



21st FKMCD-Oxitec Public Educational Webinar
One Health: Environmental, Human and Animal Health in the Florida Keys & Beyond
Tuesday, October 25th, 2022

Introductions – Panelists With You Today



Bob Eadie
Administrator and
Health Officer
Monroe County
Department of Health



Dr. Douglas Mader
Veterinary Specialist
Fellow, Royal Society of
Medicine



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Public Education &
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Head of Public Affairs
Oxitec

FKMCD-Oxitec Public Educational Webinar Series

Introduction to our Webinar Series

FKMCD and Oxitec are hosting a series of public educational webinars to share information with residents of the Florida Keys and provide forums to answer questions.

- Webinars are open to everyone.
- Webinars are recorded and made available for everyone after the event.
- All questions relating to the webinar topic(s) will be answered (some in batches if questions are similar).
- If time runs out, we will accept questions in writing via florida@oxitec.com.

FKMCD & Oxitec Public Educational Webinars

Welcome to Webinar #21!

Today's Agenda:

- **Mosquitoes and Their Impact on Public Health**
Independent presentation by Bob Eadie, Administrator and Health Officer, Monroe County Department of Health
- **Mosquitoes and Your Pet's Health**
Independent presentation by Dr. Douglas Mader, Veterinary Specialist & Fellow, Royal Society of Medicine
- **Your questions, answered**



Documentation, resources, references, and other information are available at [keysmosquitoproject.com](https://www.keysmosquitoproject.com)

Mosquitoes and Their Impact on Public Health

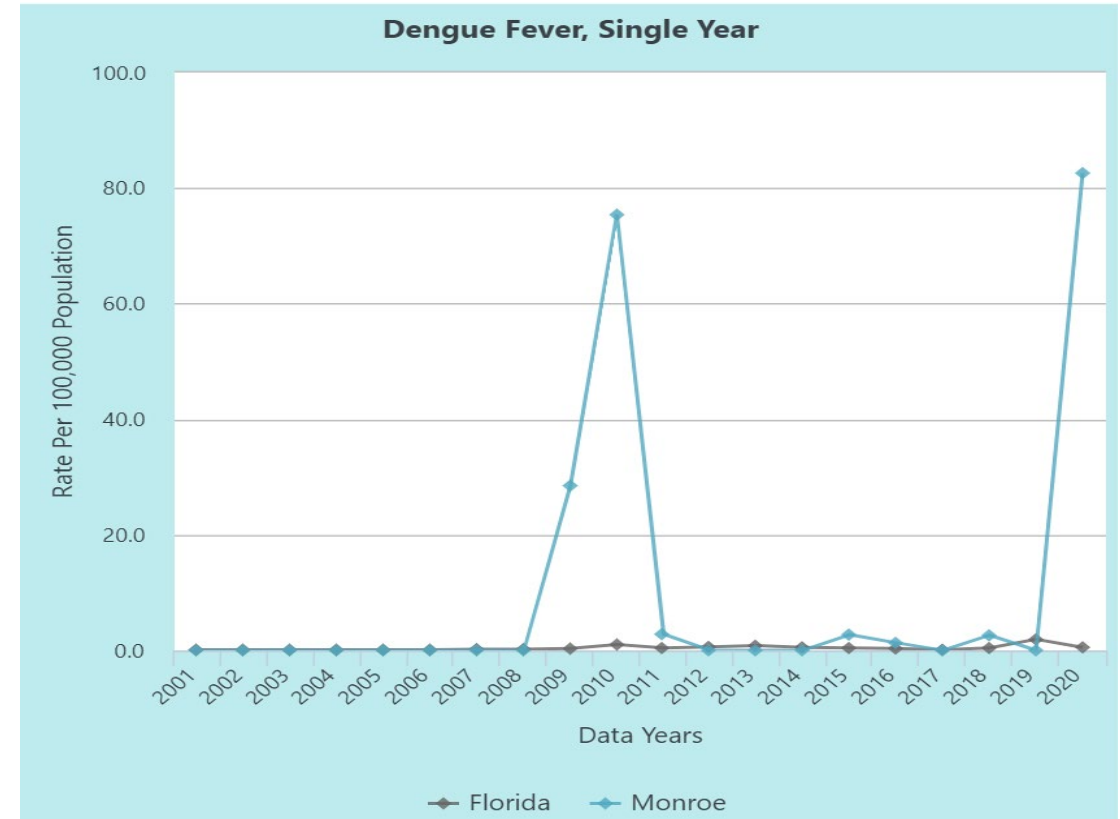
Independent presentation by:

Bob Eadie, Administrator and Health Officer, Monroe County Dept. of Health



Aedes aegypti in the Florida Keys

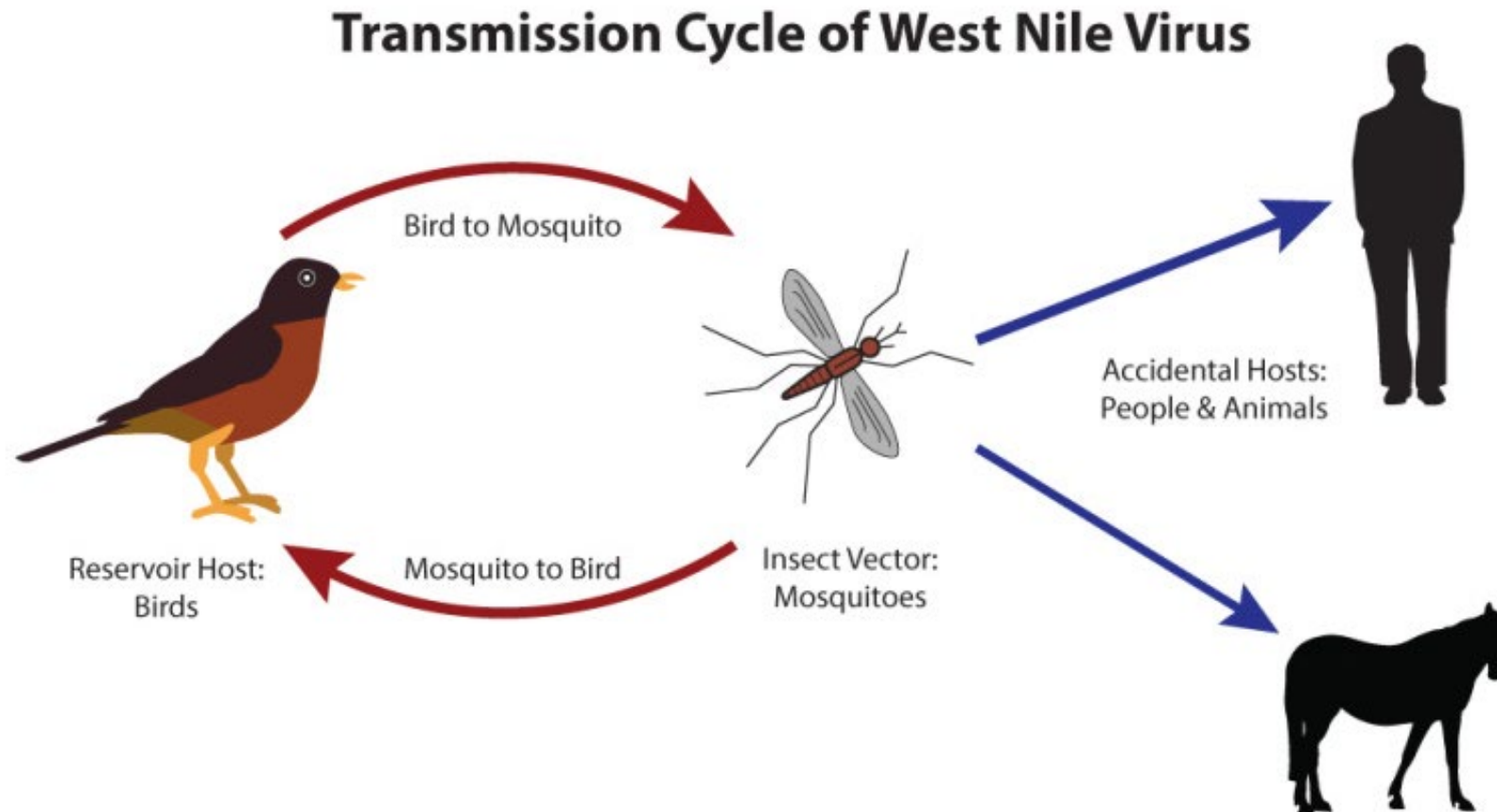
- Virus transmission and insecticide resistance are a real challenge.
- This year there have been around 200 locally-acquired and travel-related dengue cases in Miami-Dade.
- In 2020, there were 70+ locally-acquired cases in Monroe County.
- Zika, chikungunya, and yellow fever are potential risks.
- Pyrethroid resistance in *Ae. aegypti* in Florida is ubiquitous.
- Inherent challenges to *Ae. aegypti* control include hidden breeding sites and their diurnal behavior.
- Need more tools in our toolbox.
- Environmental impact a key consideration in the Keys.



Locally acquired cases of dengue in Monroe County 2001 - 2020. Courtesy of FLHealthCharts.gov.

What is a *Vector*?

A *vector* is an organism that transmits pathogens between hosts, such as ticks, fleas, and mosquitoes.



There are Over 3,500 Species of Mosquitoes



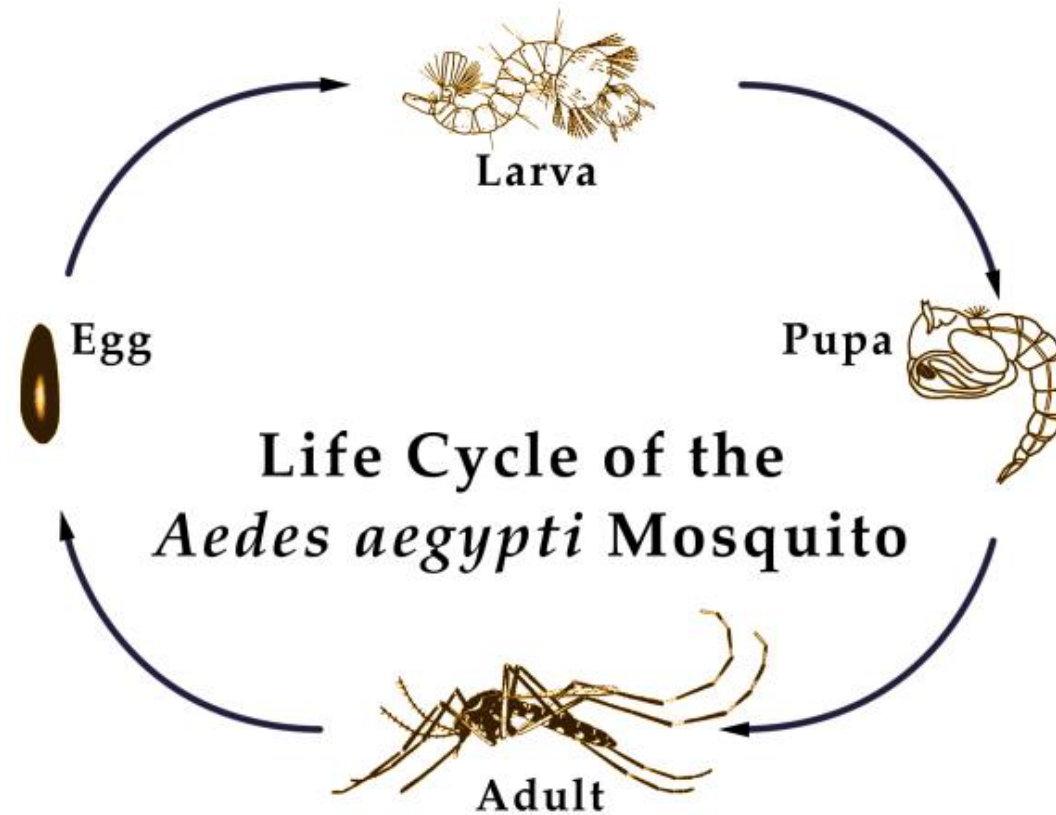
What Pathogens Do Mosquitoes Transmit?

Most mosquitoes are not a public health concern and do not transmit human diseases. The few mosquito species that do so, **kill more people than any other creature on earth!**

| Mosquito | Disease | Disease Agent |
|----------------------------|-----------------------------|---------------|
| <i>Aedes aegypti</i> | Dengue | Virus |
| <i>Aedes aegypti</i> | Yellow Fever | Virus |
| <i>Aedes aegypti</i> | Chikungunya | Virus |
| <i>Aedes aegypti</i> | Zika | Virus |
| Other <i>Aedes</i> species | Eastern Equine Encephalitis | Virus |
| <i>Culex</i> species | West Nile Fever | Virus |
| <i>Culex</i> species | Saint Louis Encephalitis | Virus |
| <i>Anopheles</i> species | Malaria | Protozoa |

Mosquito Life Cycle

- Females of mosquito species feed once in a reproductive cycle – *Aedes aegypti* feeds multiple times!



Why and How do Female Mosquitoes Feed on Blood?



Different Female Mosquitoes Feed on Particular Hosts



Why is *Aedes aegypti* Such a Good Vector?

Aedes aegypti is the most important global vector of yellow fever, dengue, Zika, and chikungunya.

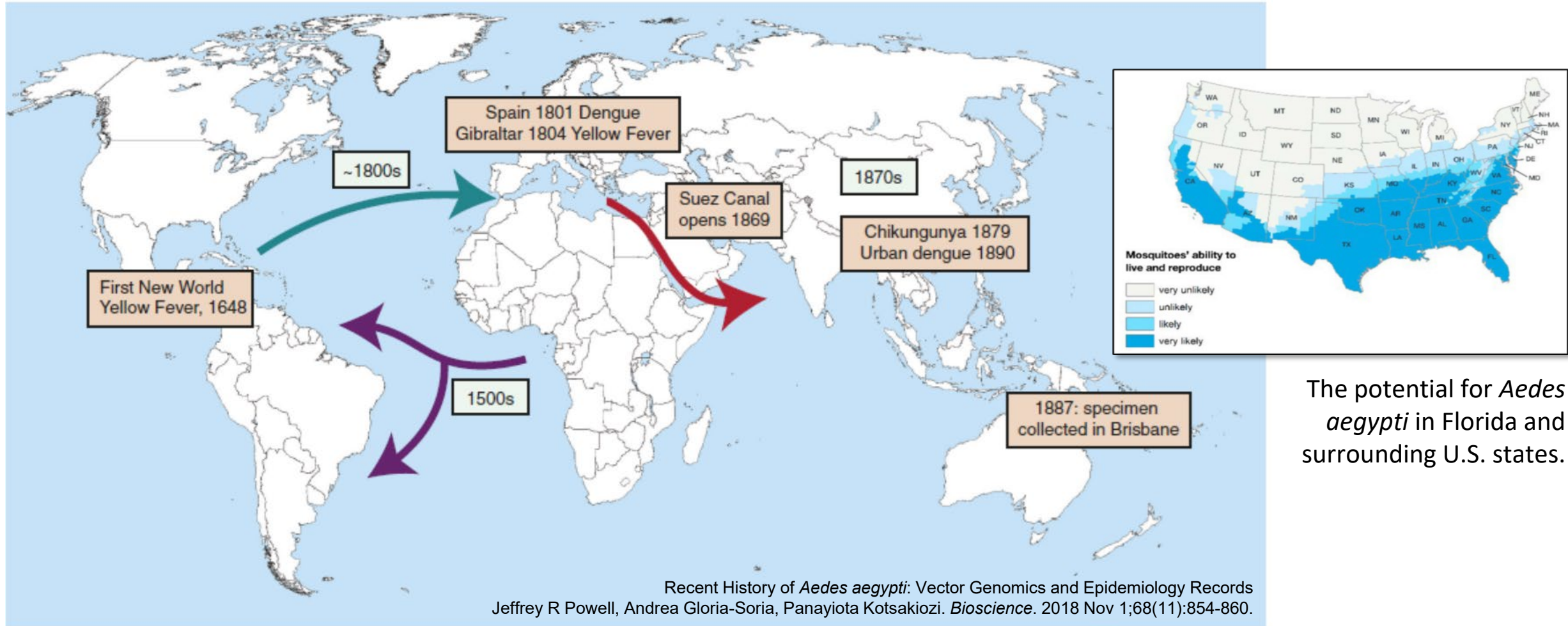
- **REMEMBER - ONLY FEMALES BITE AND SPREAD DISEASE!**
- *Aedes aegypti* feeds almost exclusively on people, so the "next bite" is usually on another person.
- *Aedes aegypti* feeds multiple times and on multiple hosts, increasing the number of infective bites.
- *Aedes aegypti* feeds and breeds in or near human homes, increasing the risk of transmission from an infective person to an uninfected person.
- This species gets infected and stays infected, transmitting viruses in saliva when the female bites another host. It has a high vector competence.
- The association of *Aedes aegypti* with humans means it's readily transported around the world – it is highly invasive!



Female *Aedes aegypti* often lay their eggs in plant pot saucers

The *Aedes aegypti* Mosquito: An Invasive Species in Florida

- *Aedes aegypti* is not native to the Americas. It was likely transported from Africa in the 16th century, bringing viral diseases with it.

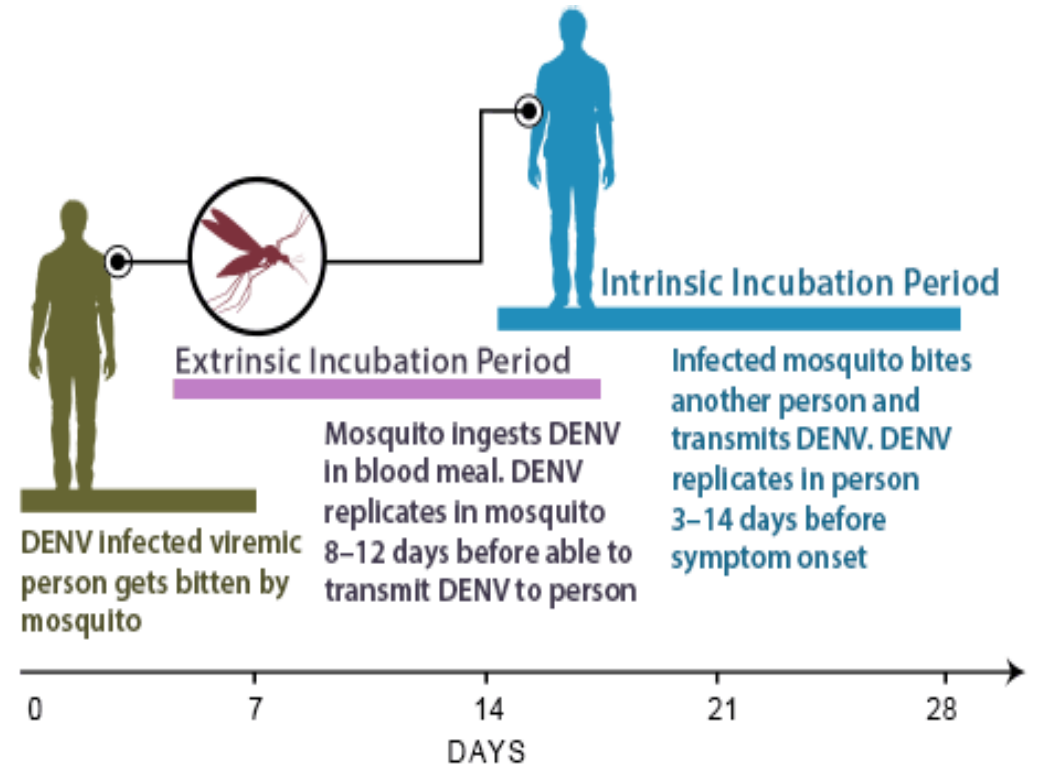


The potential for *Aedes aegypti* in Florida and surrounding U.S. states.

Dengue

Dengue is the most common mosquito-borne disease in the world.

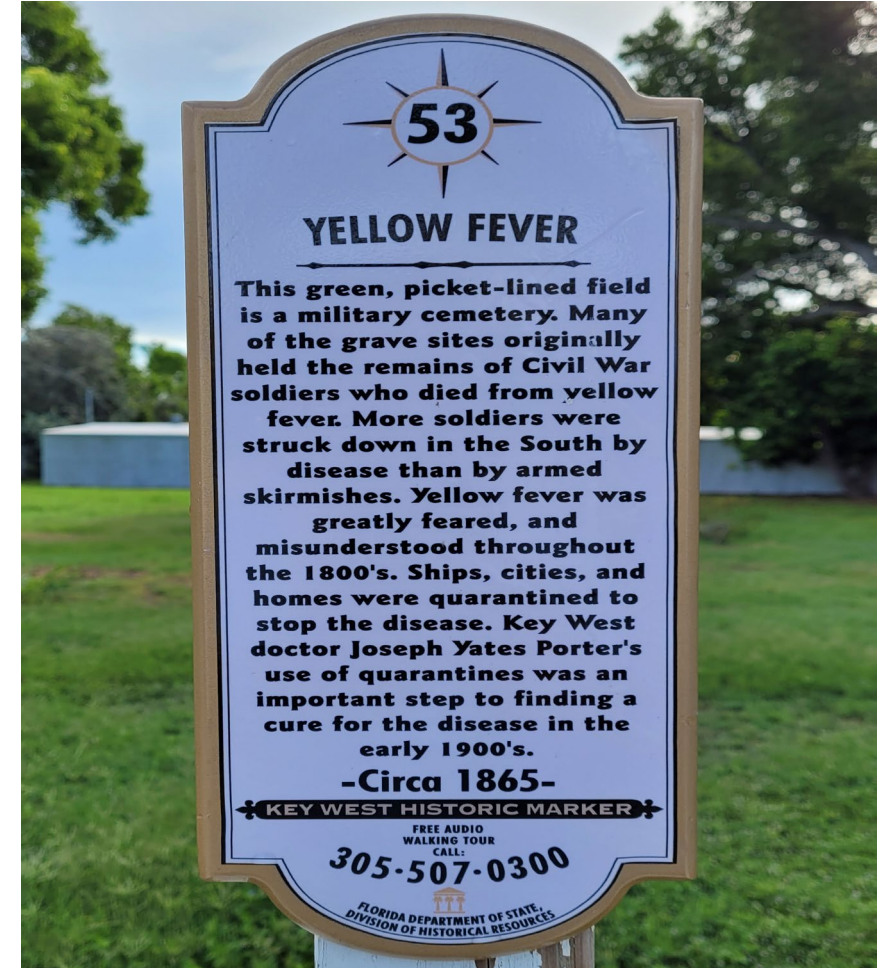
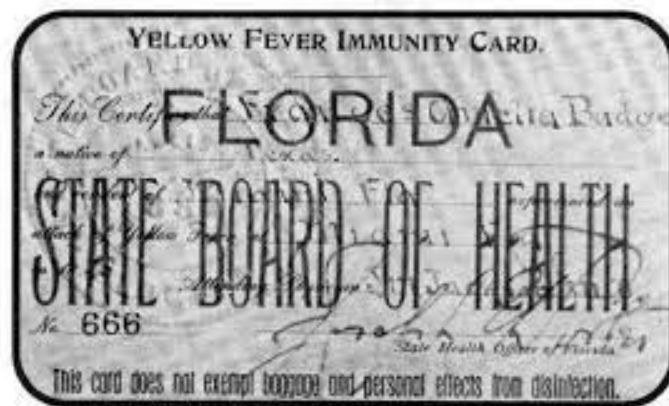
- About half the world's population is at risk of dengue.
- 100-400 million infections occur each year, >80% are *asymptomatic*.
- Dengue is found in tropical and subtropical climates worldwide.
- Dengue can present as a mild fever, or more serious forms (hemorrhagic fever and dengue shock syndrome).
- No widely available vaccine, no therapeutic medicine (treatment).
- Vector management remains the most effective prevention.



Yellow Fever

The common name of *Aedes aegypti* is the "yellow fever mosquito."

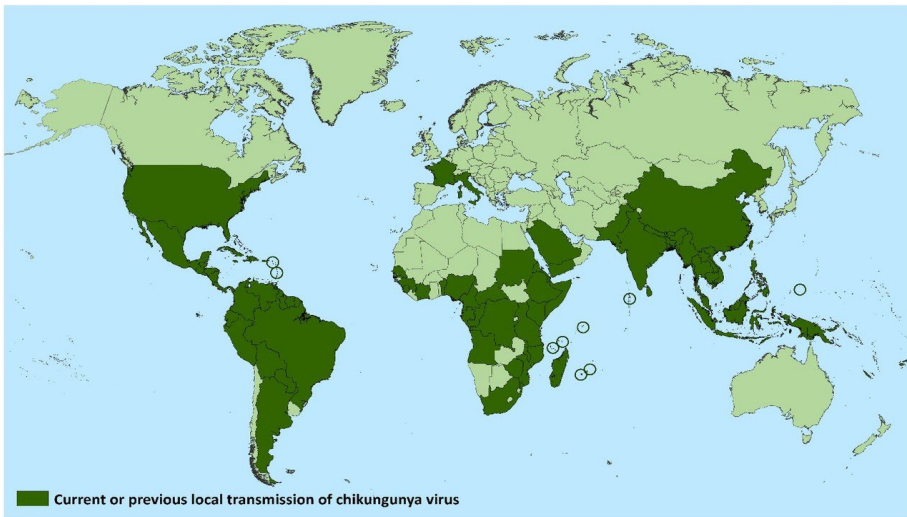
- Yellow fever is an acute hemorrhagic disease.
- The "yellow" refers to jaundice of the skin and eyes.
- Endemic to parts of Africa and Central and South America.
- Resulted in thousands of deaths in the U.S. in the 1700 and 1800s. As far north as Philadelphia and Boston!
- Effective vaccine available and supportive treatment.



Chikungunya

"Chikungunya" is from a Nilotic language meaning "that which bends up" - reference to the painful arthritis.

- Symptoms include high fever and severe muscle and joint pain.
- No vaccine, no specific treatment.



Dark green denotes countries with current or previous local transmission of CHIKV, per CDC as of Sept 17, 2019.

First Chikungunya case acquired in the United States reported in Florida

Press Release

For Immediate Release: Thursday, July 17, 2014

US chikungunya cases jump to 74 in 23 states

Filed Under: **Chikungunya**

Robert Roos | News Editor | CIDRAP News | Jun 25, 2014

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[✉ Email](#)

The chikungunya epidemic in the Caribbean is continuing to spill over into the United States, with federal and state officials reporting at least 74 cases in 23 states yesterday.



Zika

First found in monkeys at the Zika Forest Preserve in Uganda in 1947.

- In 2016, Zika became the first ever vector-borne WHO Public Health Emergency of International Concern.
- Mild symptoms include fever, rash, and headache.
- Zika virus infection during pregnancy can result in microcephaly and other birth defects.
- Zika virus can result in neurological complications.
- No vaccine, no specific treatment.



'The Committee advised that the recent cluster of microcephaly cases and other neurological disorders reported in Brazil, following a similar cluster in French Polynesia in 2014, constitutes a Public Health Emergency of International Concern (PHEIC).'

Mosquitoes and Your Pet's Health

Independent presentation by:

Dr. Douglas Mader, Veterinary Specialist & Fellow, Royal Society of Medicine



Mosquitoes & Your Pet's Health

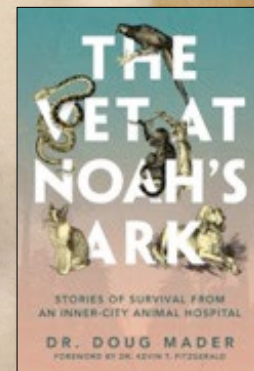


Douglas Mader, MS, DVM

Diplomate, ABVP (Canine/Feline, Reptile/Amphibian)

Diplomate, ECZM (Herpetology)

Human-Animal Bond Certified

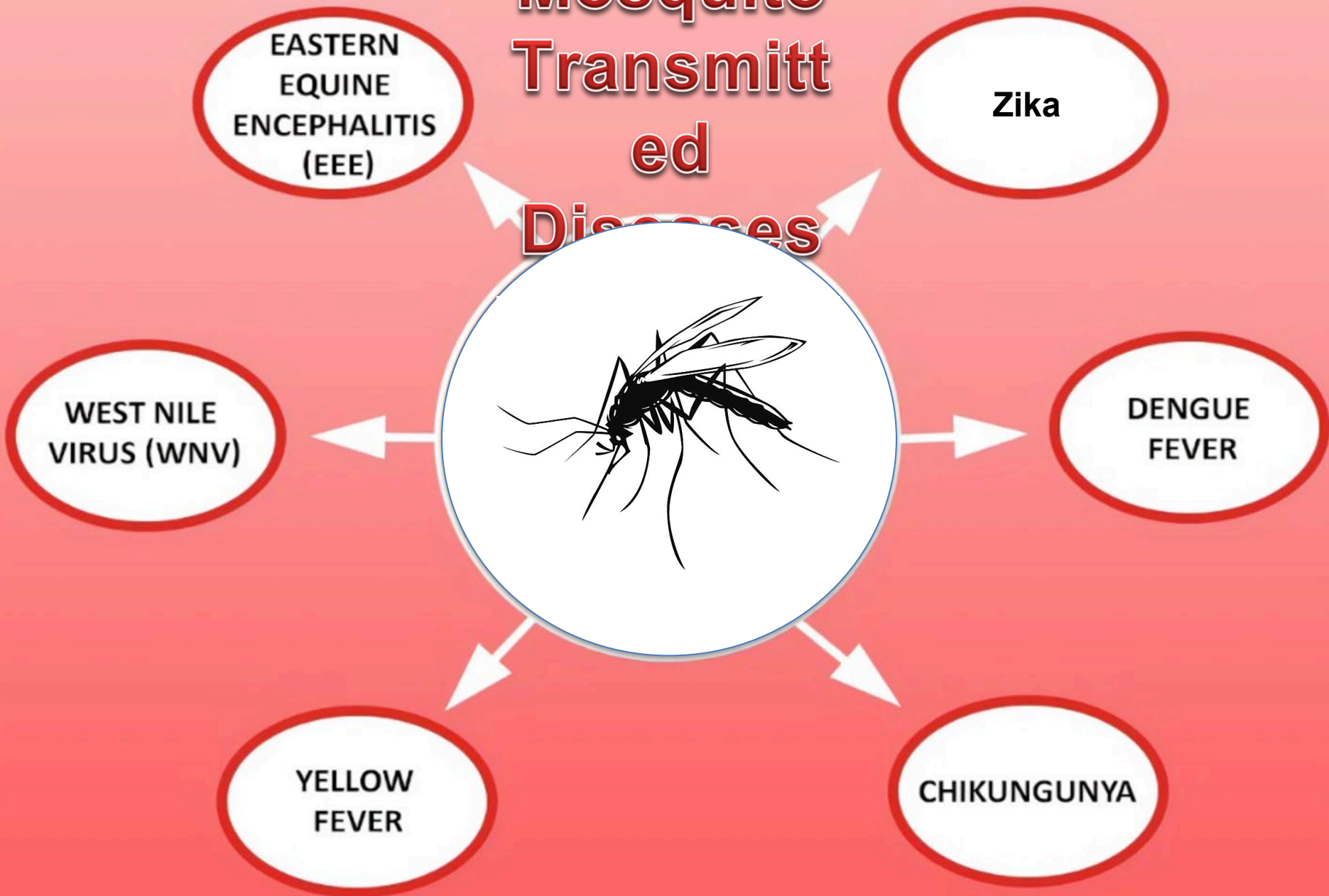


Disclosures

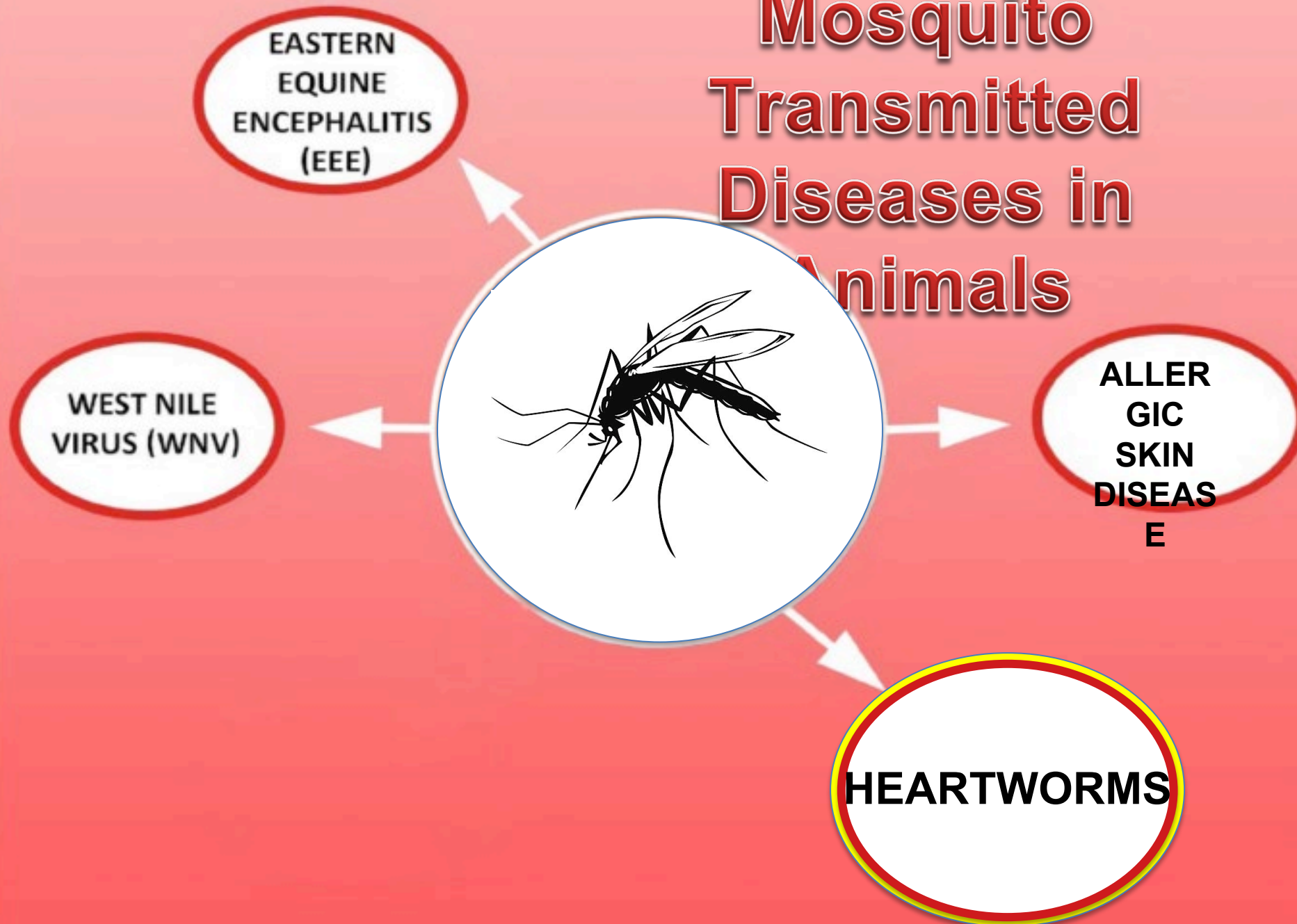
- Advisory Group for Oxitec
- NOT on payroll for Oxitec or FKMCD
- NO compensation for this lecture



Mosquito Transmitted Diseases

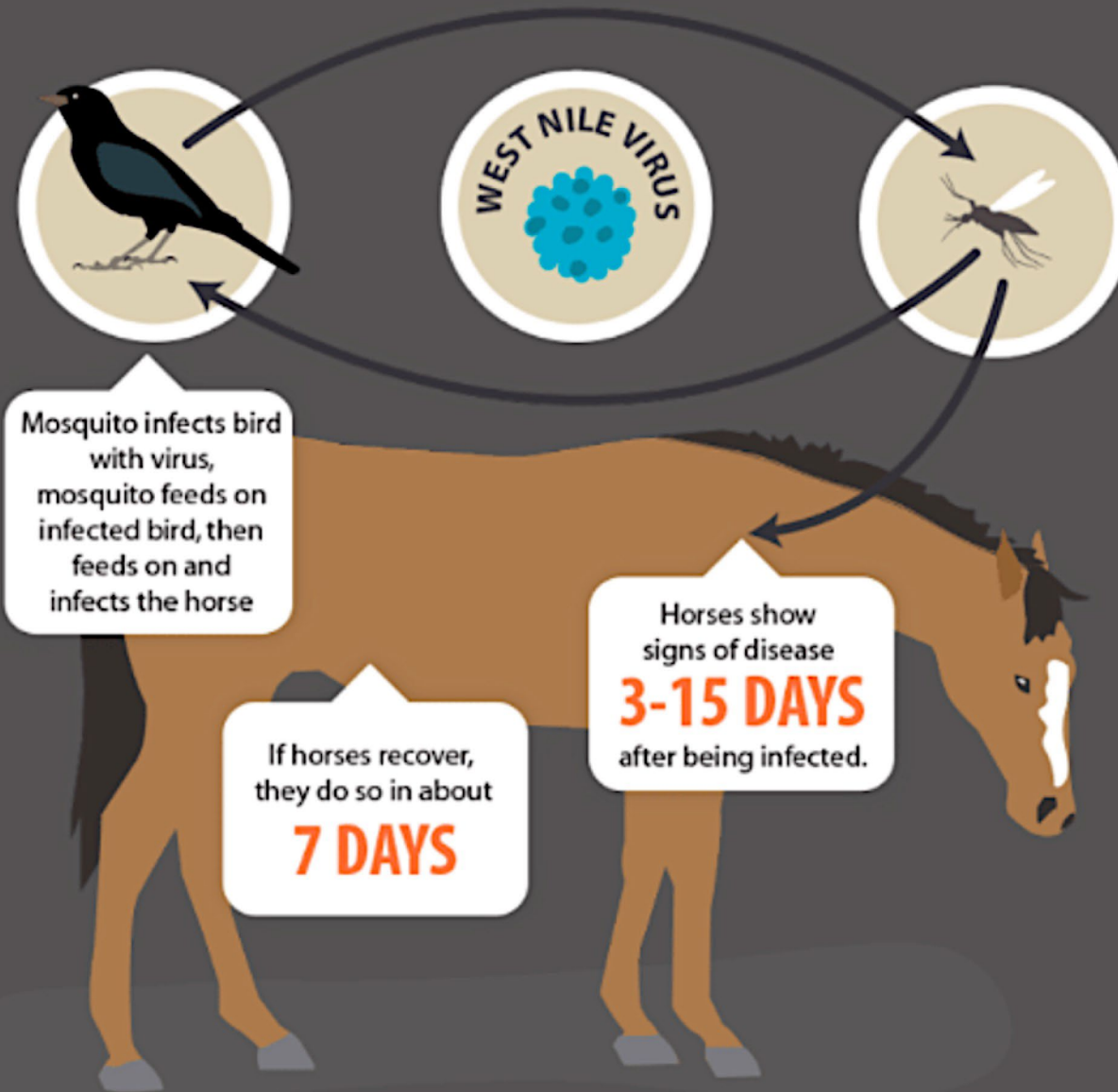


Mosquito Transmitted Diseases in Animals





West Nile Virus



WNV
Affects:
Dogs
Cats
Birds
Dolphins





WNV
“Overwinters”
in Reptiles



Trauma and Allergic Skin Disease









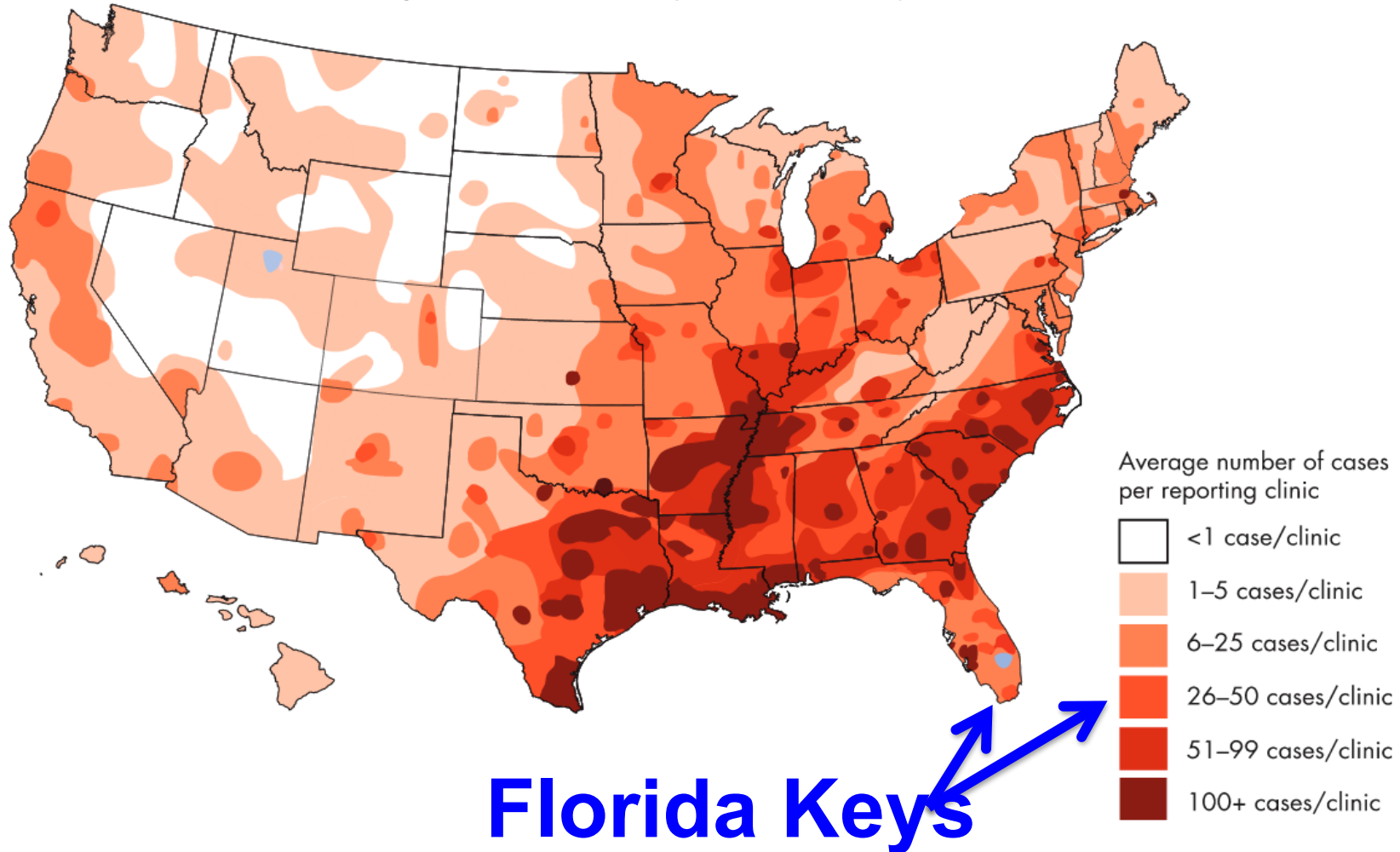


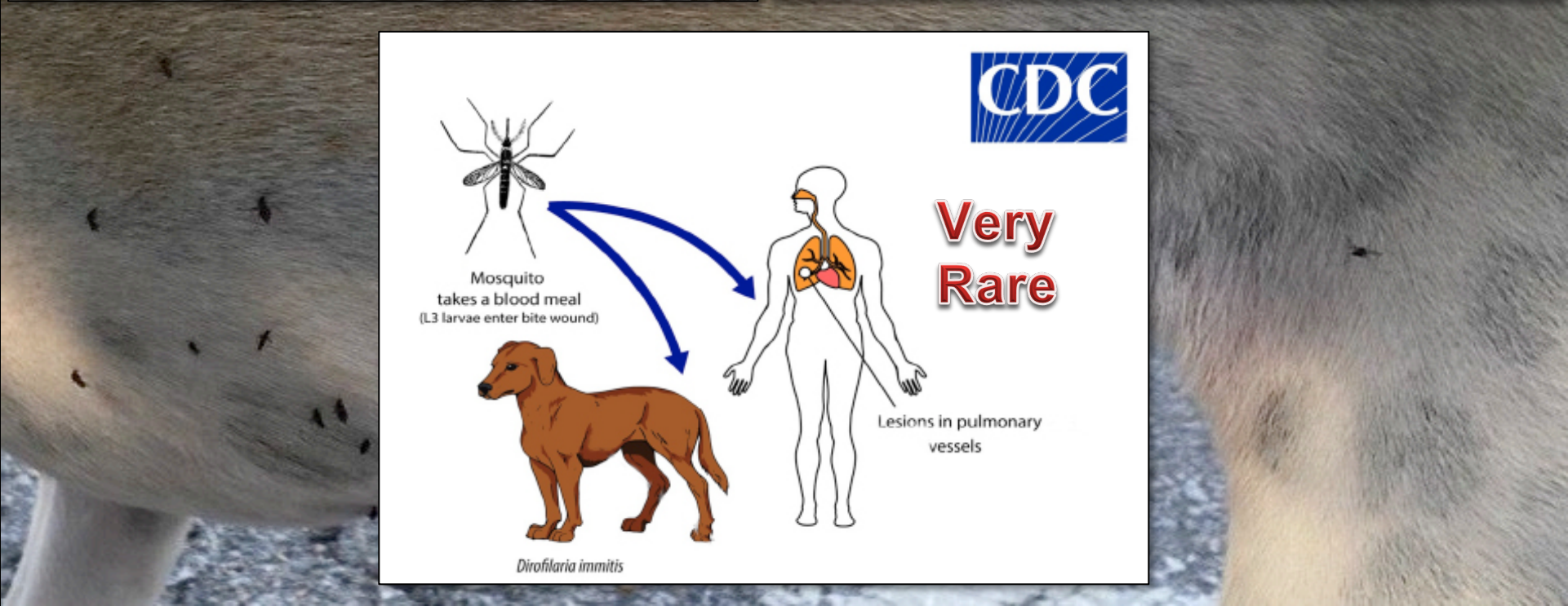
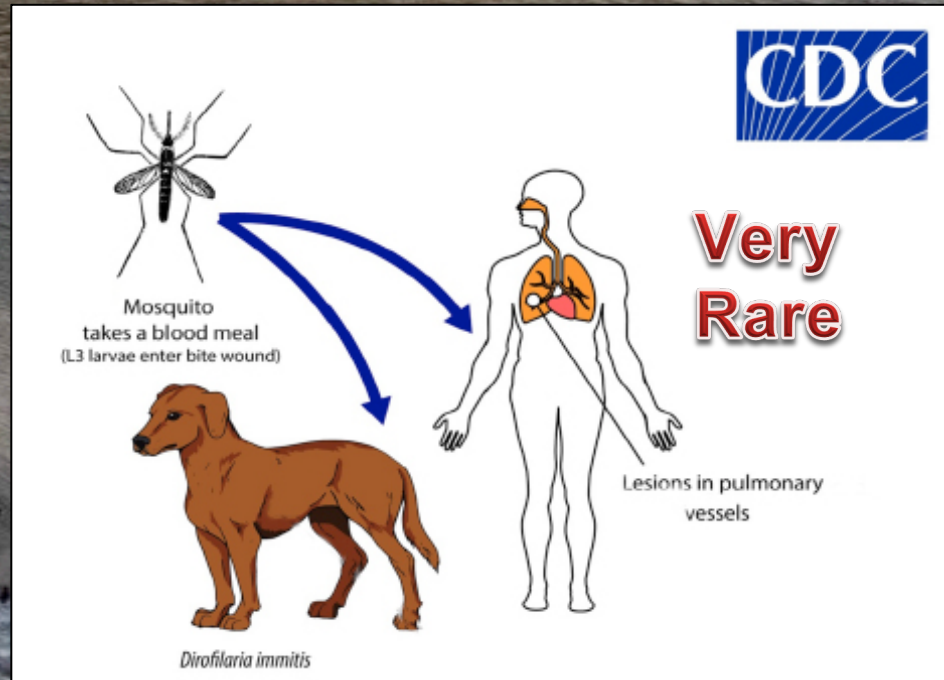
2019 HEARTWORM INCIDENCE



AMERICAN
HEARTWORM
SOCIETY™
EST. 1974

© American Heartworm Society The severity of heartworm incidence as shown in this map is based on the average number of cases per reporting clinic. Some remote regions of the United States lack veterinary clinics, therefore we have no reported cases from these areas.

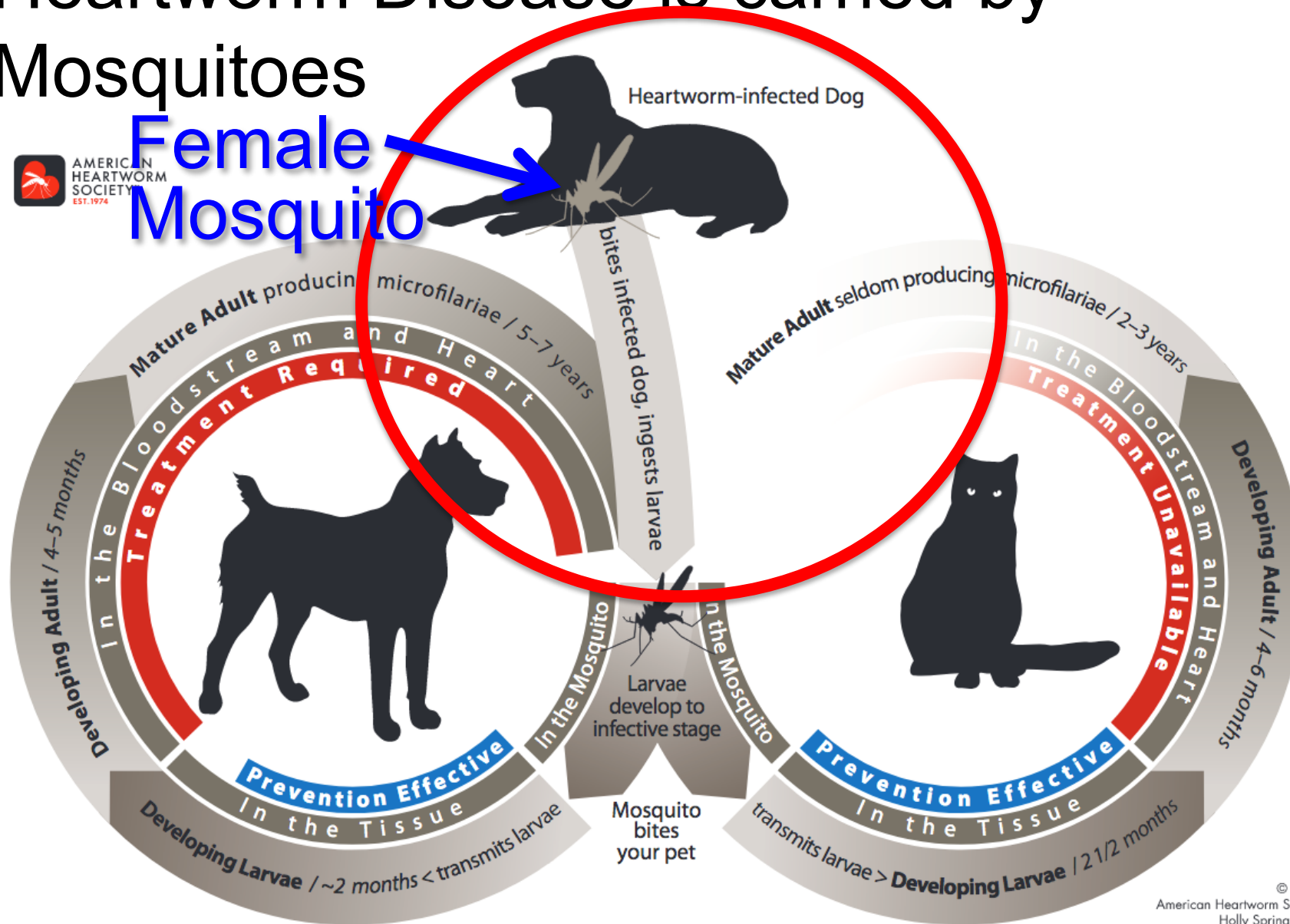




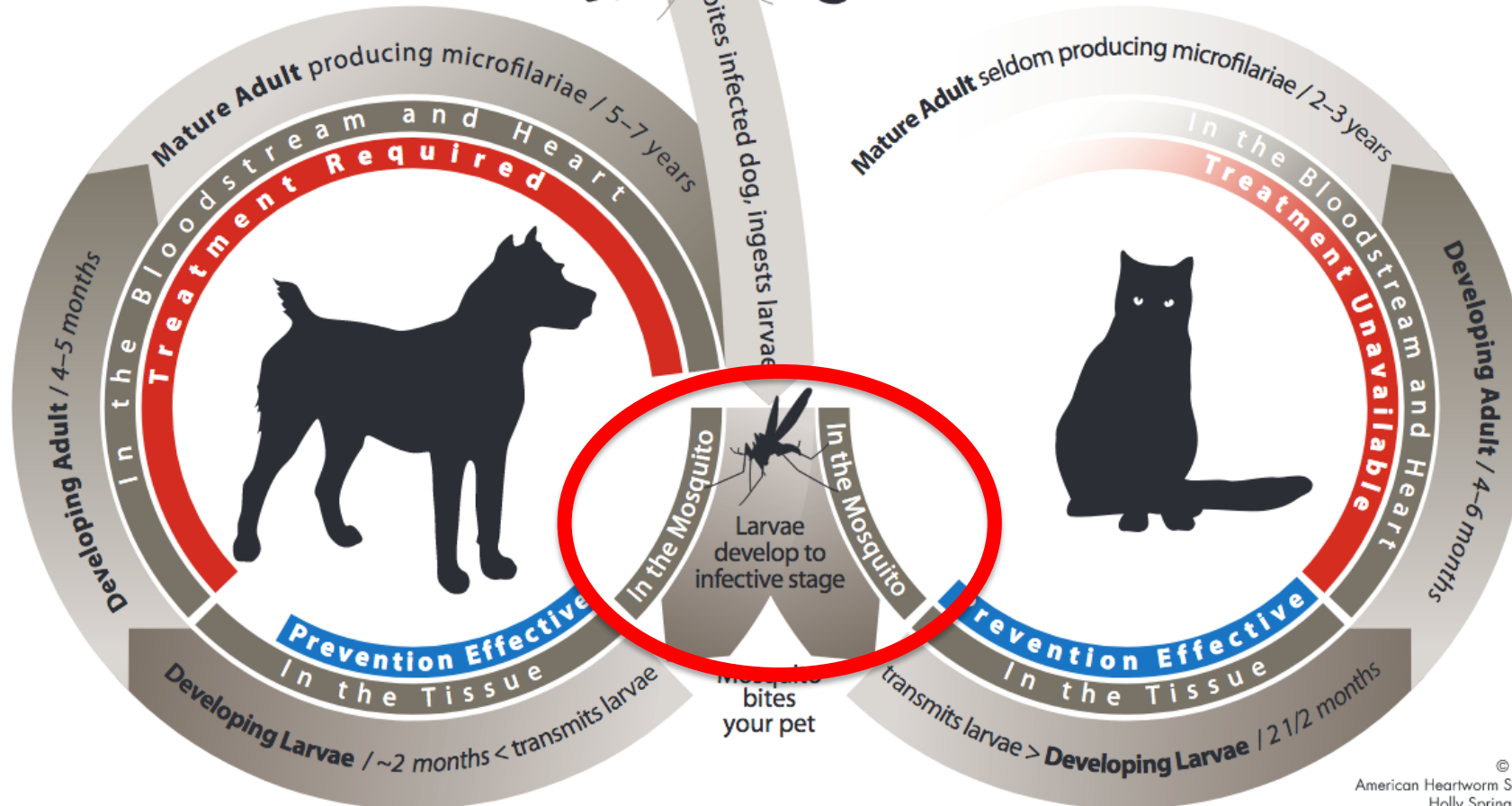
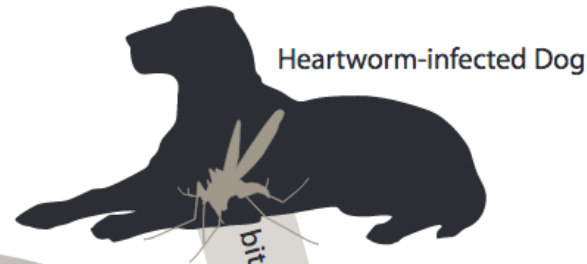
Heartworm Disease is carried by Mosquitoes



Female Mosquito

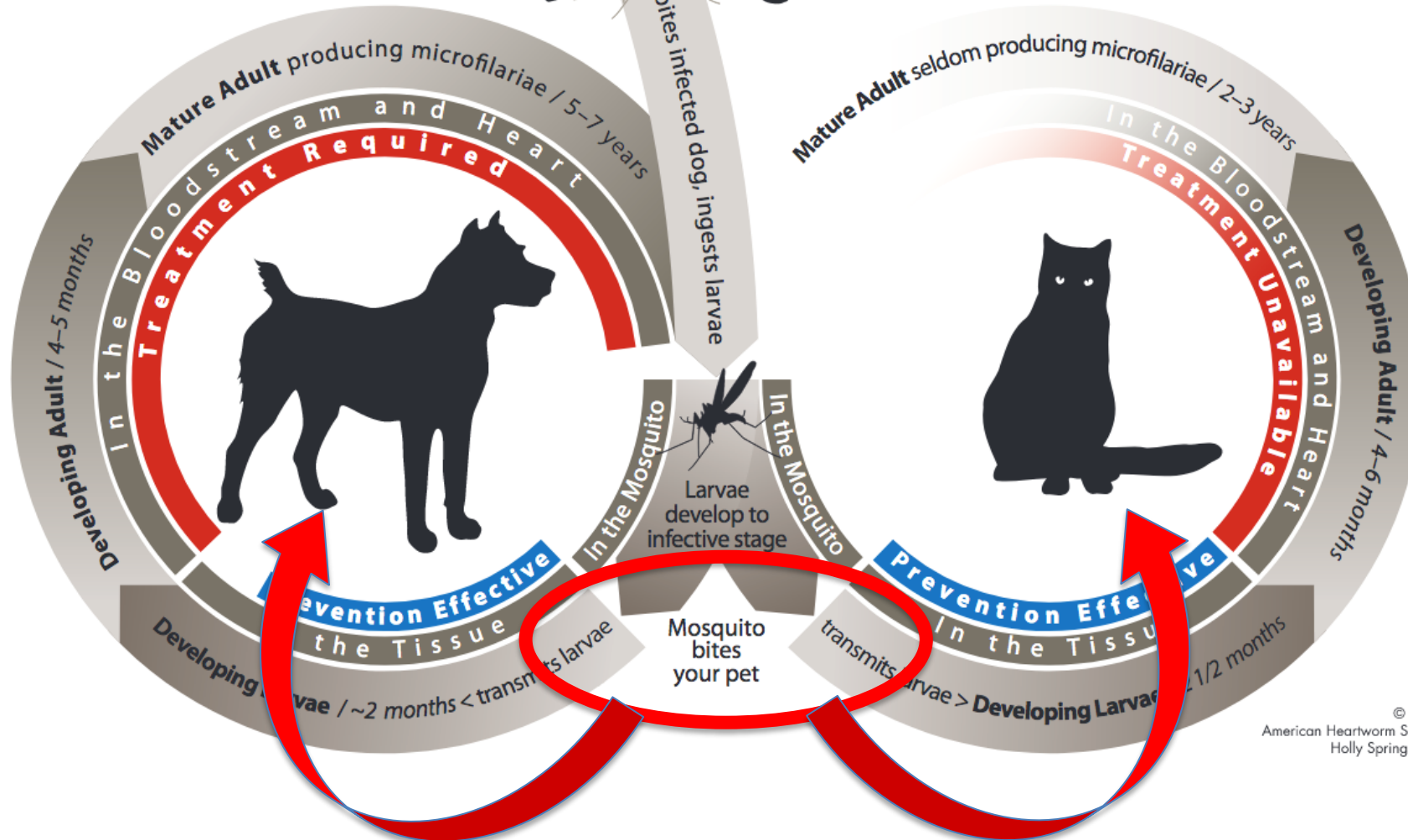
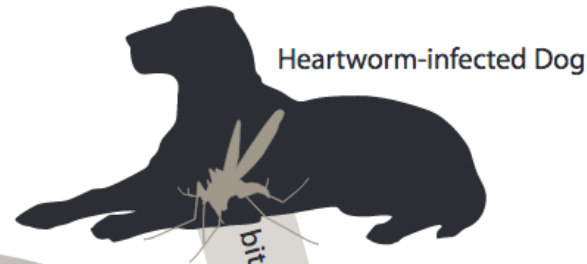


Heartworm Disease is carried by Mosquitoes



© 2020
American Heartworm Society
Holly Springs, NC

Heartworm Disease is carried by Mosquitoes



© 2020
American Heartworm Society
Holly Springs, NC

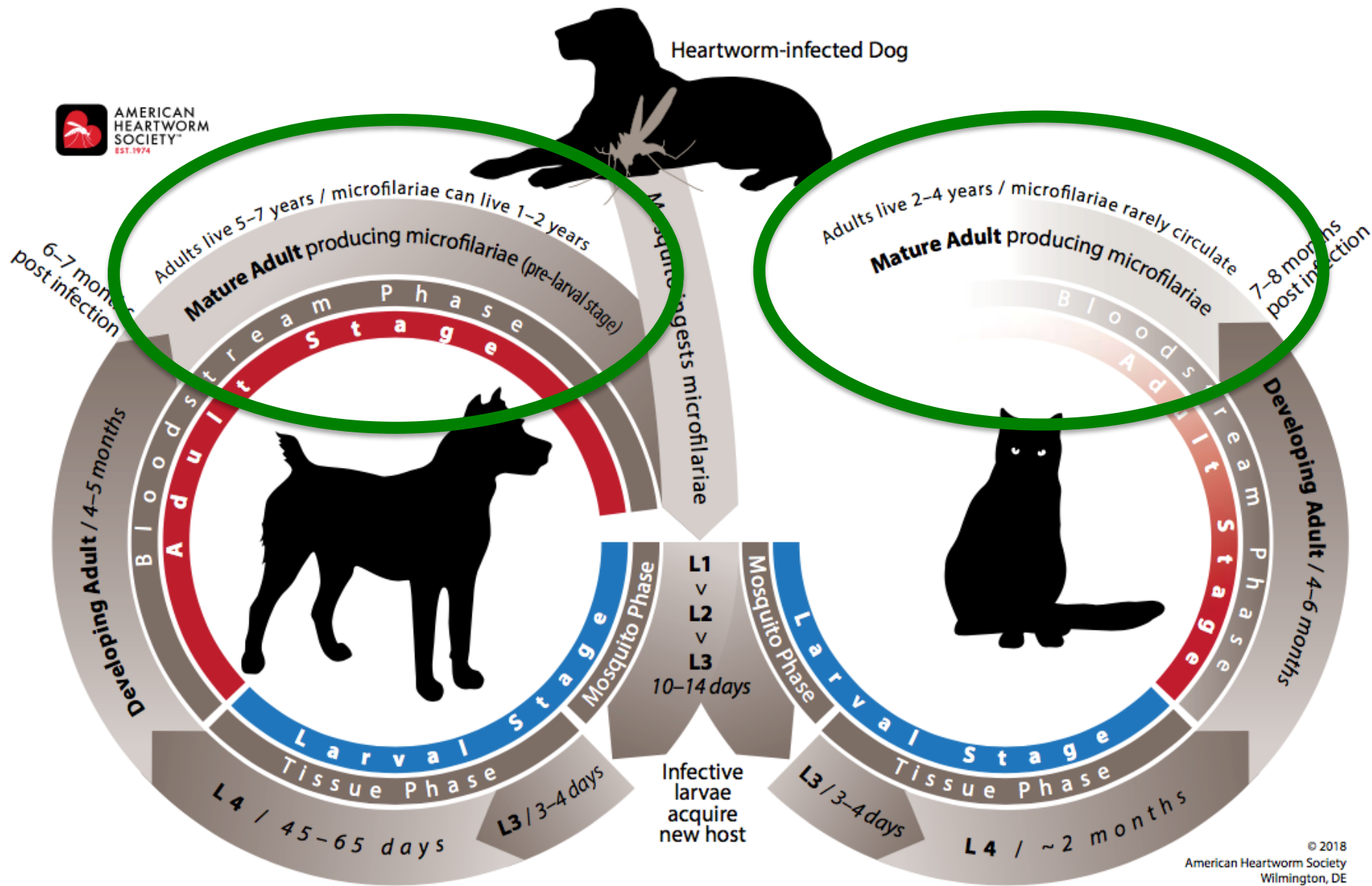
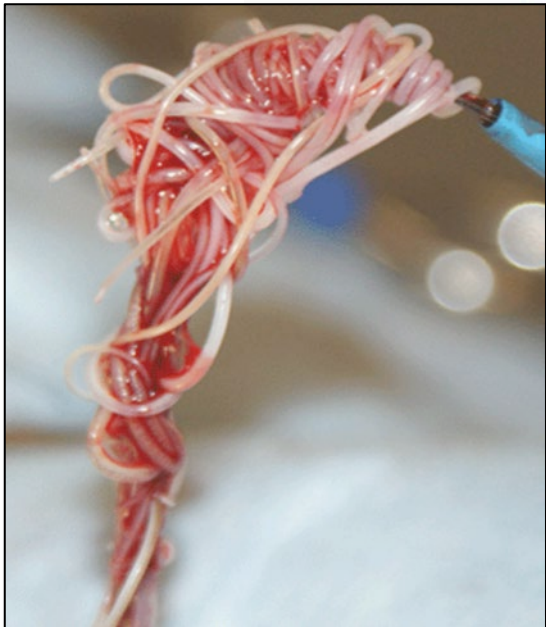
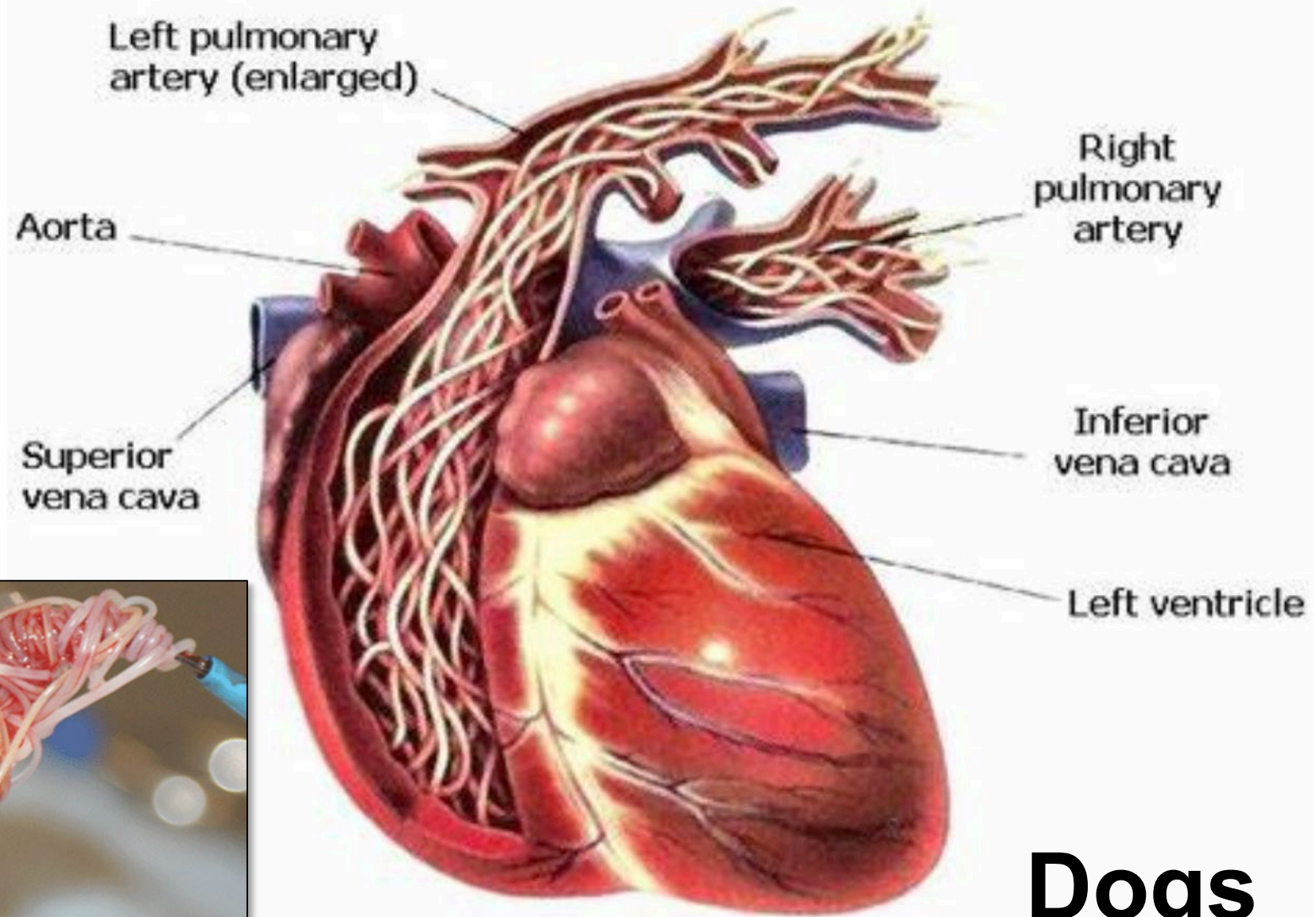
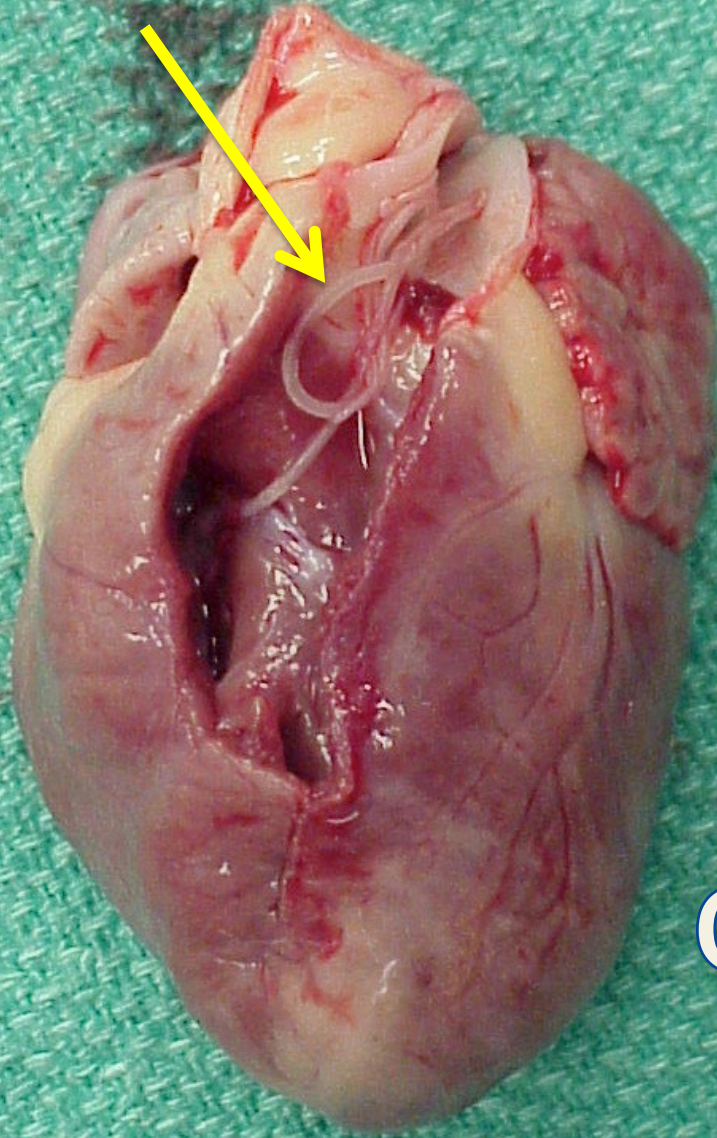


Figure 2. The heartworm life cycle.





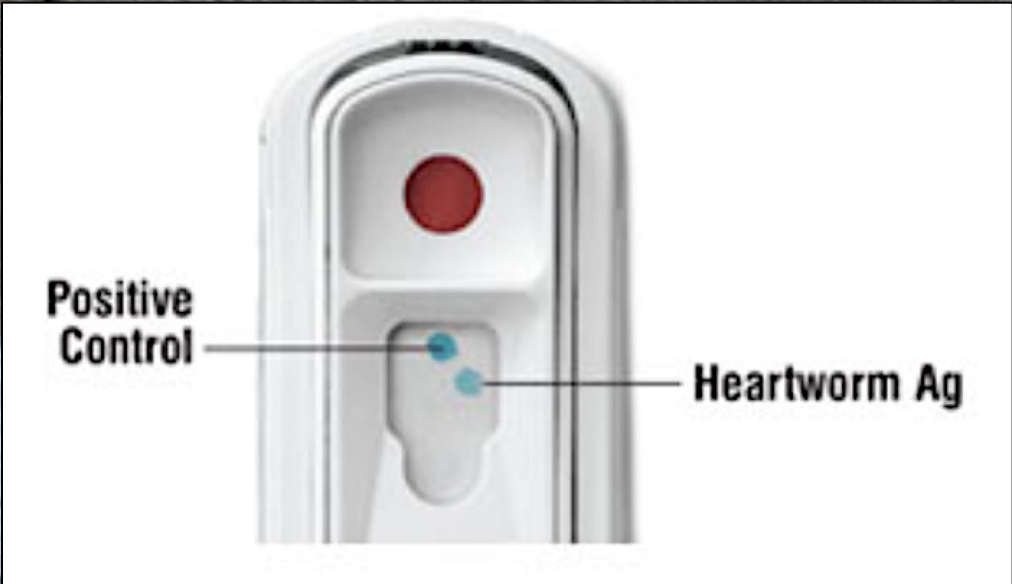
Cats
&
Ferrets

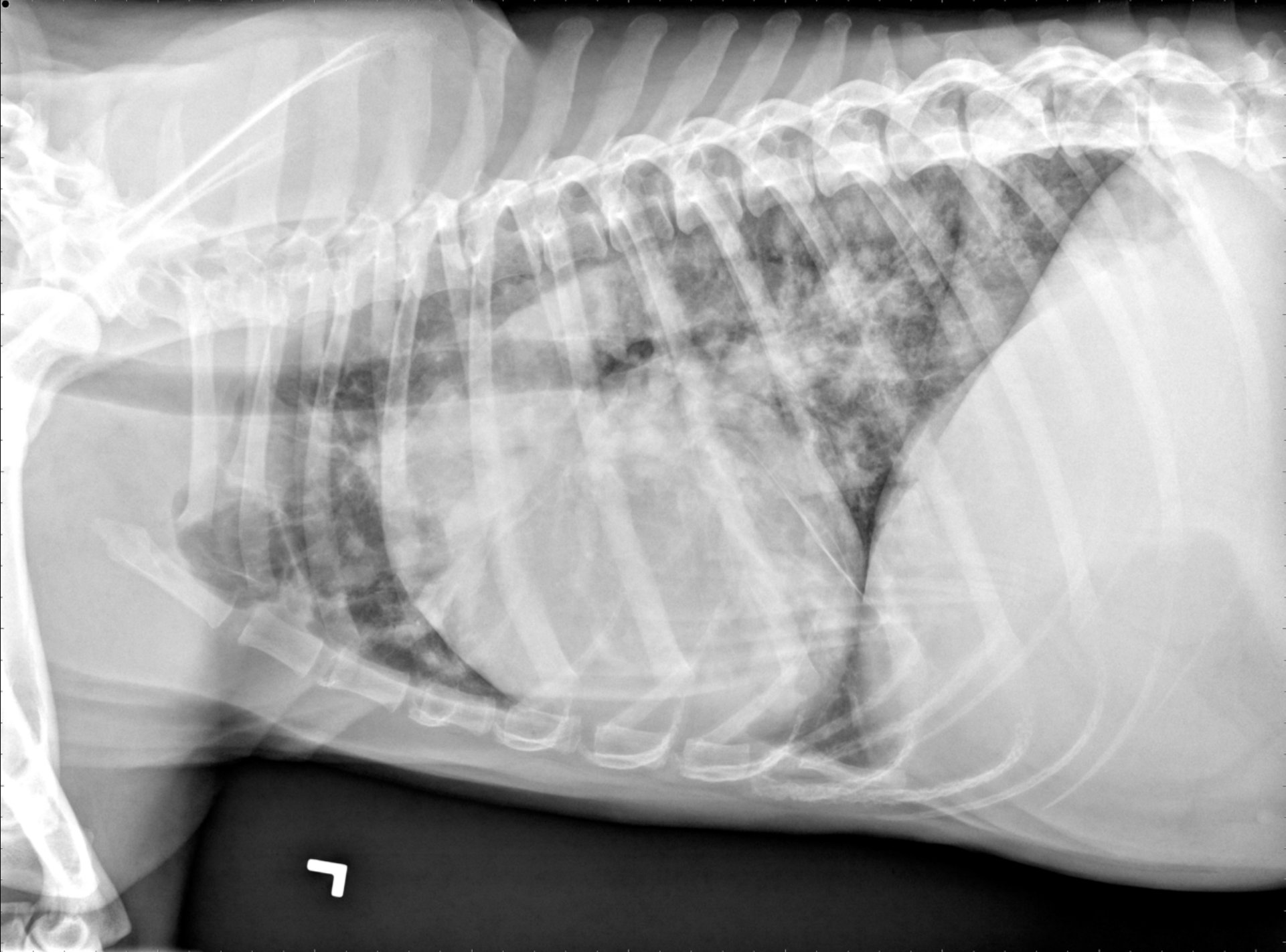
Diagnosing Heartworms





Laboratory Testing

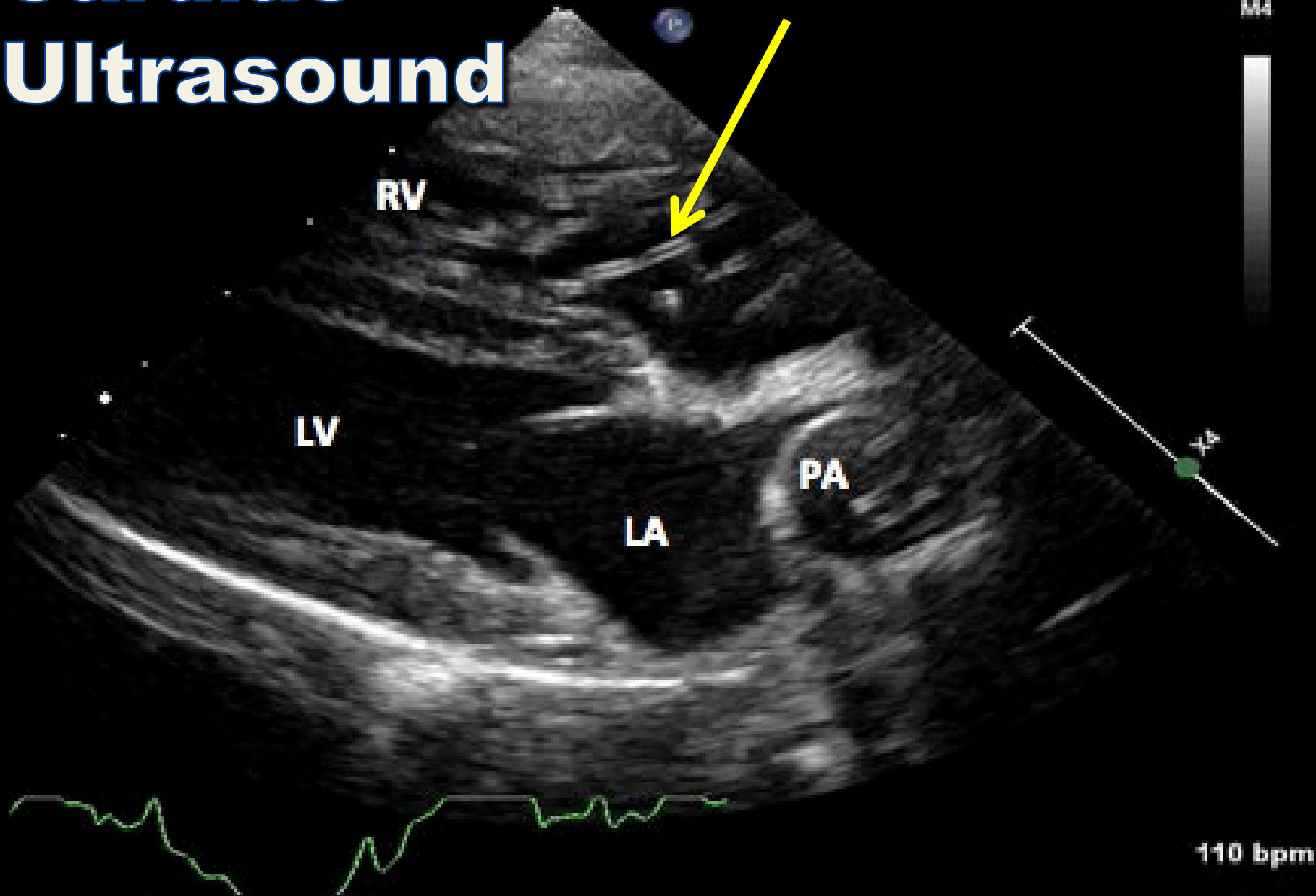




Cardiac Ultrasound

TIS 1.3 MI 1.2

Heartworms



Possible/\$\$\$\$\$\$ to

treat !

HEARTWO
RM

POSITIVE

**Easier to
PREVENT !**



HEARTWORM

WHAT'S THE RISK?



American
Heartworm
Society
EST. 1974

The risk of heartworm infection can be right next door—at ANY time.

There are

22

different mosquito
species in the U.S.
that carry heartworm
and they are **active at different
times of the day and year.**



Vectors of Canine Heartworm in the United States: A Review of the Literature Including New Data from Indiana, Florida, and Louisiana,
Glen A. Scoles, American Heartworm Society Symposium 1998.

HEARTWORM

WHAT'S THE RISK?

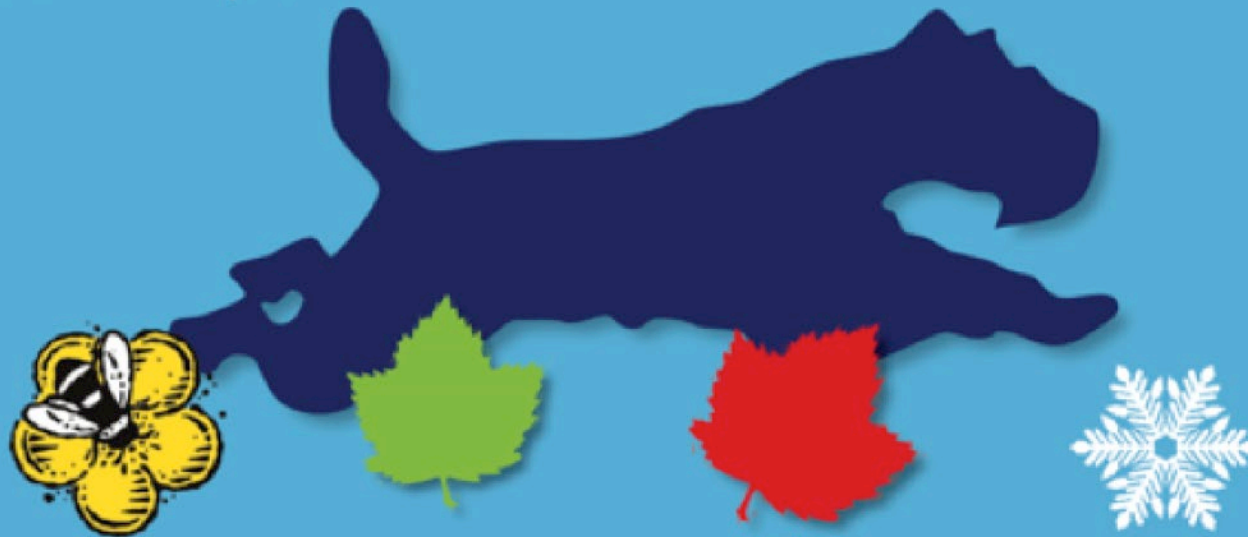


American
Heartworm
SOCIETY
EST. 1974
Society

The risk of heartworm infection can be right next door—at ANY time.

HEARTWORM "SEASON" is year-round.

To protect your pet—and others—give year-round heartworm prevention.



SPRING

SUMMER

FALL

WINTER

**How Can We
Protect
Our Pets
from
Mosquitoes
and
Heartworms ?**



Preventatives Dogs & Cats Oral & Topicals

Interceptor™
(milbemycin oxime)

BROAD SPECTRUM PARASITICIDE

Contains once-a-month flavored tablets to prevent heartworm disease, control adult hookworm infection, and remove and control adult roundworms and whipworms in dogs and puppies, and to prevent heartworm disease and remove adult hookworms and roundworms in cats and kittens.

6 PACK

For dogs 26-50 lbs.
For cats 6.1-12 lbs.

Net contents: 6 tablets, 11.5 mg each.
Product 806900
Approved by FDA under NADA # 140-915
Keep this and all drugs out of the reach of children.
Caution: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Give Monthly

Elanco

Heartgard® Plus
(ivermectin/pyrantel)

Administer once a month to prevent heartworm disease and to treat and control ascarid and hookworm infections in dogs.

For **DOGS**
51-100 lbs

12 Chewables

Each chewable contains 272 mg ivermectin and 227 mg pyrantel as pamoate salt.

Keep this and all drugs out of the reach of children.
Caution: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Boehringer Ingelheim

Heartgard®
(ivermectin)

Chewables for Cats

Administer once a month to prevent heartworm disease and to remove and control infections of hookworms in cats.

For **CATS**
5 TO 15 lbs

6 Chewables

Each chewable contains 165 mg of ivermectin.

Keep this and all drugs out of the reach of children.
Caution: Federal (USA) law restricts this drug to use by or on the order of a licensed veterinarian.

Boehringer Ingelheim

For Use ONLY on Dogs 7 Weeks and Older and 21-55 lbs.

Elanco K9 Advantix II™
Large Dog

1 monthly dose

Tick Repels and Kills Fleas and Mosquitoes

Flea Eggs Flea Larvae Waterproof

Fleas Ticks Mosquitoes Lice Biting Flies

KEEP OUT OF REACH OF CHILDREN

See back panel for First Aid, Precautionary Statements, and Directions for Use. For all information, including Storage and Disposal, see Insert inside carton.

DO NOT USE ON CATS

ACTIVE INGREDIENTS... % By Weight
Imidacloprid 8.80%
Permethrin* 44.00%
Pyriproxyfen 0.44%
OTHER INGREDIENTS 46.76%
Total 100.00%

*cis/trans ratio: Max 55% (±) cis and min 45% (±) trans

Topical Prevention and Treatment of Fleas, Ticks, Mosquitoes, Biting Flies, and Lice for Monthly Use Only on Dogs and Puppies 7 Weeks of age and Older and Weighing 21 - 55 lbs.

Dogs

Cats & Ferrets

Topical

Topical

55.1 – 88 lbs

advantage multi™
for dogs
(imidacloprid + moxidectin)
Topical Solution

CAUTION: Federal (U.S.A.) Law restricts this drug to use by or on the order of a licensed veterinarian

Once-A-Month Topical Solution

- Prevention of heartworm disease
- Treatment of *Dirofilaria immitis* circulating microfilariae
- Kills adult fleas and is indicated for the treatment of flea infestations
- Treatment and control of hookworms, roundworms, and whipworms
- Treatment and control of sarcoptic mange
- For dogs and puppies 7 weeks of age and older and 55.1 to 88 lbs.

WARNING

- DO NOT ADMINISTER THIS PRODUCT ORALLY
- For the first 30 minutes after application ensure that dogs cannot lick the product from application sites on themselves or other treated animals.
- Children should not come in contact with application sites for two (2) hours after application.

(See Contraindications, Warnings, Human Warnings, and Adverse Reactions, for more information)

Each tube contains 400 mg of imidacloprid and 100 mg of moxidectin. Keep this and all drugs out of the reach of children. Do not use this product on cats.

Approved by FDA under NADA # 141-251

SIX 4.0 mL Tubes

6 Pack

5.1 – 9 lbs

advantage multi™
for cats
(imidacloprid + moxidectin)
Topical Solution for Cats and Ferrets

CAUTION: Federal (U.S.A.) Law restricts this drug to use by or on the order of a licensed veterinarian

Once-A-Month Topical Solution

For Cats:

- Prevention of heartworm disease
- Kills adult fleas and is indicated for the treatment of flea infestations
- Treatment and control of ear mite infestations
- Treatment and control of hookworms and roundworms
- For cats and kittens 9 weeks of age and older and 5.1–9 lbs.

For Ferrets:

- Prevention of heartworm disease
- Kills adult fleas and treats flea infestations
- For ferrets that weigh at least 2 lbs.


Children should not come in contact with the application site for 30 minutes after application.

Each tube contains 40 mg of imidacloprid and 4 mg of moxidectin. Keep this and all drugs out of reach of children.

Approved by FDA under NADA # 141-254

SIX 0.4 mL Tubes

6 Pack

A large number of mosquitoes are shown flying against a sunset background. The sky is a mix of orange, yellow, and blue, with the sun low on the horizon. The mosquitoes are small, dark silhouettes scattered across the entire frame.

Avoid walking your dogs or letting them outside during dawn and dusk hours when

Mosquitoes are most active

Human Products



Veterinary (Pet Safe) Products



Plants that Repel Mosquitoes

Lavender

Catnip

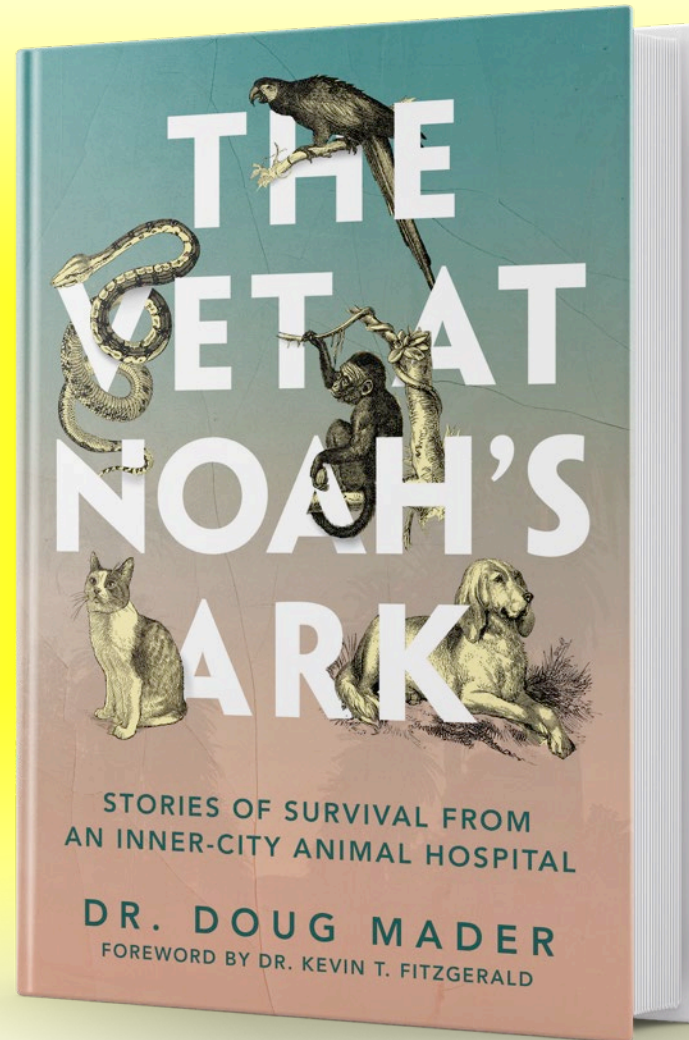
Basil

Rosemary

Citronella



Questions ???



www.DougMader.com

Question and Answers

Any and all questions on this evening's topics are welcome!

(If we run out of time tonight, email florida@oxitec.com and we will attempt to answer your question if it isn't included in the growing FAQ that we publish online at oxitec.com/florida and keysmosquitoproject.com)

THANK YOU!

Additional Q&As, resources, facts, and background materials are available at:
oxitec.com/florida and keysmosquitoproject.com