

Canine Heartworm Testing Algorithm & Macrocytic Lactone (ML) Resistance Testing

Annual Screening OR Testing in Symptomatic Dogs

Conduct both tests as recommended by The American Heartworm Society (AHS)[†]



Point-of-Care Heartworm Antigen Test

VETSCAN® Heartworm Rapid Test
VETSCAN® Flex4 Rapid Test
WITNESS® Heartworm Rapid Test



Modified Knott's Test for Microfilaria with Quantification

Zoetis Reference Lab test code: MODKNOTTSQ
Sample requirement: 2 mL EDTA whole blood
Tube type*: LTT
Turnaround time: 1-2 days



**Antigen +
Microfilaria -**

**Antigen +
Microfilaria +**

**Antigen -
Microfilaria +**



Verify Results Using a Different Antigen Test Methodology

Zoetis Reference Lab test code: 6001
Sample requirement: 0.25 mL of serum
or EDTA plasma
Tube type*: SST, LTT, RTT
Turnaround time: Next day by 8 a.m.



**Is there evidence of major
gaps in testing or
heartworm disease
preventive history?**



Perform Heartworm Antigen Test with Heat Treatment

Zoetis Reference Lab test code: HWHEAT
Tube type*: SST, LTT, RTT
Sample requirement: 0.5 mL plasma or serum,
or 1 mL whole blood
Turnaround time: 1-2 days

Positive

Negative

Yes

No

Positive

Negative

**Heartworm
Infection
Confirmed;
ML-Resistance
Cannot Be
Confirmed
Nor Disproven**

Start
heartworm
disease
treatment
according
to AHS
Guidelines

Consider Heartworm Antigen Test with Heat Treatment

Zoetis Reference Lab
test code: HWHEAT

Negative

Positive

**Heartworm
Infection
Unlikely**

Do not initiate
heartworm
treatment;
continue to
monitor
and screen
annually

**Heartworm
Infection
Confirmed
With Low
Suspicion of
ML-Resistance**

Start
heartworm
disease
treatment
according
to AHS
Guidelines

**Heartworm
Infection
Confirmed**

Confirmed
infection with
suspicion of
ML-resistance

Proceed to page 2 for next steps to
evaluate for ML-resistance

**Potential Infection With
Other Filariid Species**

Rule out infection with
other filariid species using
morphological evaluation
via a Modified Knott's Test
and/or PCR testing through
a reference laboratory

[†]Ancillary diagnostic testing (thoracic radiographs, +/- echocardiography) should be used in conjunction with heartworm diagnostic tests when heartworm disease is suspected regardless of diagnostic rapid test results.

Canine Heartworm Testing Algorithm & Macrocytic Lactone (ML) Resistance Testing

Microfilarial Suppression Testing for ML-resistant heartworm^{2,3}

For confirmed heartworm infection despite history of consistent preventive use or in cases lacking preventive use history



Modified Knott's for Microfilaria with Quantification[†]

Zoetis Reference Lab test code: MODKNOTTSSQ

Sample requirement: 2 mL EDTA whole blood

Tube type*: LTT

Turnaround time: 1-2 days

Administer microfilaricidal dose of ML heartworm preventive after blood collection



Wait 14-28 days after administration of preventive and repeat Modified Knott's Test with Quantification and evaluate: Was there a >75% decrease in microfilaria?

Yes

Low Suspicion Of Resistance

Start heartworm disease treatment according to American Heartworm Society (AHS) guidelines

No

High Suspicion Of Resistance

- Start heartworm disease treatment according to AHS guidelines
- Continue heartworm disease preventive
- Provide clear client communication on how to minimize transmission
 - AHS notes that using isoxazoline products that have demonstrated mosquito-killing activity⁴ can help break the heartworm transmission cycle and decrease transmission of resistant isolates

 **Start heartworm disease treatment** (scan QR below)



*Tube types:

SST: Serum separator top (tiger)

RTT: Red tube top

LTT: Lavender tube top

[†]Use results from initial Modified Knott's test with quantification or perform Modified Knott's test with quantification if not done initially.

Clinical judgement required. Algorithm provides general guidance and does not replace authoritative guidelines.

References:

1. American Heartworm Society. 2024. <https://www.heartwormsociety.org/veterinary-resources/american-heartworm-society-guidelines>
2. Moorhead AR, Evans CC, Kaplan RM. A diagnostic algorithm for evaluating cases of potential macrocyclic lactone-resistant heartworm. *Parasit Vectors*. 2017;10(Suppl 2):479. doi:10.1186/s13071-017-2441-9.
3. Ballesteros C, Pulaski CN, Bourguinat C, Keller K, Prichard RK, Geary TG. Clinical validation of molecular markers of macrocyclic lactone resistance in *Dirofilaria immitis*. *Int J Parasitol Drugs Drug Resist*. 2018;8(3):596-606. doi:https://doi.org/10.1016/j.ijpddr.2018.06.006
4. Geurden, T., Chapin, S., McCall, J.W. et al. Insecticidal activity of Simparica and Simparica Trio against *Aedes aegypti* in dogs. *Parasites Vectors* 16, 95 (2023). <https://doi.org/10.1186/s13071-023-05699-z>