Emergence of Visceral Leishmaniasis in Dogs in North America: A Cautionary Tale
Global Distribution of Visceral Leishmaniasis

- L. chagasi / L. Infantum
- L. donovani

= Leishmania donovani complex
Beginning late summer 1999, foxhounds at Hunt A in Dutchess County, NY, developed illness with manifestations including weight loss, bleeding, skin lesions, kidney failure. There were many deaths.
Public Health Concerns and Aims of Investigation

- How widely is it dispersed?
- How is this transmitted?
  - Insect vectors?
  - Direct dog-to-dog?
  - Other?
- Where did the infection come from?
- How did it get here?
- Are other species involved?
  - Zoonotic potential?
Fox Hunting in North America

Masters of Foxhound Hunters Association of America has 167 registered Hunts in 35 states and 4 Canadian Provinces. Together these hunts own approximately 11,000 foxhounds. These numbers do not include unregistered hunts and night hunters.
### Distribution of serum antibody titers for Leishmaniasis in Kenneled Hunting Dogs, USA and Canada, 2001-2002

Test: Indirect Immunofluorescence Assay

<table>
<thead>
<tr>
<th>Reciprocal IIF Titers</th>
<th>&lt;16</th>
<th>16</th>
<th>32</th>
<th>64</th>
<th>128</th>
<th>256</th>
<th>≥512</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. Pos.</td>
<td>10067</td>
<td>1543</td>
<td>644</td>
<td>209</td>
<td>139</td>
<td>86</td>
<td>53</td>
</tr>
<tr>
<td>% Pos.</td>
<td>86.7</td>
<td>13.3</td>
<td>5.5</td>
<td>1.8</td>
<td>1.2</td>
<td>0.7</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Number tested = 11, 610 (December, 2001)
Geographic Distribution of Kenneled Hunting Dogs Tested for Leishmaniasis, North America 2001-2002*

Number kennels sampled (no. kennels with positive dogs)

Coverage: 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

Results: Seropositive dogs identified in 71 kennels in 21 states and 2 provinces.

Test: Indirect immunofluorescence assay. Positive titer ≥ 1:64)
Geographic Distribution of Kenneled Hunting Dogs Tested for *T. cruzi*, North America 2001-2002*

Coverage: 363 dogs from 70 Hunt club kennels in 22 States and Canada (December, 2001)

Results: Seropositive dogs identified in 21 kennels in 12 states and 2 provinces.

Test: Radio Immunoprecipitant Assay (RIPA)

---

*denotes geographic data

---

[Map of the United States with annotations indicating the number of kennels sampled and the number of kennels with positive dogs for *T. cruzi* across different states and provinces.]

- **Coverage**: 9,160 dogs from 172 kennels in 35 states and Ontario, Canada (September, 2000)
- **Results**: Seropositive dogs identified in 62 kennels in 21 states and Ontario
- **Coverage**: 363 dogs from 70 hunt club kennels in 22 states and Canada (December, 2001)
- **Results**: Seropositive dogs identified in 21 kennels in 12 states and 2 provinces.
Geographic Distribution of Kenneled Hunting Dogs Tested for Leishmaniasis, North America 2001-2002*

Coverage: 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

Results: Seropositive dogs identified in 71 kennels in 21 states and 2 provinces.

Test: Indirect immunofluorescence assay. Positive titer ≥1:64)

Number kennels sampled (no.kennels with positive dogs)

Canada

- 12 (8) MONTREAL
- 10 (2) TORONTO
- 22 (5) MONTREAL
- 32 (14) WINNIPEG
- 17 (3) CALGARY
- 10 (6) VANCOUVER

United States

- 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)
- Seropositive dogs identified in 71 kennels in 21 states and 2 provinces.
- Test: Indirect immunofluorescence assay. Positive titer ≥1:64)
Some Factors That May Predispose to Direct Dog-to-Dog Transmission
Canine Visceral Leishmaniasis
Some Possible Modes of Direct Dog-to-Dog Transmission

- Biting
- Needles
- Blood Transfusion*
- Breeding*
- Tattooing

* confirmed
Why Foxhounds?

Factors That might Favor Transmission and Spread

- Breed (genetic) susceptibility (?)
- Nature of the breed and management
  - Gregarious, kenneled together, dominant behavior, fighting
  - Stress of hunting
  - National/regional competitions
  - Drafting hounds from one Hunt to another
### Distribution of Leishmania IIF serum antibody titers in pet dogs, shelter dogs and wild canids, 2001-2002

<table>
<thead>
<tr>
<th>Reciprocal titers</th>
<th>&lt;16</th>
<th>16</th>
<th>32</th>
<th>64</th>
<th>128</th>
<th>256</th>
<th>≥512</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Pet dogs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=455</td>
<td>291</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Shelter dogs</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Dutchess Co., NY</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=74</td>
<td>73</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Orange Co., VA</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=55</td>
<td>53</td>
<td>2</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Wild canids</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>n=291</td>
<td>291</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Red fox 148, Gray fox 51; coyote 82.*
Other Cases of Presumptive Dog-to-Dog Transmission of Visceral Leishmaniasis (*Leishmania donovani* complex)

Case 1 – Cockers in Florida

Case 2 – Newfoundland in Pennsylvania

Case 3 – Spinones in Canada and Virginia
Numbers of Dogs and Cats Imported or returned to USA*

- ~4000 dogs and ~4500 cats per year enter at JFK Airport alone.  
  (NY Quarantine Station, 2000)
- Estimated 1000 privately-owned dogs per year return from Southern Europe with U.S. military families. Similar number of cats.  
  (USAVETCOM, 2000)
- “Clandestine” importation of small dogs for distribution to shelters.  
  (NAIA, 2000)

*Data not recorded. Entry requirements minimal: health certificate and proof of rabies vaccination
Distribution of Phlebotomine Sand Flies in North America
Potential Vectors of *Leishmania* spp.?
Human Risk Assessment, 2001-2002

• Serologic testing has been performed on individuals that have had some association with Fox hunting.

• 129 human serum samples from various states and Canada have been tested using the IIF for Leishmania spp.

• To date, all human serologic tests have been negative.
Acknowledgements

Walter Reed Army Institute of Research
  Joan Jackson
  Edgar Rowton

Masters of Foxhound Hunters Association

Virginia State Department of Health
  Jane Rooney (CDC-EIS)
  Suzanne Jenkins

New York State Department of Health
  Millicent Eidson

Instituto di Sanita Publica
  Rome, Italy
  Marina Gramiccia

NCSU College of Veterinary Medicine
  Edward Breitschwerdt
  Michael Levy
  Amanda Gaskin

Division Of Parasitic Diseases, NCID, CDC
  Frank Steurer
  Zandra Duprey
  Heather Burns
  Peter Schantz
  Emi Saito
  Marina Caskey
  Kevin Woods

National Association of State Public Health Veterinarians

Virginia State Department of Agriculture
  Bruce Akey
Questions?
Previous Reports of Autochthonous Canine Leishmaniasis in the U.S.

- Oklahoma, 1980
- Kansas, 1982
- Ohio, 1988
- Michigan, 1989
- Alabama, 1991