



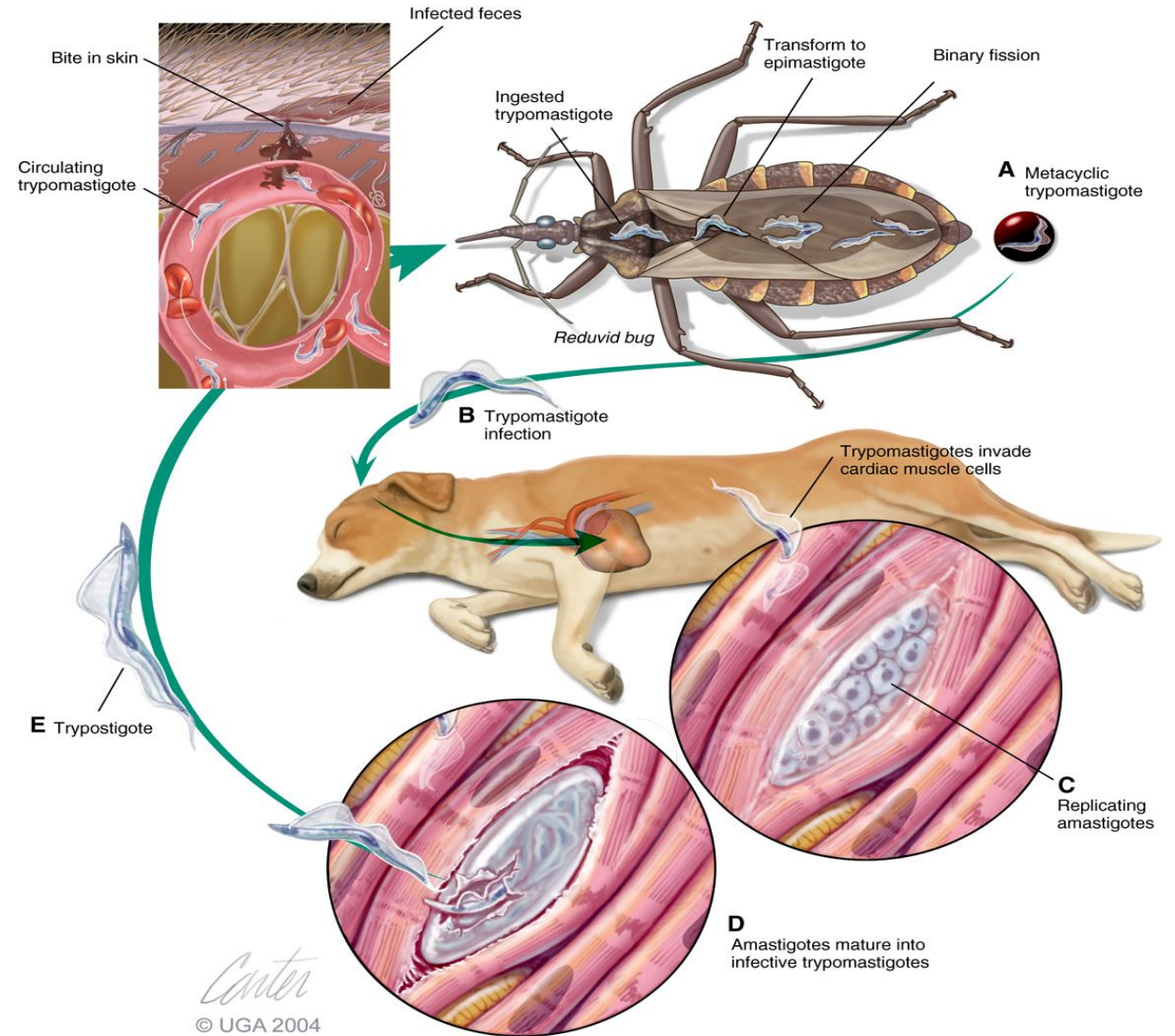
Canine Chagas

Heartworm Disease Of the 21st Century

Texas Pet Sitters Association 2023

Chagas Disease

American Trypanosomiasis



Chagas Disease

Triatomine Vector

- Kissing Bug
- 7 species found in Texas
- Most active in Warm Summer months
- >60% infected with *T. Cruzii*
- Animal Reservoirs Opossum, raccoon, rat



Chagas Disease

Oral Transmission

- Triatomine ingestion
 - Trypomastigote release
 - Oral, pharyngeal, and gastric mucosa penetration
- Contaminated food and water
 - Vector and/or feces
- Carrion
- Results in higher load of parasites
 - 600,000 vs 50,000
- Higher mortality rate/morbidity
 - 3x increase in humans



Chagas Disease

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Chagas Disease

Prevalence

Louisiana HW 7.1% positive

22% Chagas +

Tennessee HW 2.7% positive

6.4% Chagas +

Texas HW 3.3% positive

8-18% Chagas +

Oklahoma HW 2% positive

3.6% Chagas +

California HW 0.42% positive

15-60% San Francisco and Marin county



Chagas Disease

Prevalence

Breed Distribution

1. English/French Bulldog (54%)
2. German Shepherd (30%)
3. Chihuahua (29%)
 - Overall Prevalence 16.8%
 - Similar to shelter dog population 18%
 - Client owned dogs
 - Reason for testing?
 - Arrhythmia
 - Packmate infected



Meyers et al 2021 JVIM

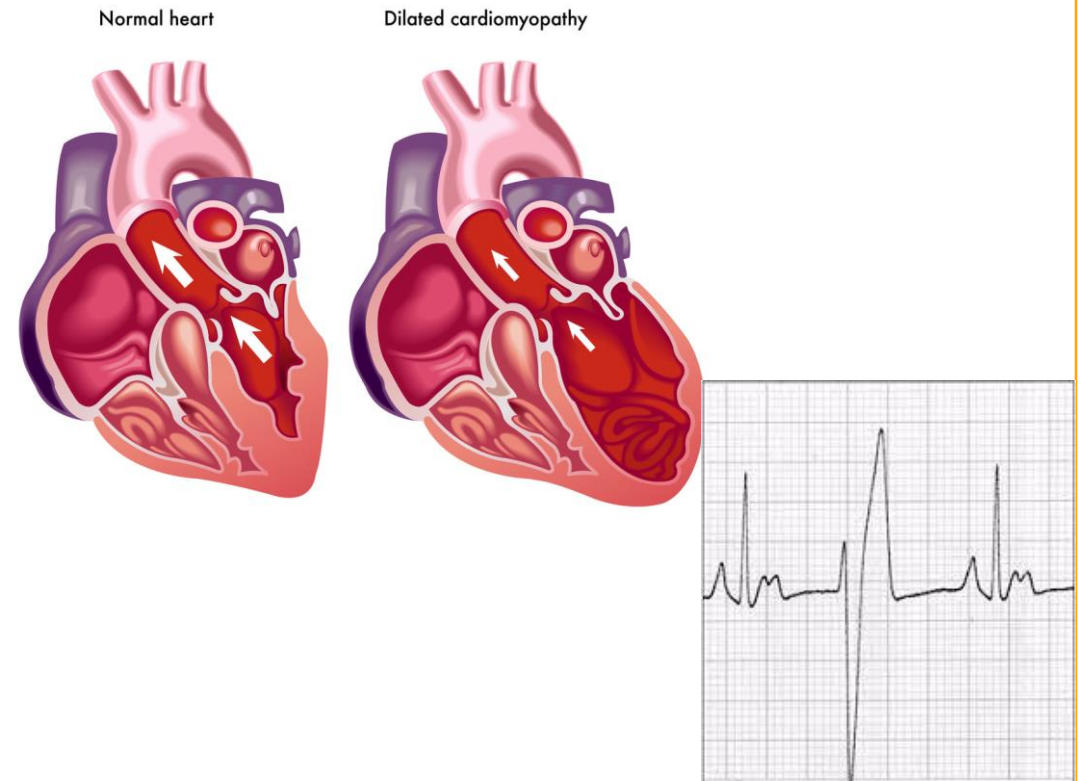
Chagas Disease



Pathogenesis

Progressive fibrosis and heart failure

- Bilateral ventricular failure and dysfunction (Myocardial dysfunction)
- Arrhythmias (conduction system failure)
- Extensive cardiac ventricular remodeling



Chagas Disease



Clinical Symptoms Canine

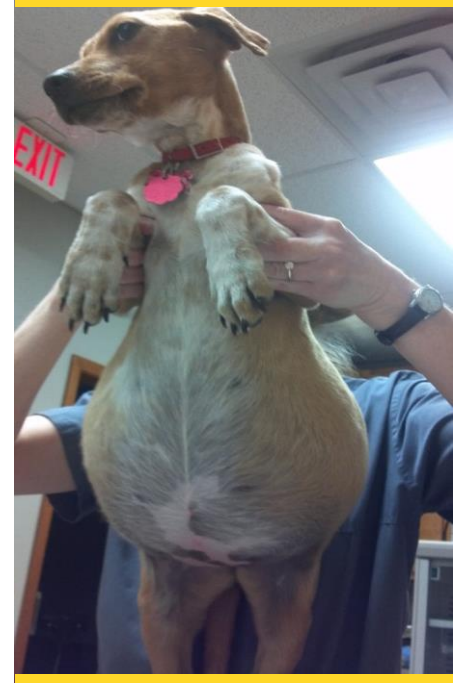
Acute

- Intense parasitemia
- High grade tissue parasitism
- Collapse
- Arrhythmias/pericardial effusion
- Lymphadenopathy
- Neurological signs
- Fever
- Death

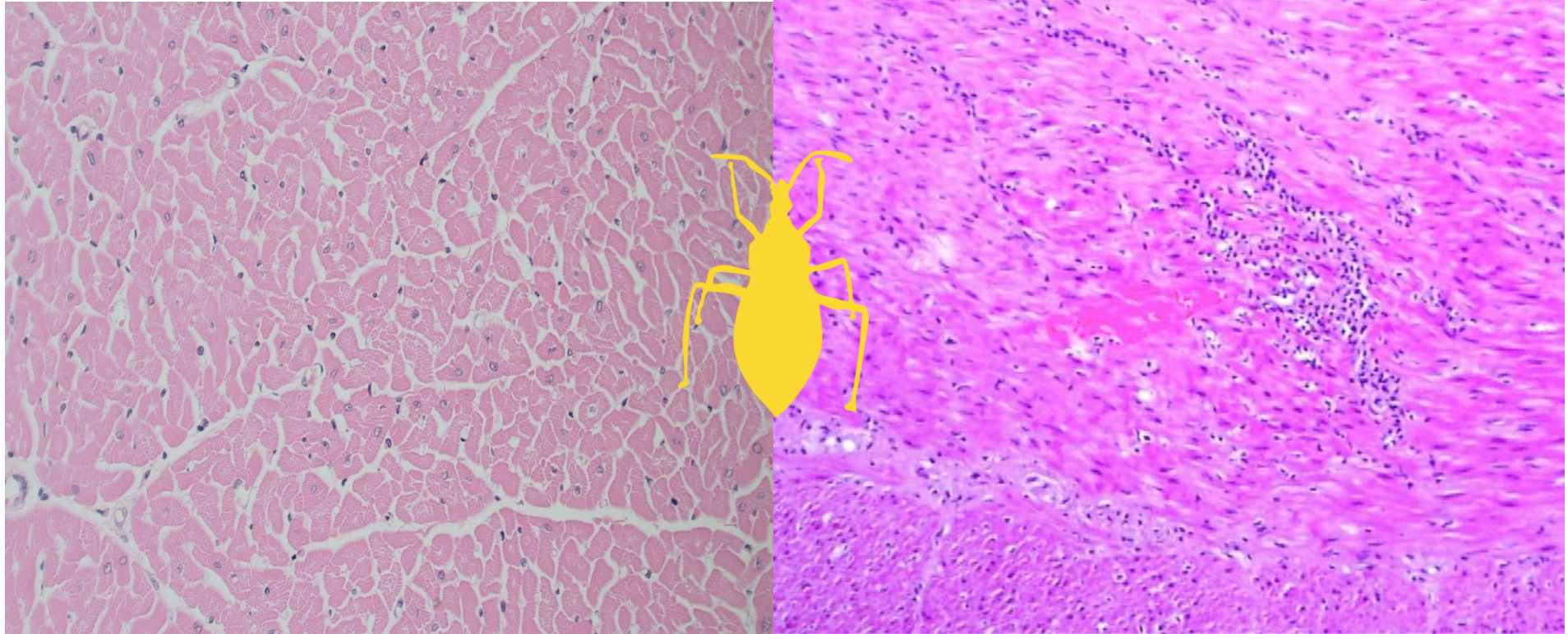
Chronic

- Low grade intermittent parasitemia
- Slow, progressive fibrosing myocarditis
- Arrhythmias
- Congestive heart failure
- Right and left failure
- Weight loss
- Acute death
- ASYMPTOMATIC**

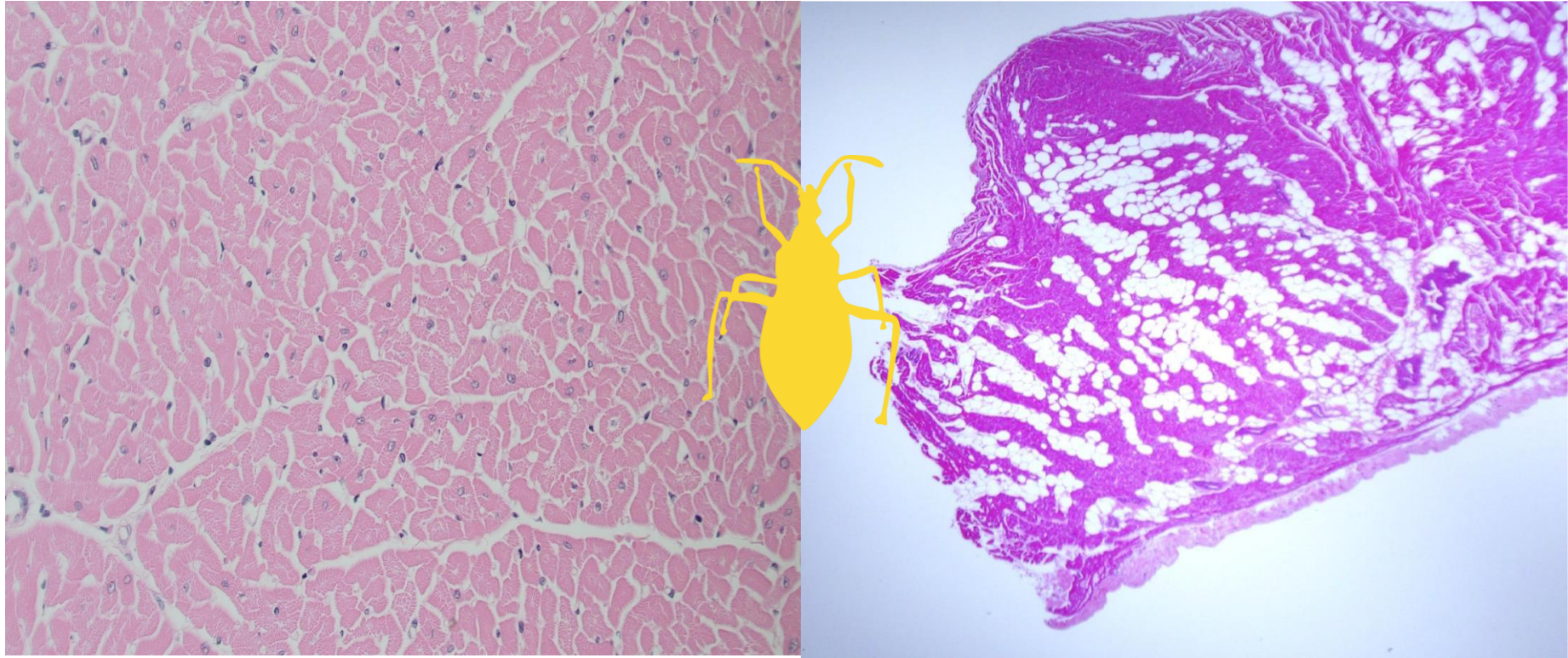
Chagas Disease



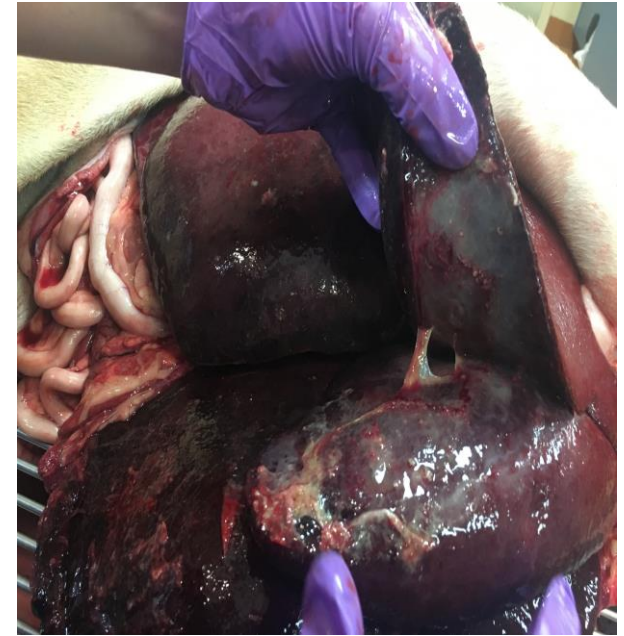
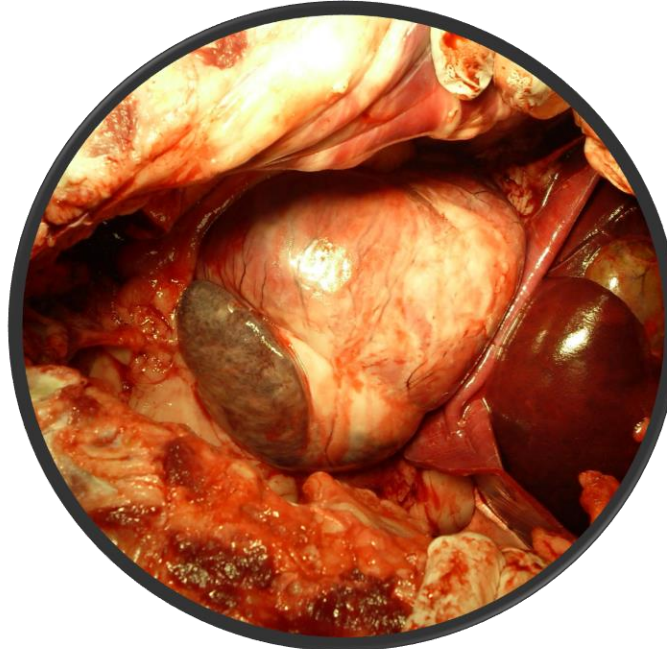
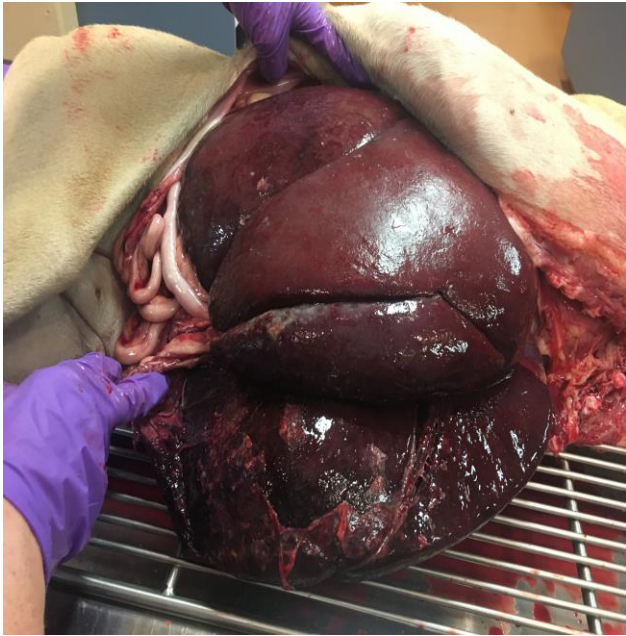
Chagas Disease



Chagas Disease



Chagas Disease



Chagas Disease

ECG

Range of arrhythmias

Arrhythmogenic antibodies

Autonomic denervation



Diagnostic Imaging

Radiographs

Echocardiogram



Pathology

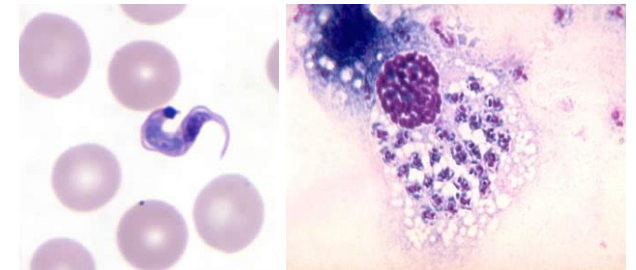
Blood smear

Troponin

White blood cell count

Lymph node aspirates

Necropsy



Chagas Disease

Diagnostics

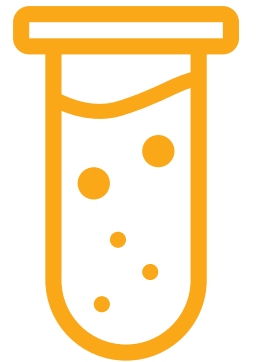
- Serology (21 day post infection)
 - IFA (96% sens/ 90% spec)
 - *Lifelong persistence likely*
 - *Texas Veterinary Medical Diagnostic Laboratory*
 - **ELISA** (*GOLD standard*)
 - *More sensitive*
 - *Experimental*
 - Flow cytometry (FC)
 - A,T,E
 - Quick Ab drop
 - *Experimental*

PCR

- Kinetoplast DNA 121/122
- 99%+ Acute sensitivity, 100% specificity
- 51% Chronic sensitivity, 100% specificity
- Decreased parasitemia with chronicity of infection
- Serial PCR - Good for monitoring treatment efficacy

Blood Culture

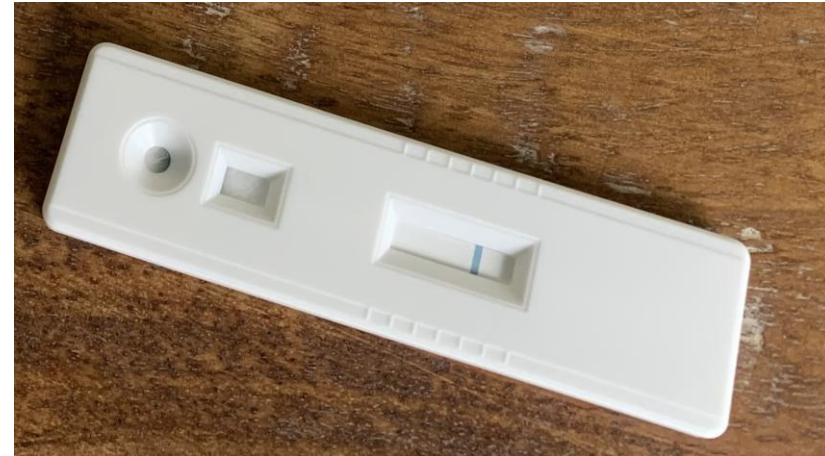
- Slow (2-20 weeks)
- Limited Use



Chagas Disease

Diagnostics

- **ELISA**
 - More sensitive 100%
 - Currently available VRL (\$125)
 - Soon at reference lab
 - Better than IFA
- **Lateral Flow (LFA)**
 - Accurate (sensitive 100%)
 - Rapid (10 minutes)
 - Cheap (~\$35)
 - Paired option with Heartworm
 - Available 2024



Chagas Disease

Monitoring



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Treatment

Chagas Disease Treatment

Amiodarone

- Class III antiarrhythmic
- Disrupts calcium homeostasis/Cruzipain
- Loading dose: 15mg/kg PO once x 28 days
- Maintenance: **7.5mg/kg PO ONCE daily**

Adverse reactions: *Decrease appetite, vomiting*, lethargy, liver enzymes. These signs are *reversible* with dose adjustment

Itraconazole

- Triazole antifungal
- Interferes with ergosterol synthesis
- **5 mg/kg PO ONCE daily with food**

Treatment is for **12 months**



Chagas Disease

Supportive Care

Quadruple therapy

1. ACEi
 - Enalapril or Benazepril
2. Pimobendan
3. Furosemide
 - Renal caution
4. Spironolactone
 - RAAS inhibition
 - Reduction of fibrosis



Chagas Disease

Environmental Control

Environmental Control

Permethrin

Cypermethrin

Systemic Control

Isoxazolines

Fluralaner (Bravecto®)

Afoxolaner (NexGard®)

Rapid triatomine death within 5 days

Bonus: phlebotomine sandflies

Systemic insecticide treatment of the canine reservoir of *Trypanosoma cruzi* induces high levels of lethality in *Triatoma infestans*, a principal vector of Chagas Disease

Loza et al. Parasites & Vectors (2017) 10:344





Case Study Princeton

Chagas Disease

Case Study

Princeton

- Asymptomatic; wellness check, other packmates + Chagas
- Physical exam WNL; CBC/Chem7 WNL; Chagas IFA(-)
- 8 weeks later: 4 grand mal seizures
- CBC/Chemistry/Toxoplasma/Neospora/RMSF/Chagas/Thoracic radiographs/ECG:
 - Mature neutrophilia 18,000 (<16k)
 - **T cruzi IFA + 1:320**
 - ECG: sinus rhythm
- Neuro consultation: WNL
- MRI: “collection of fluid is seen what appears to be within the parenchymal margin”



Chagas Disease

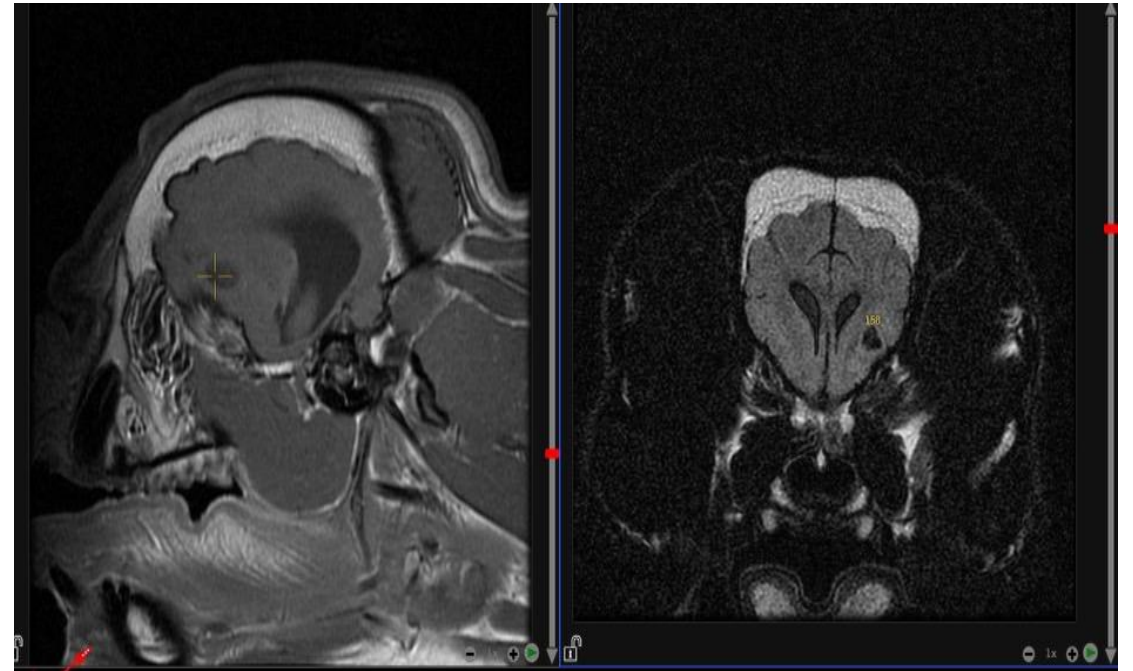
Case Study

Princeton

MRI:

“The constellation of findings and reported history of seizures may be consistent with a prior necrotizing encephalitis or a resolved parenchymal lesion with a resulting fluid pocket replacement in the region of a portion of the brain parenchyma or sulcus on the right.”

- Treatment
 - Zonisamide 10mg/kg PO BID
 - Itraconazole/amiodarone
- Follow-up
 - 6 months into treatment (May 2022)
 - Zonisamide longterm
 - No seizures





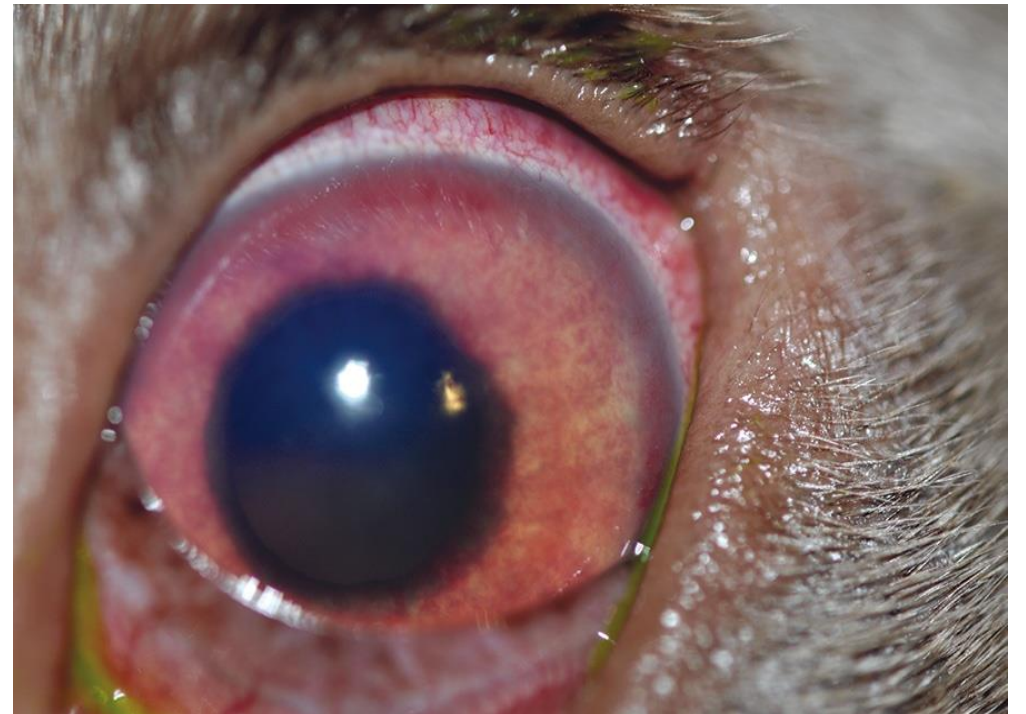
Case Study Bella

Chagas Disease

Case Study

Bella

- Presented for acute blindness
- 2 months prior mild diarrhea, 103 temp, resolved with amoxicillin
- Nonvisual, aqueous flare, miotic pupil
- IOP: 42mm OD; 19mm OS
- 2+ proteinuria
- Diagnosis: Uveitis with secondary glaucoma



Chagas Disease

Case Study

Bella

- Infectious disease screen
 - Ehrlichia, Lyme, Anaplasma, HW: negative
 - RMSF: negative
 - Fungal: negative
 - Bartonella: negative
 - Chagas: + >1280



Chagas Disease

Case Study

Bella

- Treatment
 - Timolol
 - Dorzolamide
 - Prednisolone (ophthalmic)
 - Amiodarone/Itraconazole
- Recheck 30 days
 - IOP: persistent 35mm
 - Plan: enucleation/histopath



Chagas Disease

Case Study

Bella

- Enucleation
- Histopathology
- Follow-up
 - Full recovery postop
 - Post Tx at 1 year *T. cruzi* PCR (-)
 - Opposite eye normal

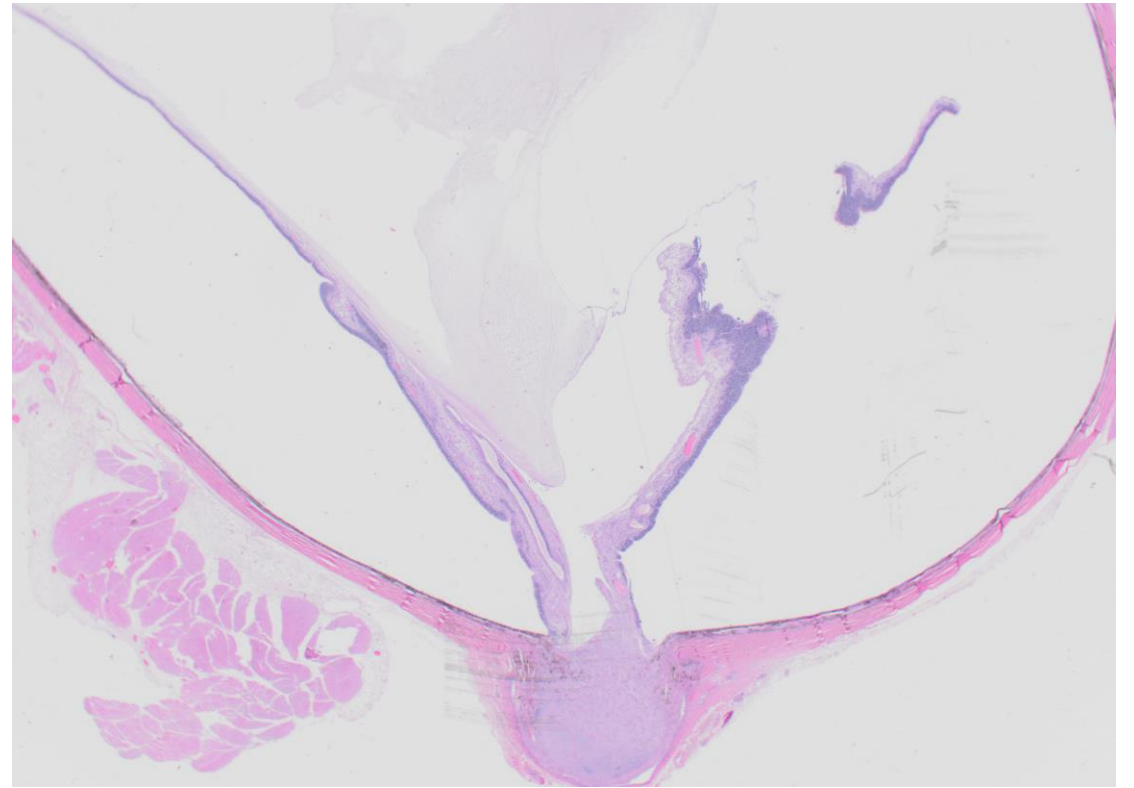


Chagas Disease

Case Study

Bella

- Detached retina
- Inflammation
- Intraocular hemorrhage





Case Study

Luigi

Chagas Disease

Case Study

Luigi

- 5 yr Male White and Black Ruffed Lemur
- Acute onset grand-mal **seizures and ataxia, thin, not eating**
- Bloodwork **dehydration, sodium and chloride low**
- Ultrasound: **free fluids left side thorax**
- IV fluids, steroids, antibiotics
- Serology Toxoplasma gondii NEGATIVE
- **Chagas +**



Chagas Disease

Case Study

Luigi

- 24 hours eating, more alert
- Ataxia still present, no more seizures
- Continued fluids for 4 days, patient discharged with meds
- Started itraconazole/amiodarone liquid
- Slow improvement over 6 months



Chagas Disease

Case Study

Luigi

- 24 hours eating, more alert
- Ataxia still present, no more seizures
- Continued fluids for 4 days, patient discharged with meds
- Started itraconazole/amiodarone liquid
- Slow improvement over 6 months
- Jumping, running and normal by 11 months





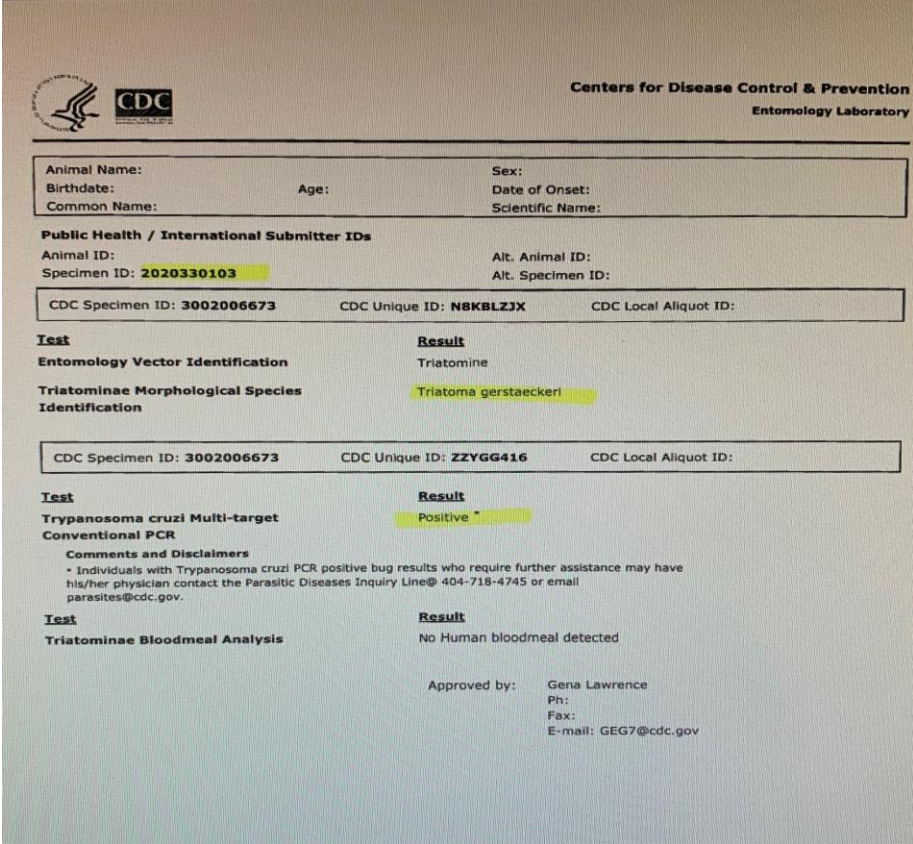
Takeaways

Chagas Disease

Kissing Bug Submission

Submit live or dead triatomine

- <https://www.dshs.texas.gov/IDCU/health/zoonosis/Triatomine-Testing.aspx>
- Bloodmeal analysis
- Public health responsibility
 - Dogs, cats, and humans in household to get tested
 - Vector control



The image shows a CDC Entomology Laboratory submission form for Chagas Disease. The form is titled "Centers for Disease Control & Prevention Entomology Laboratory". It contains fields for animal information, specimen IDs, and test results. The form is divided into sections for "Public Health / International Submitter IDs", "Entomology Vector Identification", and "Triatominae Morphological Species Identification". The results section shows "Triatominae Morphological Species Identification" as "Triatoma gerstaeckeri" and "Triatominae Bloodmeal Analysis" as "No Human bloodmeal detected".

Centers for Disease Control & Prevention Entomology Laboratory		
Animal Name:	Age:	Sex:
Birthdate:		Date of Onset:
Common Name:		Scientific Name:
Public Health / International Submitter IDs		
Animal ID:	Alt. Animal ID:	
Specimen ID: 2020330103	Alt. Specimen ID:	
CDC Specimen ID: 3002006673	CDC Unique ID: N8KBLZJX	CDC Local Aliquot ID:
Test	Result	
Entomology Vector Identification	Triatomine	
Triatominae Morphological Species Identification	Triatoma gerstaeckeri	
CDC Specimen ID: 3002006673 CDC Unique ID: ZZYGG416 CDC Local Aliquot ID:		
Test	Result	
Trypanosoma cruzi Multi-target Conventional PCR	Positive	
Comments and Disclaimers • Individuals with Trypanosoma cruzi PCR positive bug results who require further assistance may have his/her physician contact the Parasitic Diseases Inquiry Line@ 404-718-4745 or email parasites@cdc.gov.		
Test	Result	
Triatominae Bloodmeal Analysis	No Human bloodmeal detected	
Approved by: Gena Lawrence Ph: Fax: E-mail: GEG7@cdc.gov		

Chagas Disease

Client Education

Encourage your clients

- Treatable disease
- Test all pets
- Test all humans
- Prevent reinfection





THANK YOU

info@vidapharmacal.com