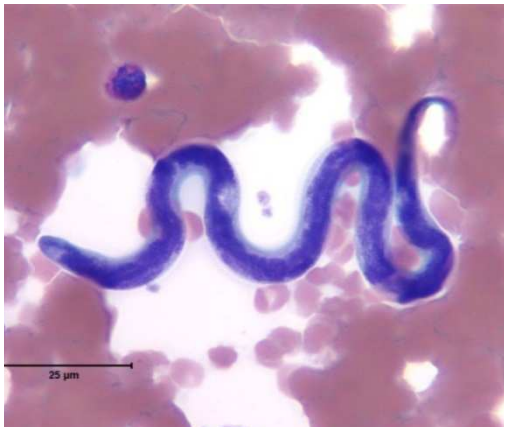
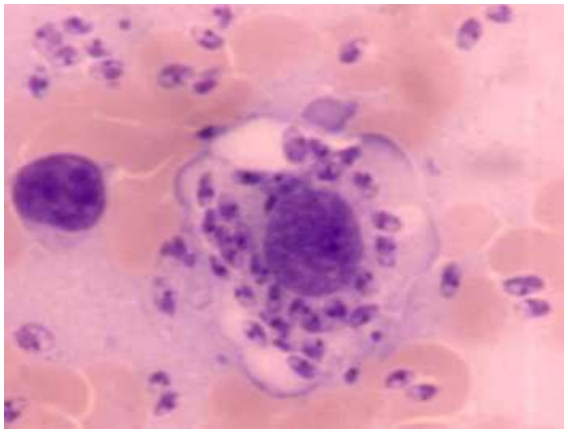
Infections of concern in imported dogs?





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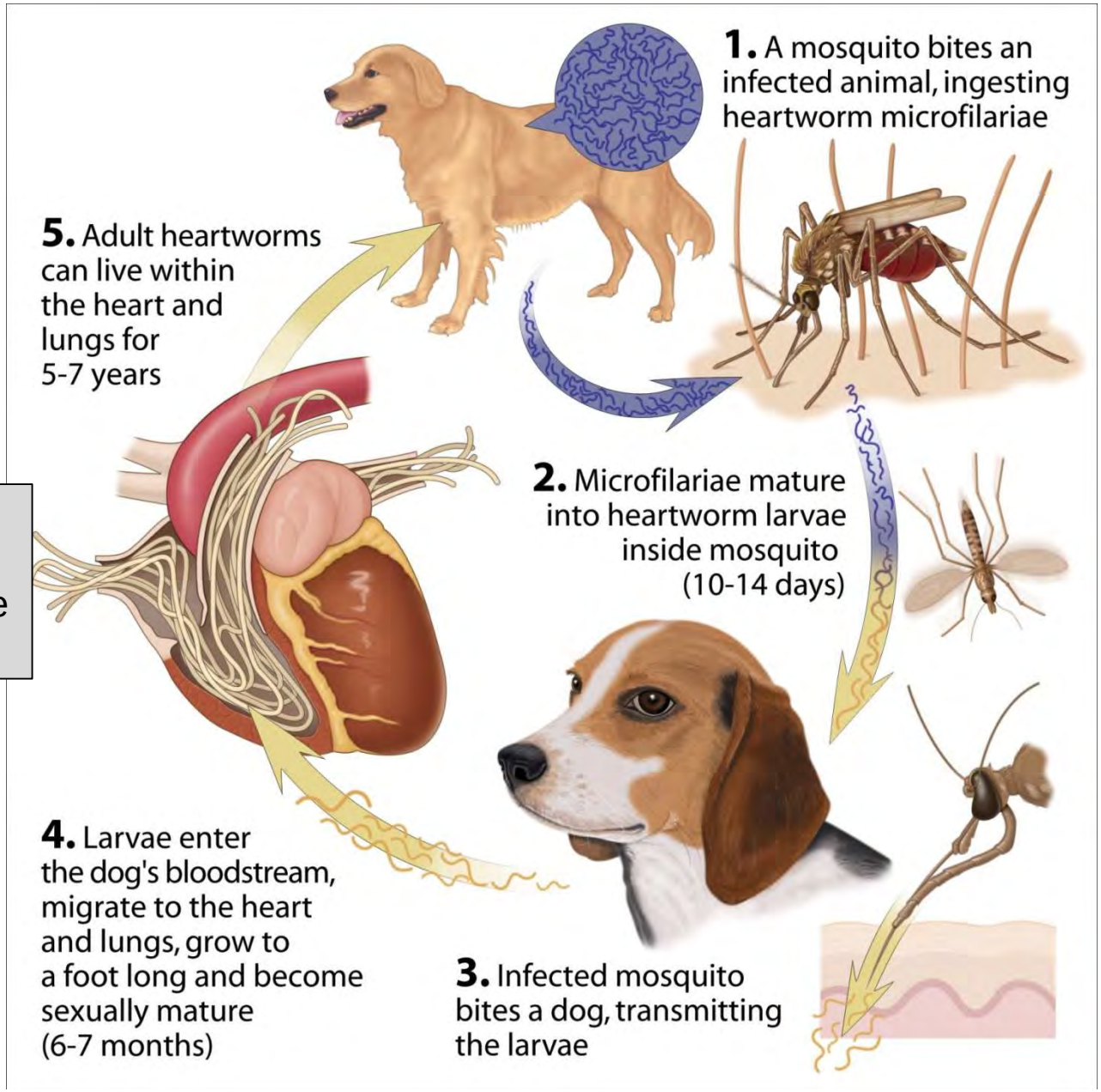
Infections of concern?

- Brucellosis
- **Canine heartworm**
- Canine influenza
- Canine lungworm
- *Echinococcus multilocularis*
- **Leishmaniasis**
- Rabies
- Screwworm
- Tick-borne diseases

(Canine Importation working Group 2016)

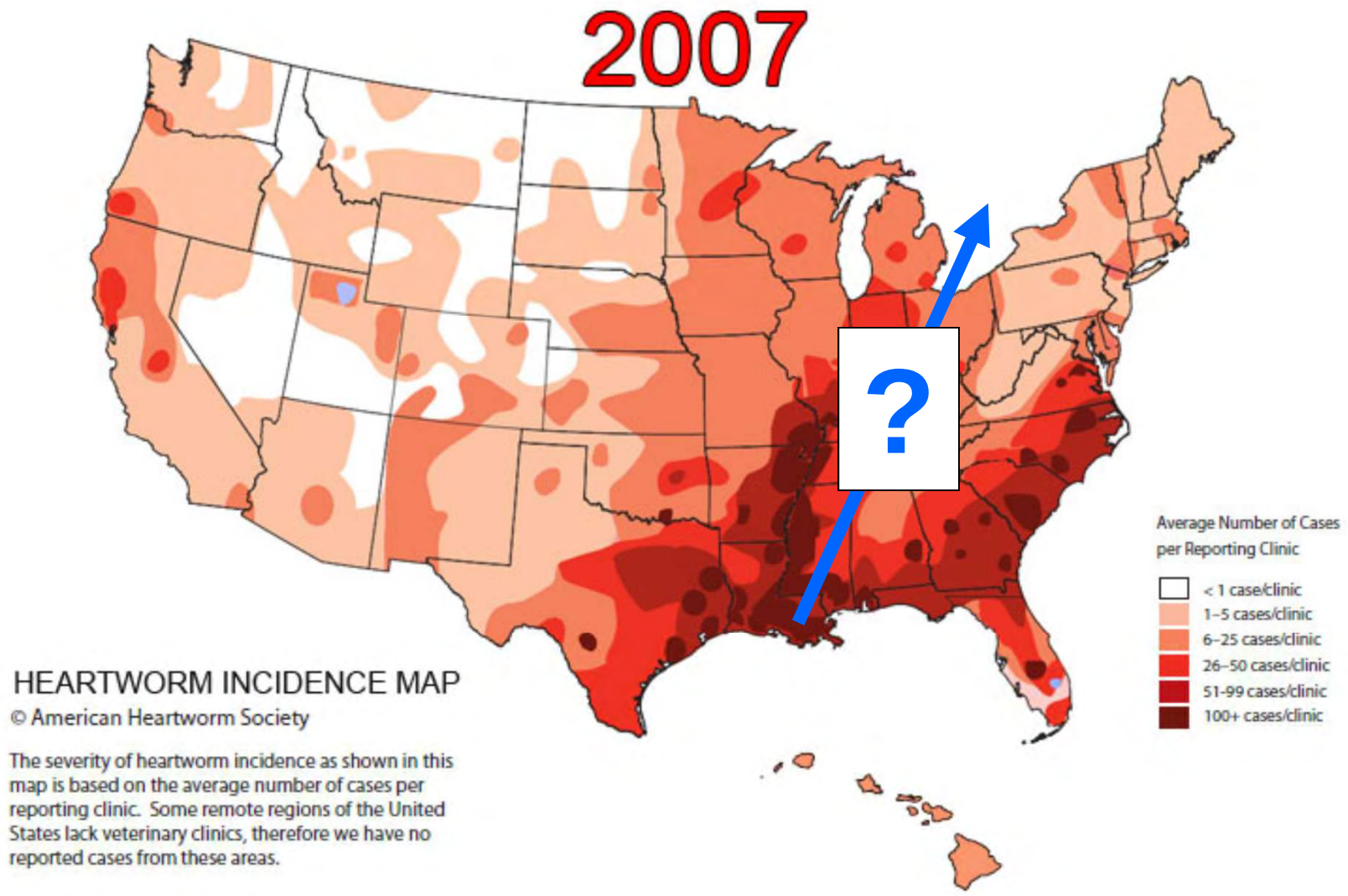
Heartworm



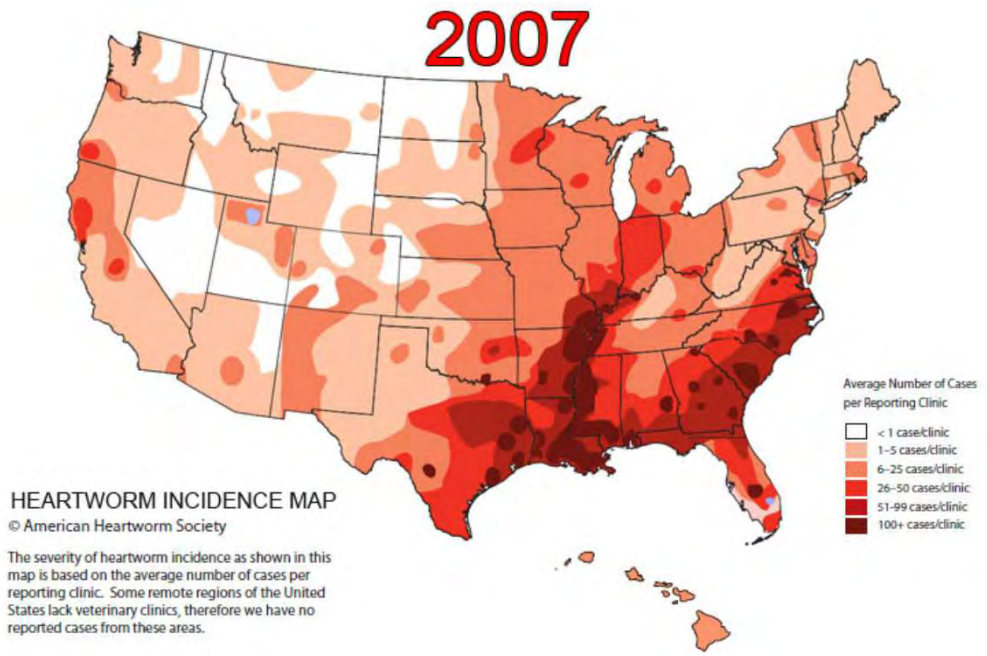
Treatment:
3 doses of melarsomine (Immiticide)

(American Heartworm Society 2009)

Heartworm risk in USA



Heartworm risk in USA



Animals originating from Gulf Coast area in 4 months following Hurricane Katrina:

- 195/400 (**48.8%**) **dogs** = heartworm antigen positive
- 4/50 (**8.0%**) **cats** = heartworm antigen positive

(Levy et al 2011)

Impact of hurricane Katrina dogs in Canada ?

- What has been the impact of “Katrina” dogs in Ontario?
- Tested for heartworm in Louisiana immediately prior to departure for Canada:
  - If test negative, sold as heartworm negative
  - If test positive, often treated with one dose of melarsomine and being sold as negative.
- Some owners refusing to pay for adulticide treatment
- Still being imported in to Canada ?

Importation of drug-resistant heartworm infections?

- Anecdotal evidence from Mississippi River Valley area, USA (Hampshire, 2005).
- First published case of macrocyclic lactone resistance in *Dirofilaria immitis* in North America:
  - Labrador cross dog in Welland, Ontario – first seen in June 2008
  - Transferred to Canada for adoption in January 2008 by Boudreaux Rescue crew, New Orleans

(Bourguinat et al 2011)

Leishmaniasis?

Has dog lived in a *Leishmania*-endemic area within the last 7 years?

- Clinical signs develop 3 months to 7 years after infection -

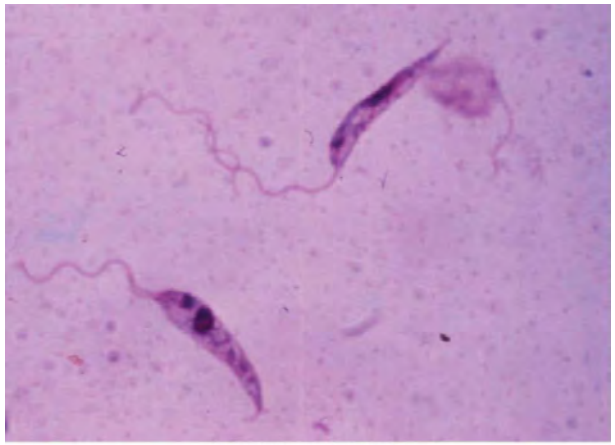
www.straysofgreece.org

Leishmania life cycle

Sandfly

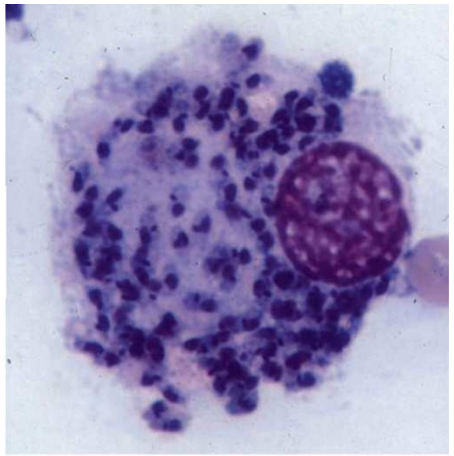
www.medicinenet.com/leishmaniasis/article.htm

Promastigotes in gut



Greene 2012

Amastigotes in macrophages



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Leishmania species

Primarily transmitted by sandflies:

- *Phlebotomus* species – outside Americas
- *Lutzomyia* species – throughout Americas

***Leishmania infantum*:**

- typical species found in dogs & zoonotic
- dogs = main reservoir for visceral leishmaniasis in people:
  - **Mediterranean basin**
  - **Middle East**
  - **South America**

Leishmania infantum in dogs

- Infection prevalence = 70-90% in highly endemic foci:
  - Much of Greece
  - Marseille, France
  - Naples area, Italy
- Most infected dogs remain subclinical carriers for life, i.e. do not develop disease.
- Dogs with or without clinical signs and seropositive are infective to sandflies.

Skin lesions – rarely pruritic

(i) exfoliative dermatitis and alopecia (81-89%)

Greene 2012

Skin lesions

(ii) mucocutaneous ulceration

Greene 2012

Ocular lesions

- uveitis and conjunctivitis (16-81%)

Greene 2012

Weight loss and muscle atrophy (64%)

Greene: Infectious Diseases of the Dog and Cat, 4th Edition
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Greene 2012

Therapy for canine leishmaniasis

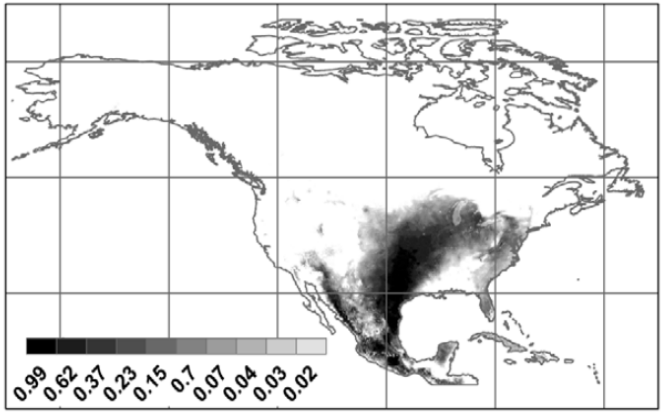
Drug	Dosage (mg/kg)	Route	Interval (hours)	Duration (weeks)
Meglumine antimoniate	75-100	SC	24	4-8
Allopurinol	10	PO	12	At least 6-12 months

- rarely are *Leishmania* parasites completely eliminated
- relapses requiring re-treatment are common

Public health concerns in Canada

- *L. infantum* → visceral leishmaniasis in people
- Dogs are main reservoir for *L. infantum* in much of world
- Sizeable wild canid populations across Canada
- 14 *Lutzomyia* species recorded in North America:
  - most common = *L. shannoni* (Delaware – Louisiana)
  - New York State = *L. vexator*

L. diabolica distribution, model 2, 2080



Gonzalez et al 2010

Importation of dogs from countries endemic for *Leishmania*?

- Dogs should be tested prior to departure for Canada.
- Dogs that test positive should not be imported.
- Dogs that test negative prior to importation – after arrival in Canada should be tested for at least 2 years:
  - Quantitative serology (ELISA, IFAT) after 4 months, 1 year, 2 years.
  - Nested PCR (ideally of kDNA) after 1 year and 2 years:
    - Ideally on bone marrow or spleen
    - Realistically = blood