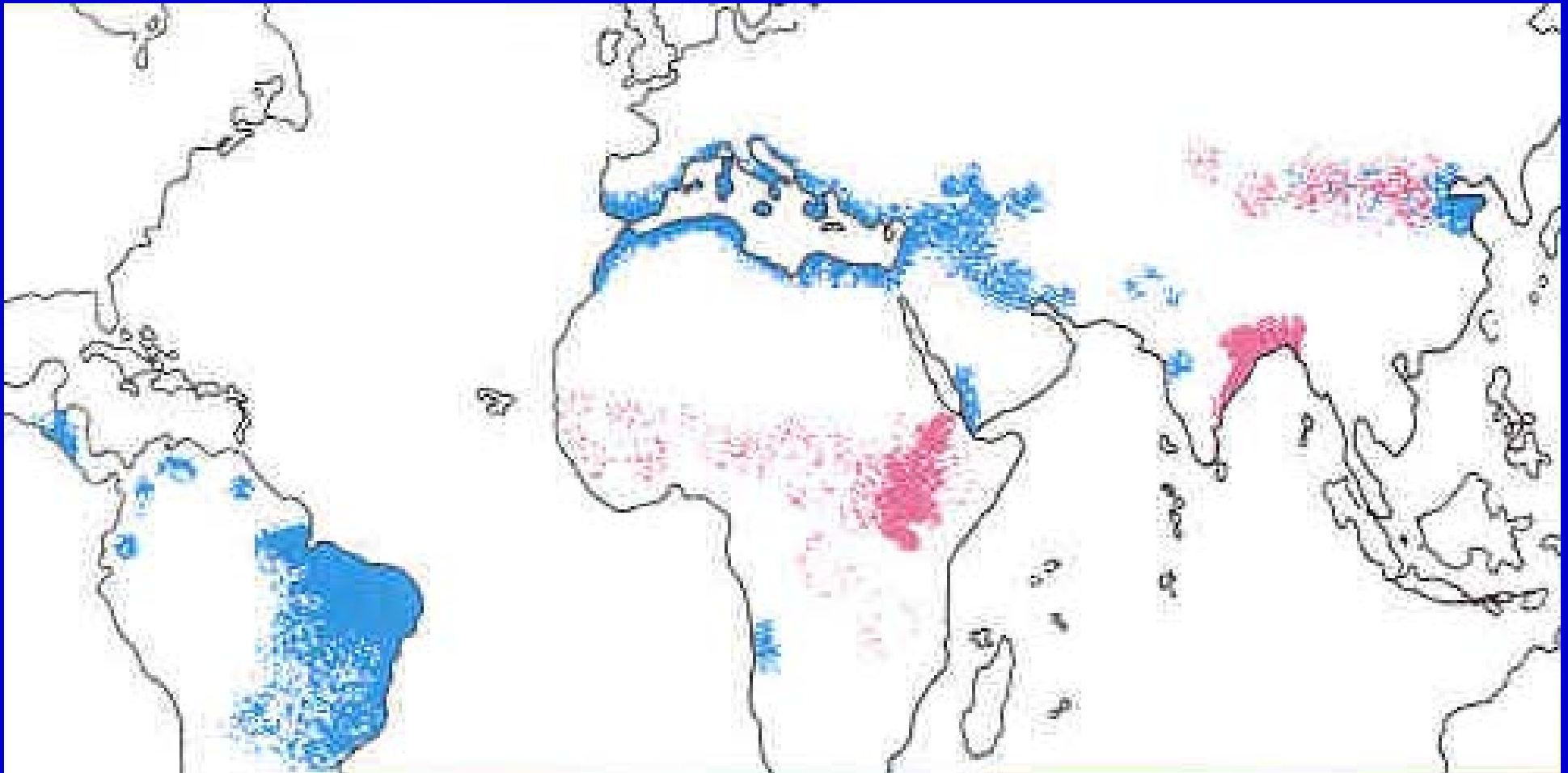




**Emergence of  
Visceral Leishmaniasis  
in Dogs in North America:  
A Cautionary Tale**

# 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

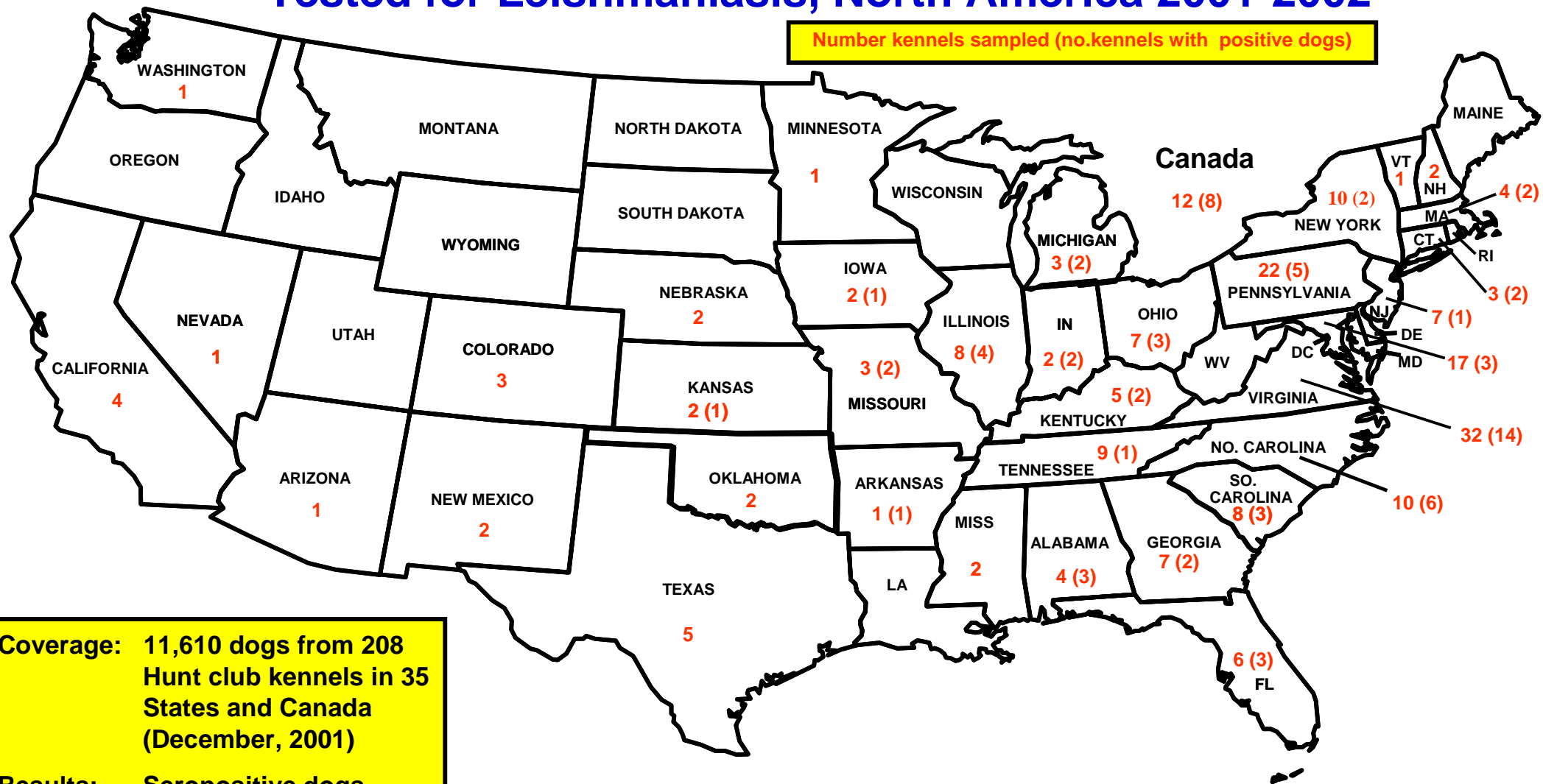
Test: Indirect Immunofluorescence Assay

| Reciprocal IIF Titers | <16   | 16   | 32  | 64  | 128 | 256 | ≥512 |
|-----------------------|-------|------|-----|-----|-----|-----|------|
| No. Pos.              | 10067 | 1543 | 644 | 209 | 139 | 86  | 53   |
| % Pos.                | 86.7  | 13.3 | 5.5 | 1.8 | 1.2 | 0.7 | 0.5  |

**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)



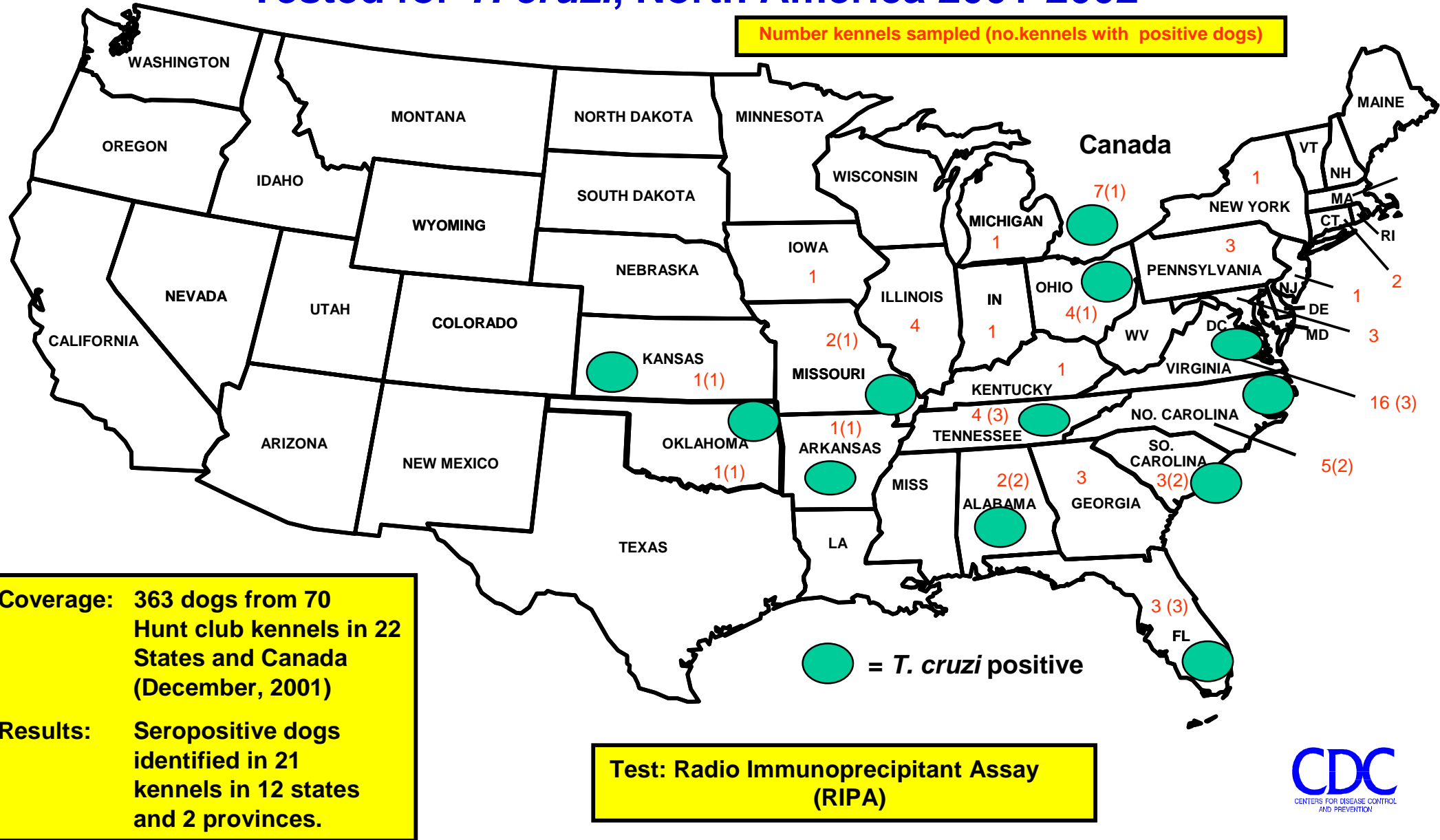
**Coverage:** 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

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

**Test:** Indirect immunofluorescence assay.  
Positive titer  $\geq 1:64$



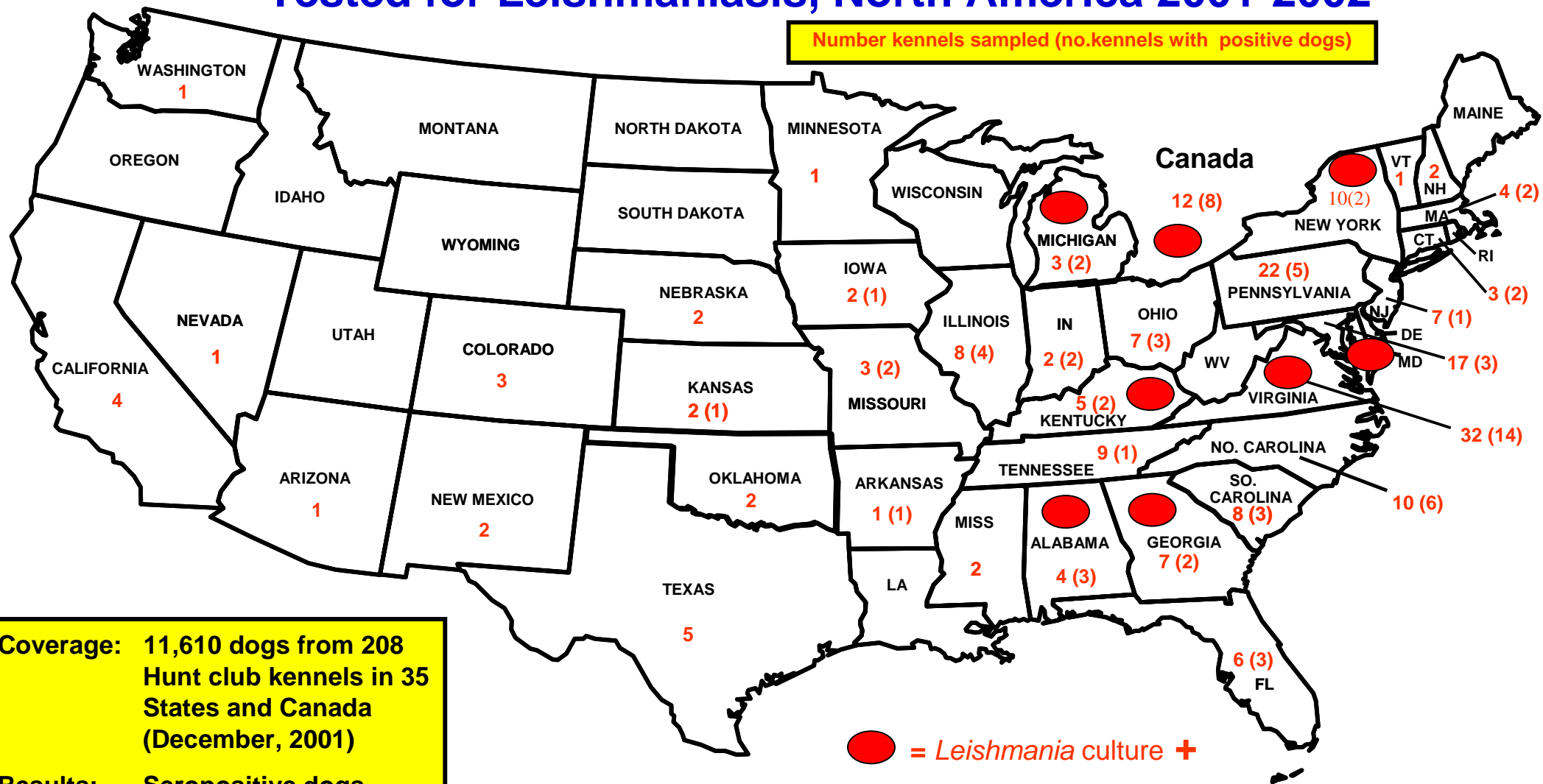
# Geographic Distribution of Kenneled Hunting Dogs Tested for *T. cruzi*, North America 2001-2002\*





# Geographic Distribution of Kenneled Hunting Dogs Tested for Leishmaniasis, North America 2001-2002\*

Number kennels sampled (no. kennels with positive dogs)

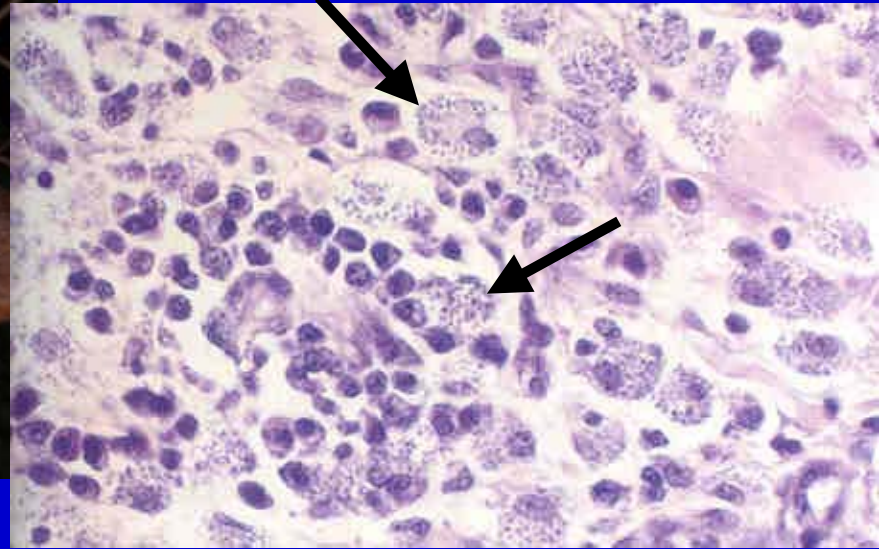


Coverage: 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

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

● = *Leishmania* culture +

Test: Indirect immunofluorescence assay. Positive titer  $\geq 1:64$



***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

| Reciprocal titers                                 | <16 | 16 | 32 | 64 | 128 | 256 | ≥512 |
|---|-----|----|----|----|-----|-----|------|
| <b>Pet dogs<br/>n=455</b>                         | 291 | 0  | 0  | 0  | 0   | 0   | 0    |
| <b>Shelter dogs<br/>Dutchess Co., NY<br/>n=74</b> | 73  | 1  | 0  | 0  | 0   | 0   | 0    |
| <b>Shelter dogs<br/>Orange Co., VA<br/>n=55</b>   | 53  | 2  | 0  | 0  | 0   | 0   | 0    |
| <b>Wild canids*<br/>n=291</b>                     | 291 | 0  | 0  | 0  | 0   | 0   | 0    |

\* 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\*

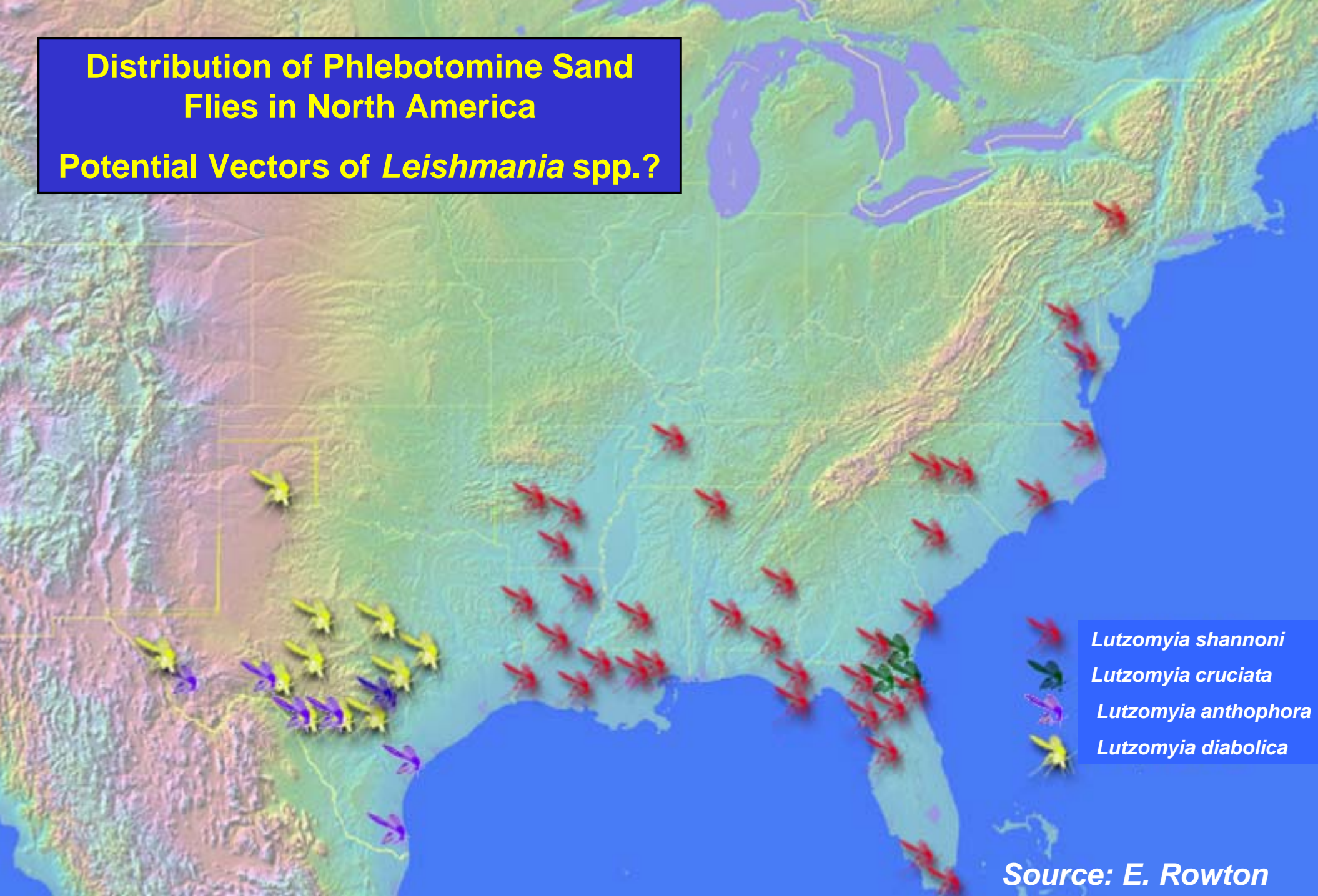
- ~4000 dogs and ~4500 cats per year enter at JFK Airport alone.  
(NY Quarantine Station, 2000)
- Estimated 1000 privately-owned dogs per year return from Southern Europe with U.S. military families. Similar number of cats.  
(USAVETCOM, 2000)
- “Clandestine” importation of small dogs for distribution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



- Lutzomyia shannoni*
- Lutzomyia cruciata*
- Lutzomyia anthophora*
- Lutzomyia diabolica*

Source: E. Rowton

# 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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Bruce Akey

Questions?



# Previous Reports of Autochthonous Canine Leishmaniasis in the U.S.



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