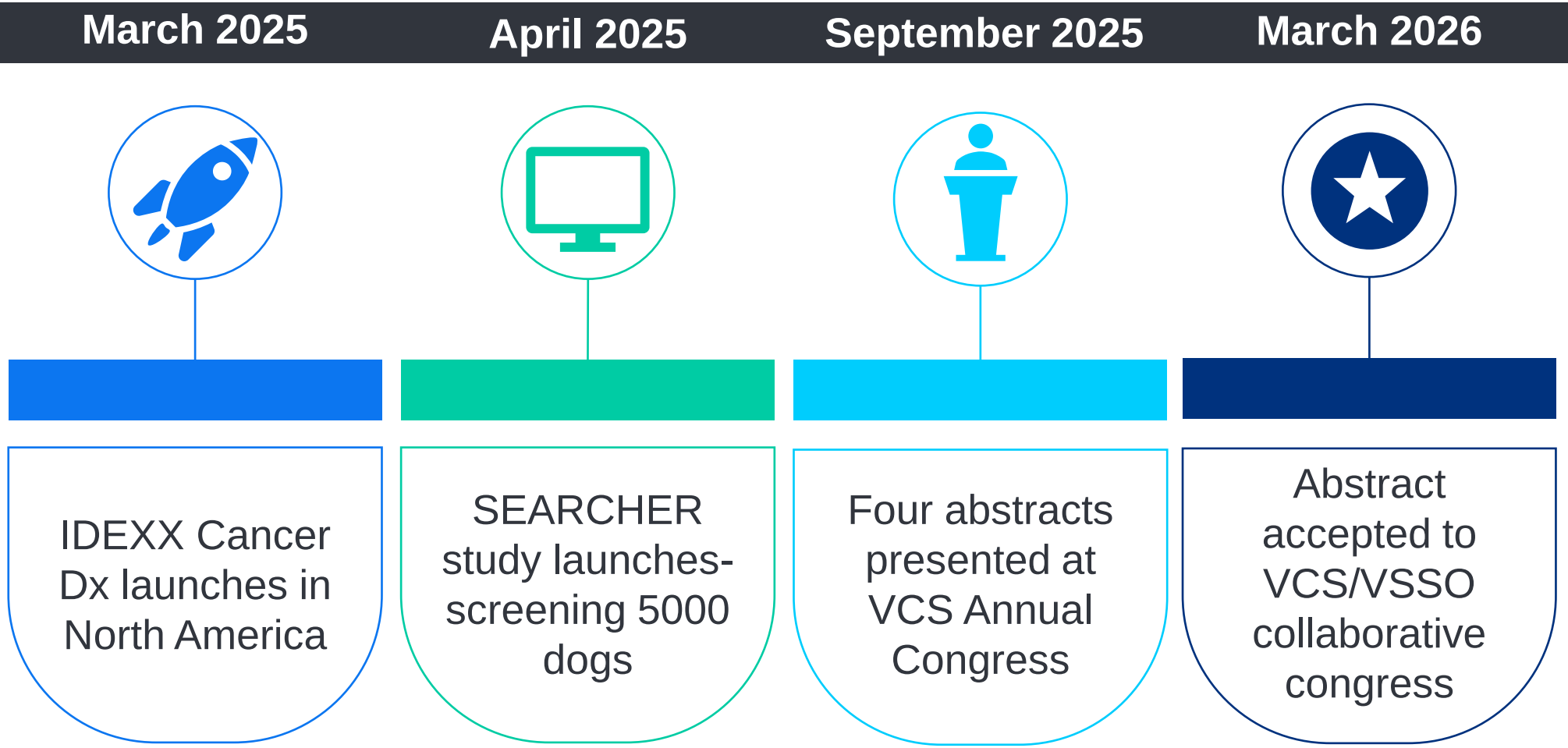


Screening results can lead to timely collaboration

IDEXX Cancer Dx is a tool for earlier referral

Let’s use this to catch cases sooner together

Ongoing studies and support



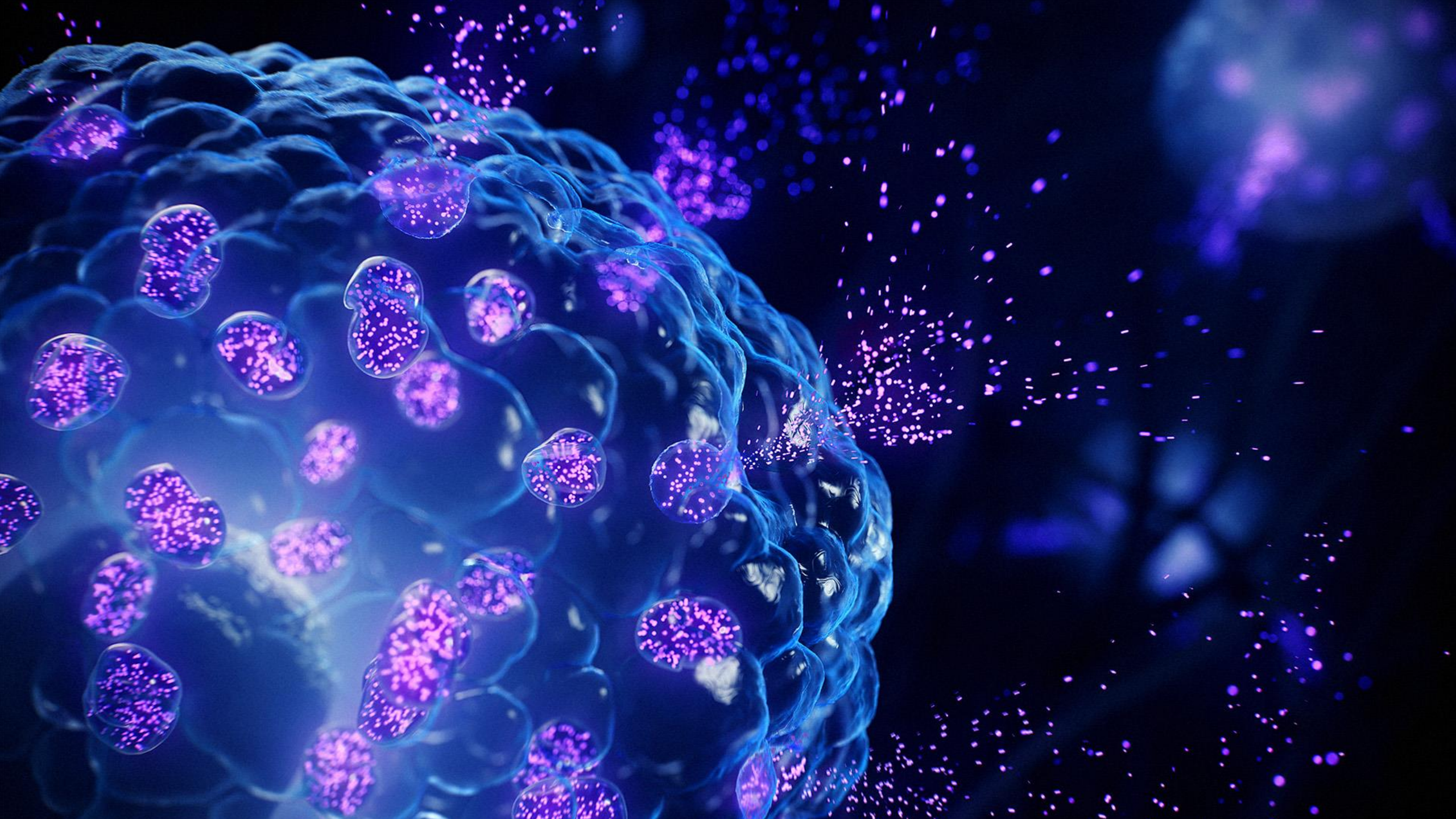
What dogs are appropriate to test?

Screening At-Risk Breeds

Screening Senior Dogs

Diagnostic Aid Sick Dogs

Monitoring During Therapy



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THE CURATED MIND

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