Imported and traveling dogs as carriers of *Dirofilaria* spp. from South America

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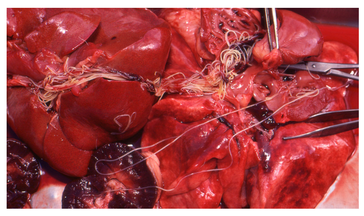
Background

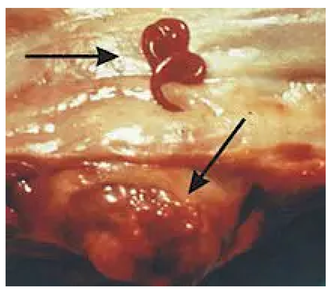
- ***Dirofilaria immitis* & *Dirofilaria repens* are vector-borne filarial parasites that infect canids. Both species are the principal agent of human dirofilariasis in their respective endemic zones.**
- **In co-infected animals, performing a heat-mediated immune complex dissociation (ICD) step for *D. immitis* antigen testing can lead to false-positive results due to cross-reactivity with other helminth species (Refs a,b), some of which are not zoonotic.**
- **The importation risk of these species from traveling dogs is unknown**

Dirofilaria immitis & Other Cross-Reactive Helminth Species

Endemic to the U.S.



1. *Dirofilaria immitis* (canine heartworm) adults reside within the heart and pulmonary arteries, damaging the vessels and tissues.



2. *Spirocerca lupi* adults reside within the esophagus, resulting in granulomas and sarcomas. Larval migration to and from the heart can result in aortic aneurysms and thrombosis, along with other complications.

Not Endemic to the U.S.

3. *Angiostrongylus vasorum* (french heartworm) adults reside within the pulmonary arteries, resulting in respiratory disorders.

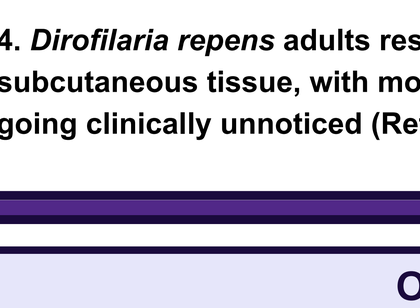
4. *Dirofilaria repens* adults reside within the subcutaneous tissue, with most infections going clinically unnoticed (Ref c).

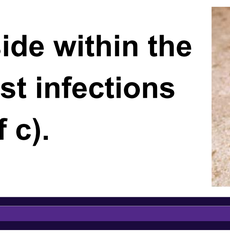
Objectives

- **Examine the risk of imported dogs in the transmission of parasitic diseases to U.S. dog populations.**
- **Evaluate the need for screening imported dogs for vector-borne nematodes to mitigate the introduction and establishment of non-endemic species in the U.S.**

Methods

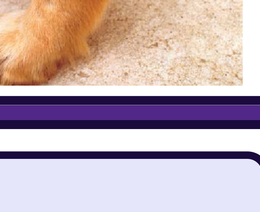
1.





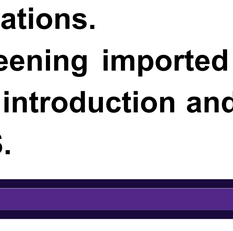
Residual canine serum samples banked at KSU VDL after rabies antibody testing

2. Sera was sorted by country and pooled



3. 1 ml of the pooled sera was heat-treated at 100°C for 10 mins[a]

4. Untreated and heat-treated pooled sera was tested using DiroCHEK®



5. Absorbance was read on a spectrophotometer

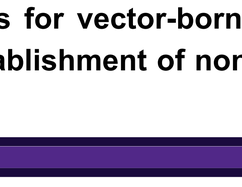


Figure 1. Methods for detection of *D. immitis* from canine sera from South America.

- **Pool sizes based on estimated prevalence in each country or surrounding country if data was not available.**

Results

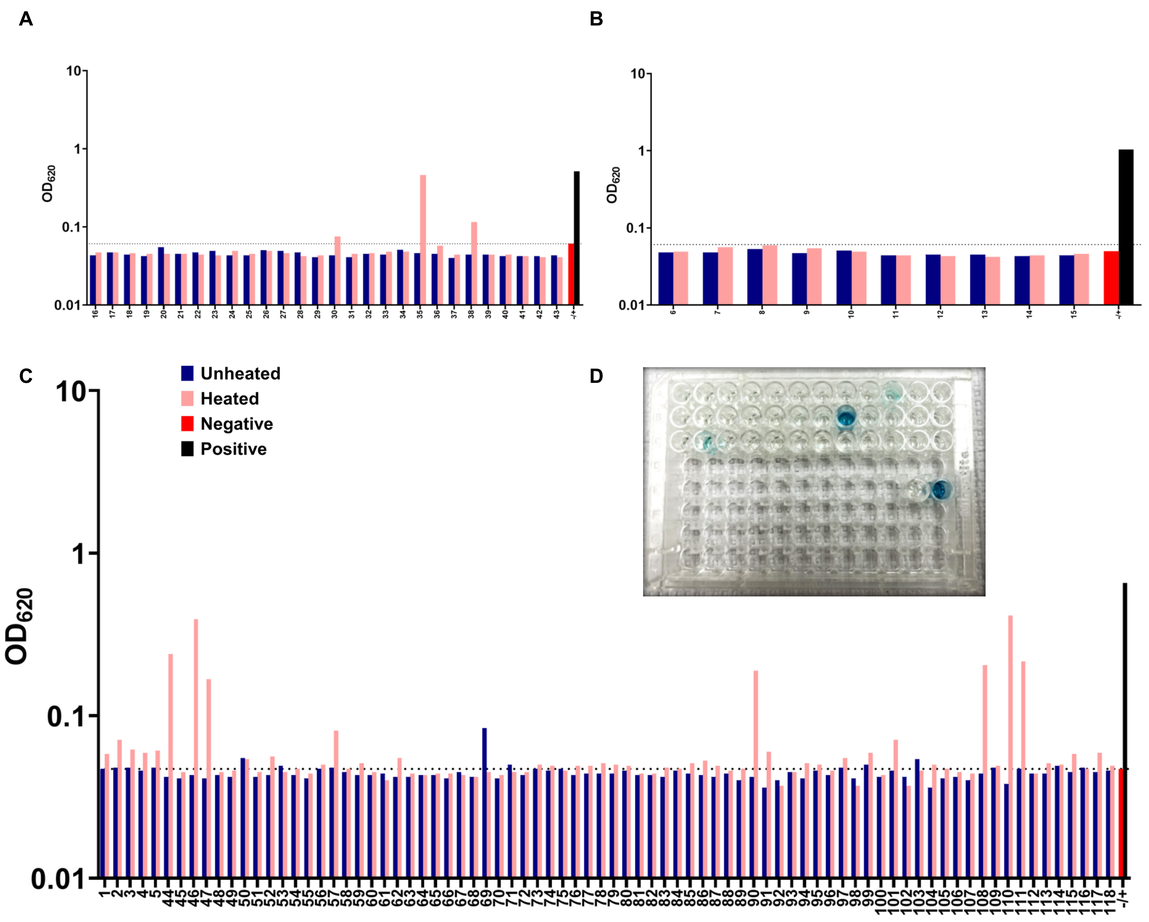


Figure 2. Absorbance results of *D. immitis* antigen testing of pooled sera from dogs in (A) Ecuador, (B) Uruguay and (C) Colombia. (D) Positive samples detected using DiroCHEK® (blue) from Ecuador. Dotted line indicates average negative control value.

Conclusions/Discussion

- **The DiroCHEK (Zoetis) kit is a highly sensitive and specific ELISA for the detection of *D. immitis* when used as directed with serum (not heat-treated).**
- **When used with heat-treated serum, the assay is cross-reactive and can detect *D. immitis*, *D. repens*, *A. vasorum*, and *S. lupi*, but can not differentiate them.**
- **We have tested 118 pools (~1,500 serum samples) from submission sites throughout South America that were banked at the KSU VDL after rabies antibody testing.**
- **Several positive heat-treated pools were detected using the *D. immitis* ELISA, despite being negative with unheated sera.**
- **In these pools, we can not rule out the presence of cross-reactive nematodes due to cross-reactivity of the assay when using heat-treated serum.**
- **Additionally, inadequate surveillance efforts and/or endemic reports limits the ability to accurately assess the risk of these nematode species being imported.**
- **Although *D. immitis* and *S. lupi* are currently endemic in the U.S., imported infected dogs could potentially introduce novel genetic characteristics.**
- **Imported dogs carrying *D. repens*, or *A. vasorum* can introduce these species to the U.S, where they are non-endemic.**

References

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b. Little, Susan E., et al. "Heat Treatment Prior to Testing Allows Detection of Antigen of Dirofilaria Immitis in Feline Serum." *Parasites & Vectors*, vol. 7, no. 1, 2014, pp. 1–1

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