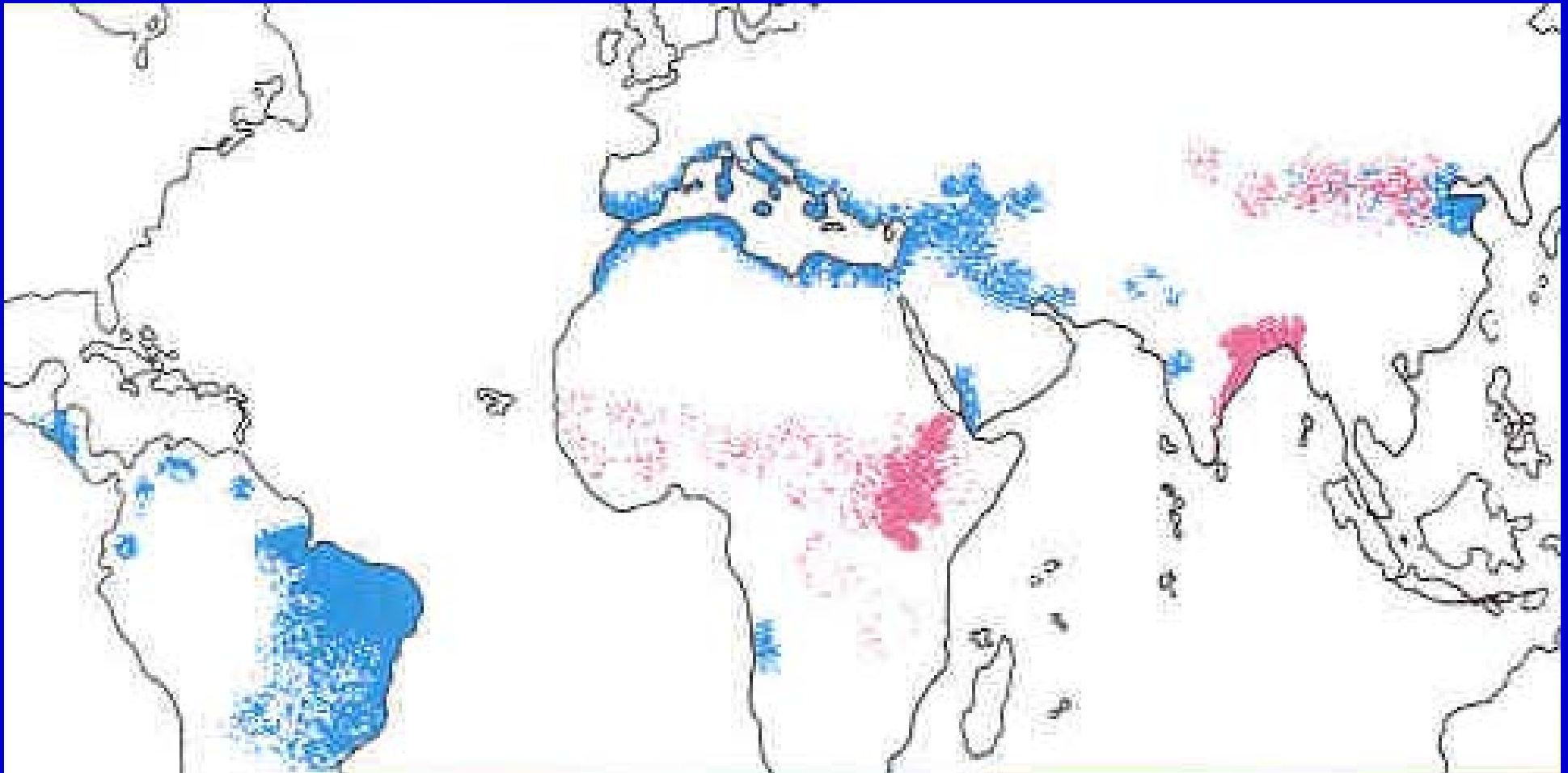




**Emergence of
Visceral Leishmaniasis
in Dogs in North America:
A Cautionary Tale**

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

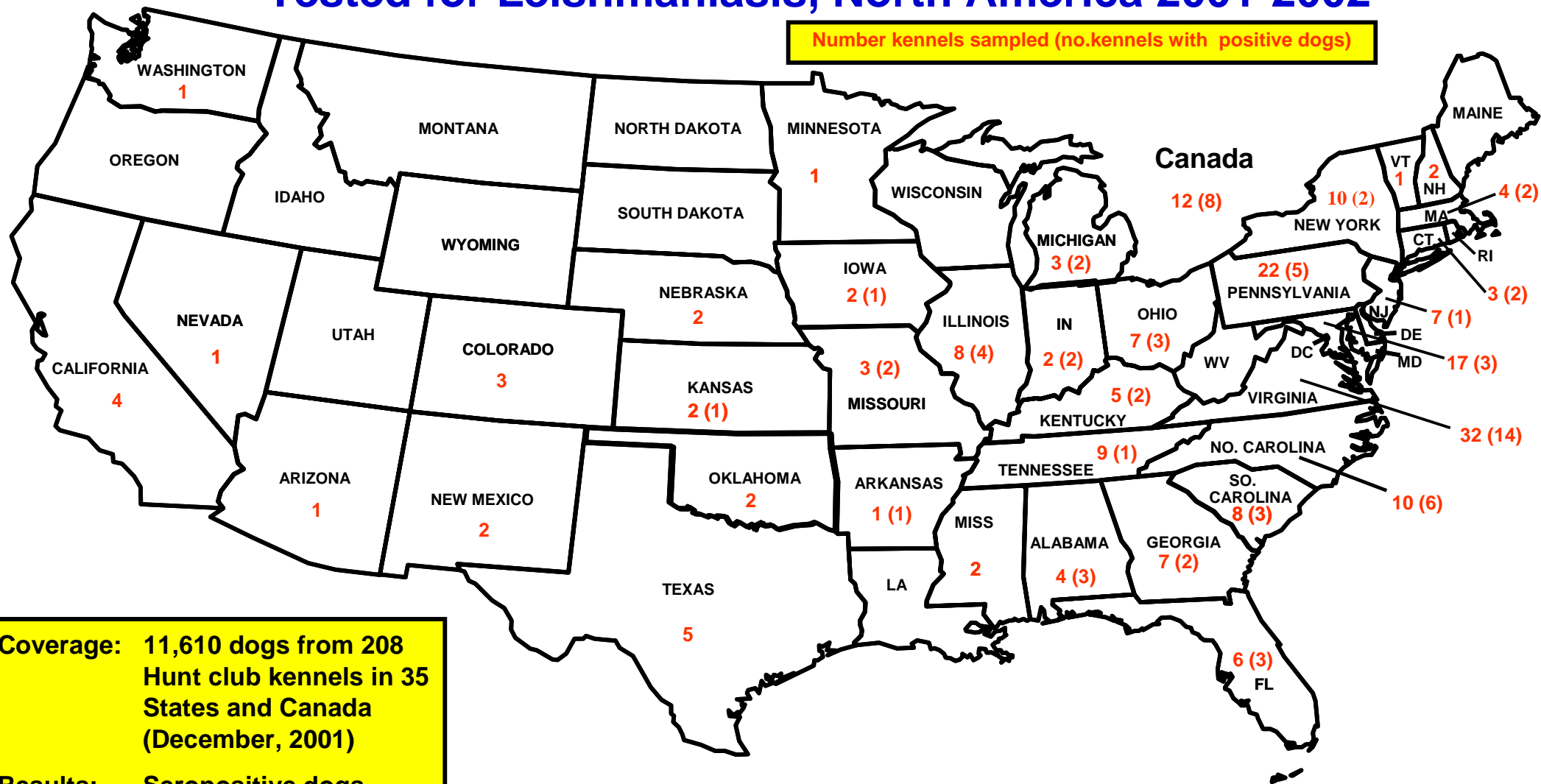
Test: Indirect Immunofluorescence Assay

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)



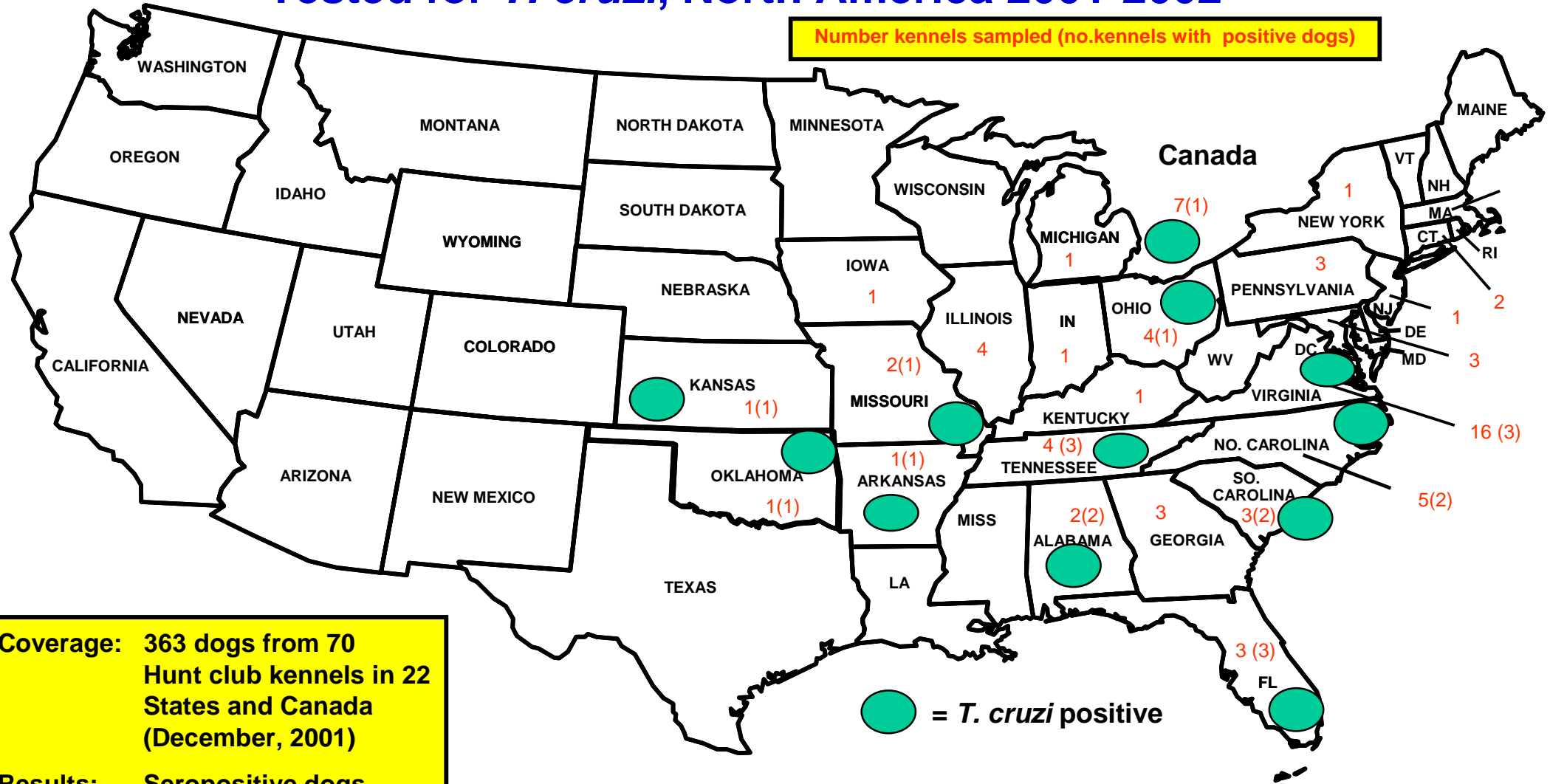
Coverage: 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

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*

Number kennels sampled (no. kennels with positive dogs)



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

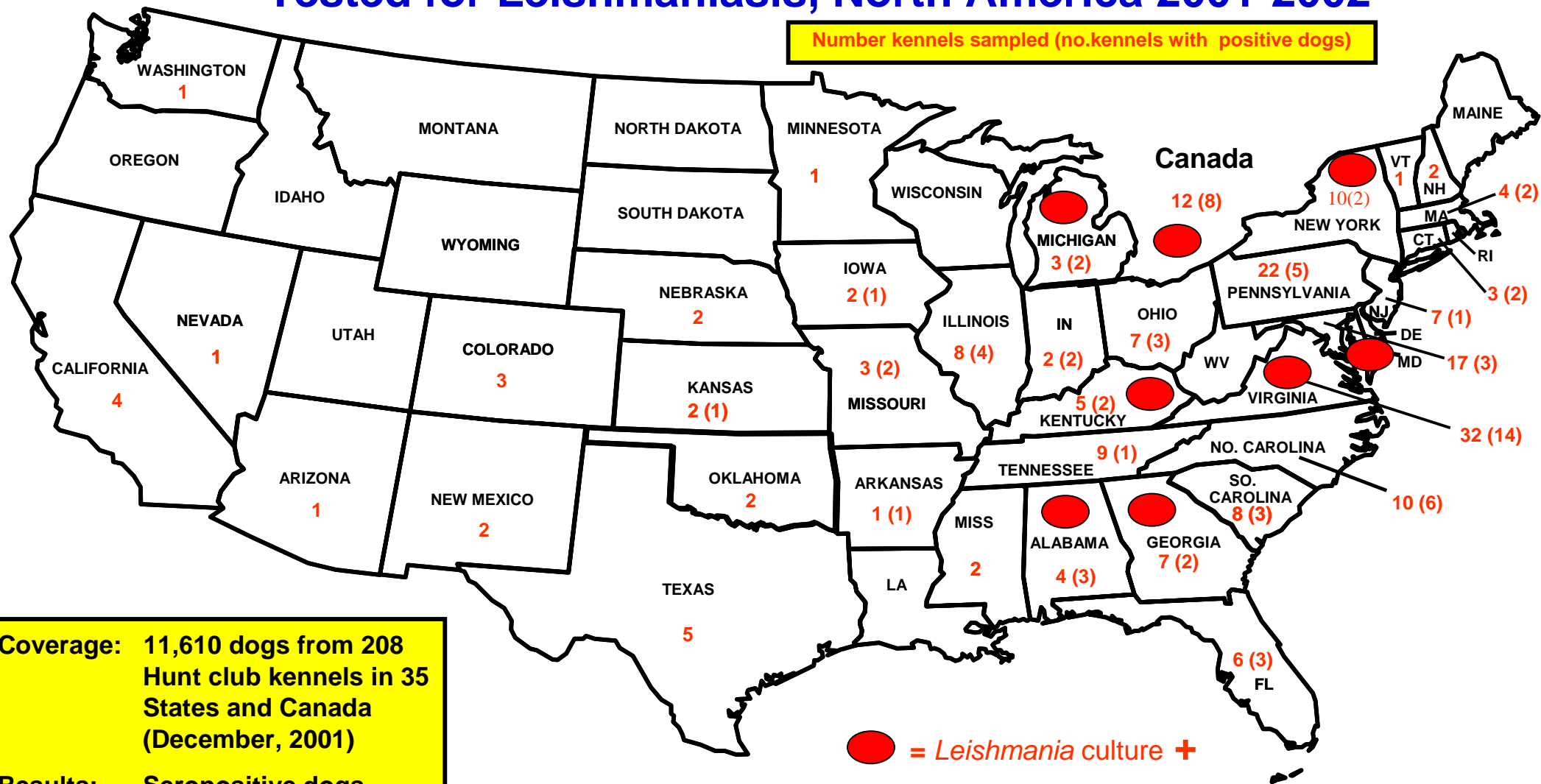
Results: Seropositive dogs identified in 21 kennels in 12 states and 2 provinces.

Test: Radio Immunoprecipitant Assay (RIPA)



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

Number kennels sampled (no. kennels with positive dogs)



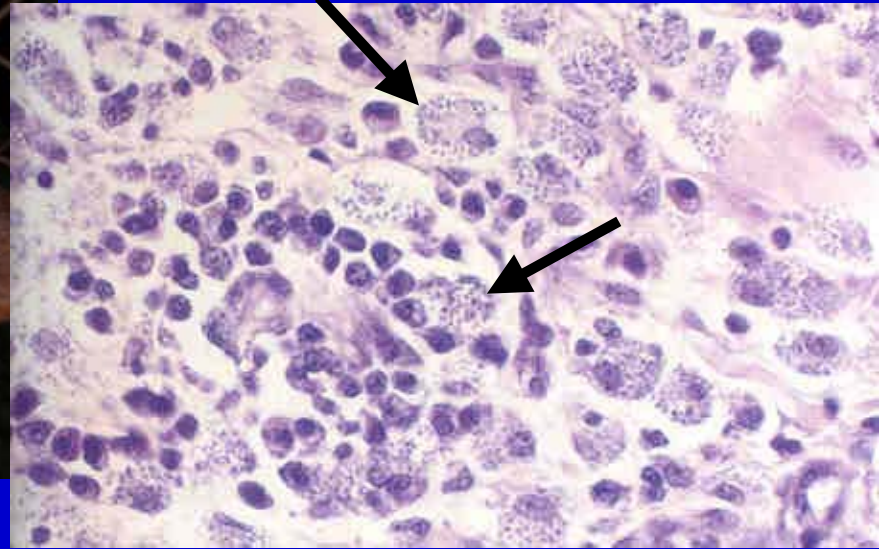
Coverage: 11,610 dogs from 208 Hunt club kennels in 35 States and Canada (December, 2001)

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

Red circle = *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
Pet dogs n=455	291	0	0	0	0	0	0
Shelter dogs Dutchess Co., NY n=74	73	1	0	0	0	0	0
Shelter dogs Orange Co., VA n=55	53	2	0	0	0	0	0
Wild canids* n=291	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





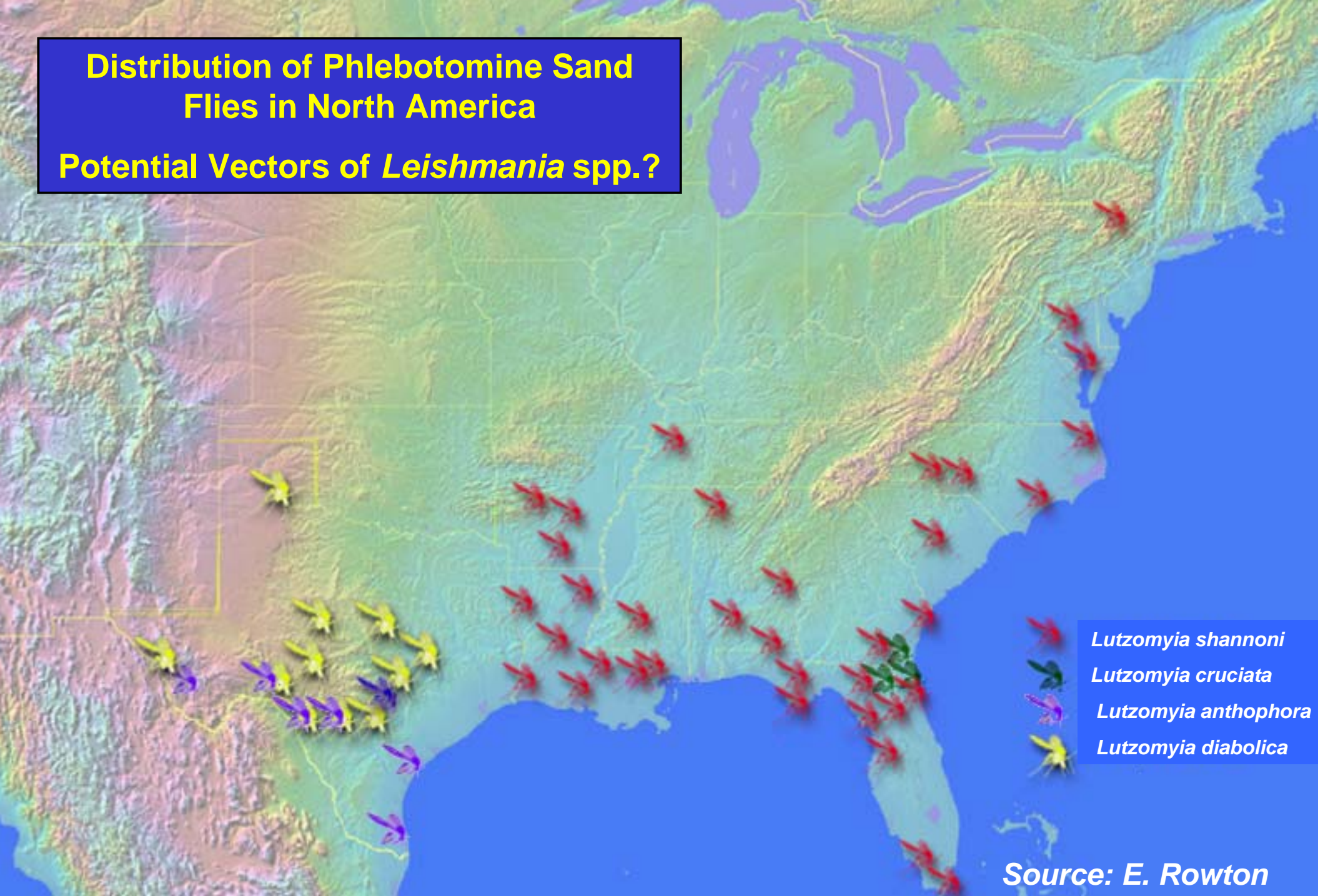
Numbers of Dogs and Cats Imported or returned to USA*

- ~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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Questions?



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



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