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

L. chagasi / L. Infantum

= Leishmania donovani complex

L. donovani
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*

Number kennels sampled (no. kennels with positive dogs)

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)
Covered: 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
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>
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</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.?

Source: E. Rowton

- *Lutzomyia shannoni*
- *Lutzomyia cruciata*
- *Lutzomyia anthropora*
- *Lutzomyia diabolica*
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.
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CDC

CDC

CDC
Questions?
Previous Reports of Autochthonous Canine Leishmaniasis in the U.S.

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