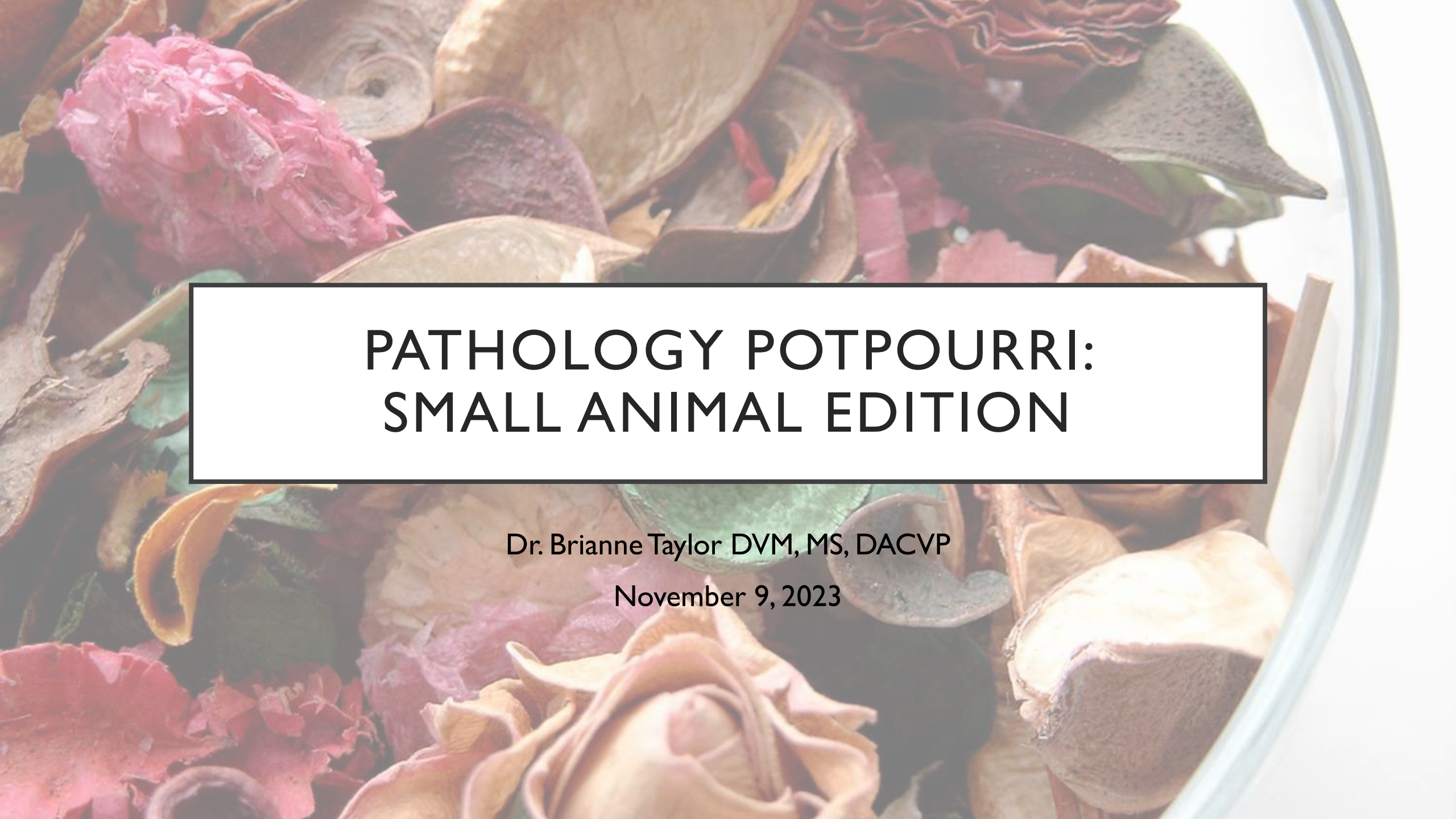


# PATHOLOGY POTPOURRI: SMALL ANIMAL EDITION

Dr. Brianne Taylor DVM, MS, DACVP

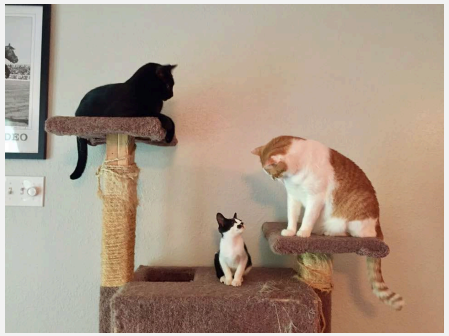
November 9, 2023

# OUTLINE

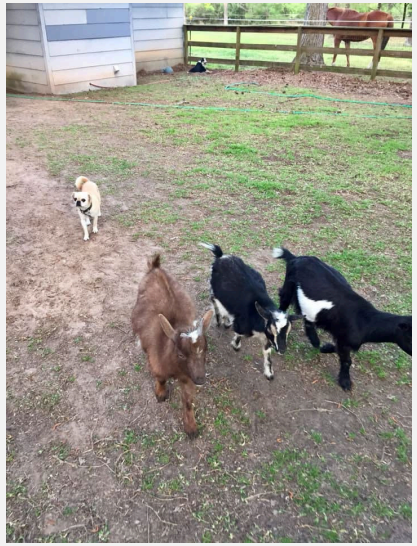
- About me
- Tips and tricks for submitting to a diagnostic laboratory
- Potpourri of cases
  - The dose makes the poison
  - The tell-tale hearts
  - Imposter syndrome


Dr. Tim Snider

# ABOUT ME

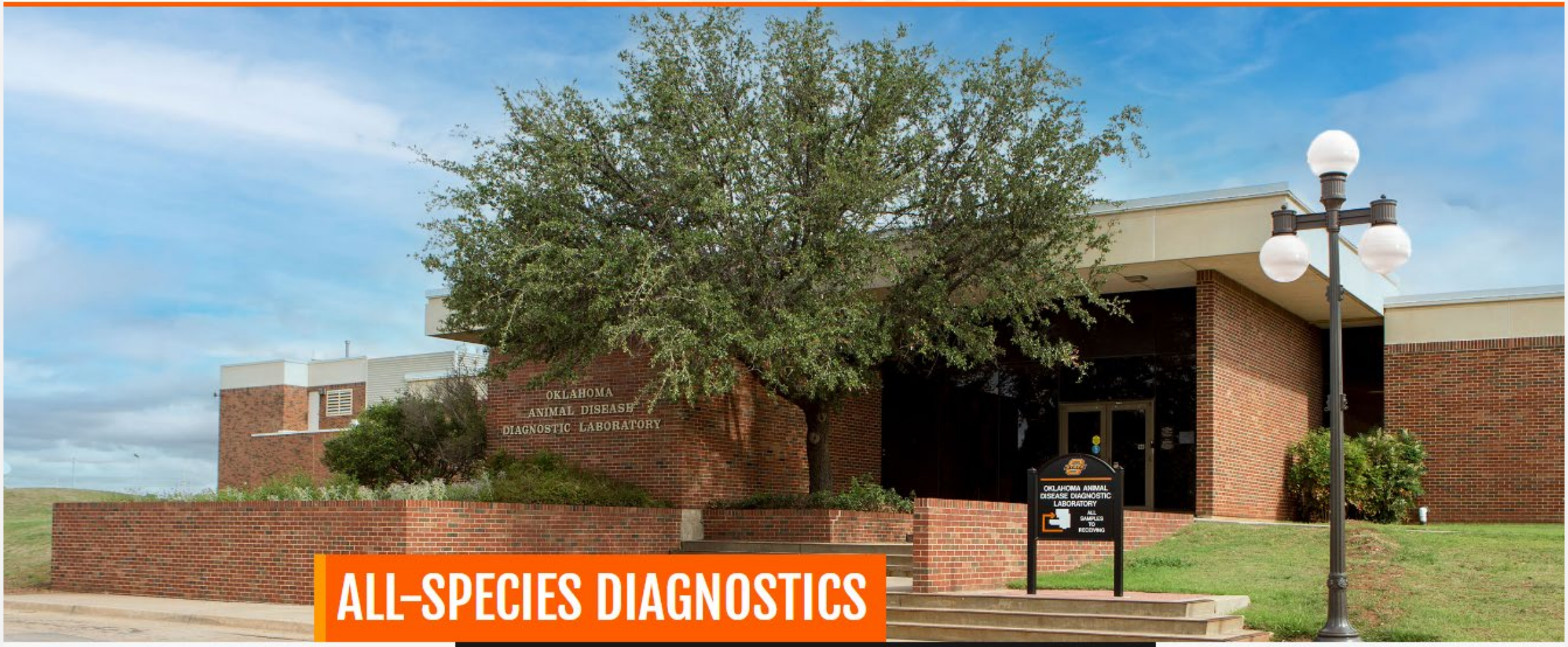






# OKLAHOMA ANIMAL DISEASE DIAGNOSTIC LABORATORY

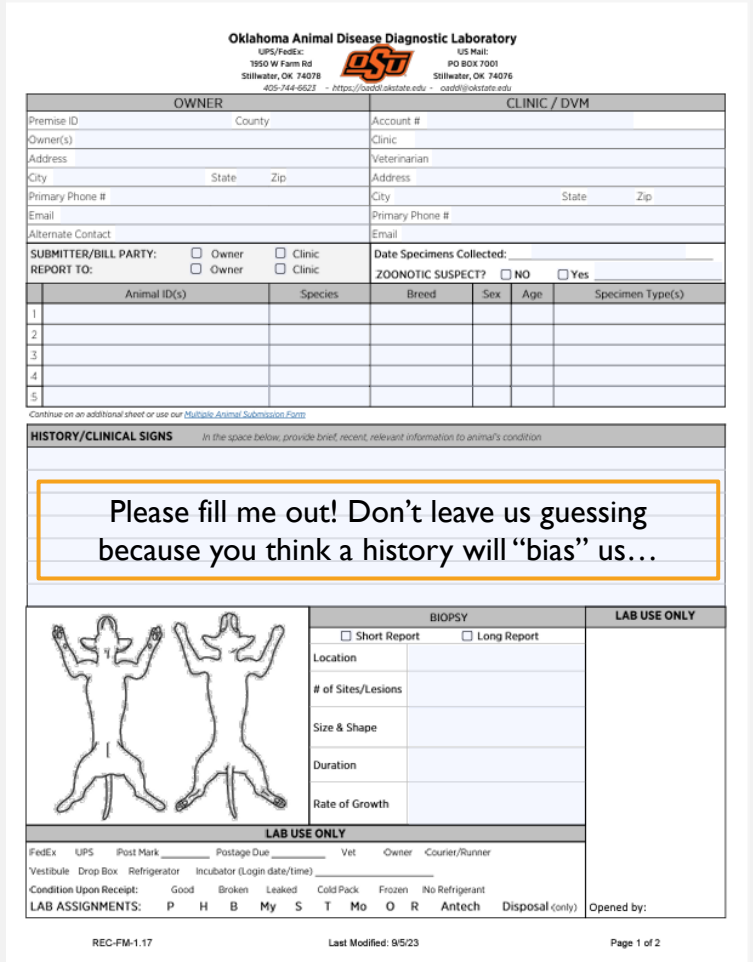





## ALL-SPECIES DIAGNOSTICS

**Promoting the overall well-being of animal health through veterinary diagnostic testing, instruction of professional students, and research in diseases of economic importance to Oklahoma and beyond.**

# SUBMITTAL FORM



**Oklahoma Animal Disease Diagnostic Laboratory**

UPS/FedEx: 1950 W Farm Rd, Stillwater, OK 74078
US Mail: PO BOX 7001, Stillwater, OK 74076
405-744-6623 - https://oaddl.okstate.edu - oaddl@okstate.edu

| OWNER | CLINIC / DVM |
|---|---|
| Premise ID / County | Account # |
| Owner(s) | Clinic |
| Address | Veterinarian |
| City / State / Zip | Address |
| Primary Phone # | City / State / Zip |
| Email | Primary Phone # |
| Alternate Contact | Email |
| SUBMITTER/BILL PARTY: ☐ Owner ☐ Clinic | Date Specimens Collected: |
| REPORT TO: ☐ Owner ☐ Clinic | ZOONOTIC SUSPECT? ☐ NO ☐ Yes |

| | Animal ID(s) | Species | Breed | Sex | Age | Specimen Type(s) |
|---|---|---|---|---|---|---|
| 1 | | | | | | |
| 2 | | | | | | |
| 3 | | | | | | |
| 4 | | | | | | |
| 5 | | | | | | |

Continue on an additional sheet or use our Multiple Animal Submission Form

**HISTORY/CLINICAL SIGNS** *In the space below, provide brief, recent, relevant information to animal's condition*

Please fill me out! Don't leave us guessing because you think a history will "bias" us…



**BIOPSY** ☐ Short Report ☐ Long Report

| | |
|---|---|
| Location | |
| # of Sites/Lesions | |
| Size & Shape | |
| Duration | |
| Rate of Growth | |

**LAB USE ONLY**

FedEx UPS Post Mark _____ Postage Due _____ Vet Owner Courier/Runner
Vestibule Drop Box Refrigerator Incubator (Login date/time) _____
Condition Upon Receipt: Good Broken Leaked Cold Pack Frozen No Refrigerant
LAB ASSIGNMENTS: P H B My S T Mo O R Antech Disposal (only)

**LAB USE ONLY** Opened by:

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**TEST(S) REQUESTED**

*For a complete list of tests and specimen requirements, see test catalog at https://oaddl.okstate.edu*

**BACTERIOLOGY / MYCOLOGY**

- ☐ Aerobic Culture with up to 2 Susceptibility Profiles
- ☐ Anaerobic & Aerobic Culture with up to 2 Susceptibility Profile
- ☐ Fungal & Aerobic Culture with up to 2 Susceptibility Profiles
- ☐ Aerobic Culture only
- ☐ Anaerobic Culture only
- ☐ Antibiotic Susceptibility
- ☐ Bacterial Isolate ID by MALDI-TOF
- ☐ *Campylobacter fetus* Culture
- ☐ Clostridial Culture
- ☐ *Salmonella* Culture with Susceptibility Profile (serogrouping upon request)
- ☐ *Salmonella* Culture - Environmental (Stalls, barns, litter)
- ☐ Urine Culture with Susceptibility *(cystocentesis or catheter-collected only)*
- ☐ Fungal Culture
- ☐ Milk Culture & Susceptibility
- ☐ *Mycoplasma bovis* Culture

**TOXICOLOGY**

- ☐ Blue-Green Algae
- ☐ Prussic Acid/Cyanide

**PARASITOLOGY**

- ☐ Baermann
- ☐ Centrifugal Floatation & Direct Smear
- ☐ Coproculture (Larvae ID)
- ☐ Centrifugal Floation
- ☐ Fecal Egg Count
- ☐ McMasters
- ☐ Wisconsin
- ☐ Feline Heartworm Ag
- ☐ Giardia AG
- ☐ Gross Parasite ID
- ☐ Heartworm AG (Pre & Post Heat Treated)
- ☐ Hemoparasite Exam (Wright-Giemsa)
- ☐ Modified Knotts
- ☐ Sedimentation
- ☐ Tick ID

**AVIAN**

- ☐ Avian Influenza
  - ☐ AGID ☐ PCR
  - ☐ ELISA
- ☐ Exotic Newcastle Disease
  - ☐ IPCR
- ☐ *Mycoplasma gallisepticum/M synoviae*
  - ☐ ELISA
  - ☐ PCR
- ☐ *Salmonella pullorum-typhoid*
  - ☐ Agglutination
  - ☐ Microagglutination Titer

**BOVINE**

- ☐ Diarrhea Panel – *Aerobic Culture with Susceptibilities, Clostridium perfringens Culture, Salmonella Culture, Rotavirus Group A, Coronavirus PCR, Fecal Float, Smear*
- ☐ Bovine Abortion (Serology) – *Leptospira, IBR, BVD SN, BVD ELISA, Brucella, Neospora*
- ☐ Bovine Respiratory SN Profile 1 – *IBR, BVD-1, PI3, BRSV*
- ☐ Bovine Respiratory Panel PCR "Basic – *BVD, IBR, BRSV*
- ☐ *Anaplasma marginale*
  - ☐ ELISA
  - ☐ PCR
- ☐ Bluetongue
  - ☐ ELISA
  - ☐ PCR
- ☐ Bovine Coronavirus PCR
- ☐ Bovine Leukemia Virus
  - ☐ ELISA
  - ☐ PCR
- ☐ Bovine ELISA Panel – *BVD, BLV, Johne's (11 animal minimum)*
- ☐ Bovine Respiratory SN Profile 2 – *IBR, BVD-1, BVD-2, PI3, BRSV*
- ☐ Bovine Respiratory Panel PCR "Comprehensive – *BVD, IBR, BRSV, BCV, M Bovis*
- ☐ Bovine Respiratory Syncytial Virus
  - ☐ SN
  - ☐ IPCR
- ☐ *Brucella abortus / B. suis*
- ☐ Bovine Viral Diarrhea (BVD)
  - ☐ ELISA (PI)
  - ☐ Type 1 SN
  - ☐ Type 2 SN
  - ☐ IPCR
- ☐ General Herpes Virus PCR
  - ☐ Sequencing (if Positive)
- ☐ IBR
  - ☐ SN
  - ☐ PCR
- ☐ Johne's *(Submit individual samples)*
  - ☐ ELISA
  - ☐ PCR – Individual
  - ☐ PCR – Pooled in Lab
- ☐ *Leptospira spp.*
  - ☐ MAT – *5 serovers*
  - ☐ PCR
- ☐ *Mycoplasma bovis* PCR
- ☐ *Neospora spp* ELISA
- ☐ Parainfluenza 3 (PI3) Virus SN
- ☐ Pregnancy ELISA
- ☐ Rotavirus Group A Card
- ☐ *Tritrichomonas foetus* *(Submit Individual Samples)*
  - ☐ Culture (InPouch TF)
  - ☐ PCR (PBS or InPouch TF)
  - ☐ PCR – Pooled in Lab

**CANINE**

- ☐ Diarrhea Panel - *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Campylobacter jejuni Culture, Parvovirus PCR, Fecal Float, Smear*
- ☐ *Brucella canis* IFA
- ☐ Canine Distemper PCR
- ☐ Canine Herpesvirus PCR
- ☐ Canine Influenza PCR
- ☐ Canine Parvovirus PCR
- ☐ *Ehrlichia* sp.
- ☐ *Leptospira spp.*
  - ☐ MAT – *5 serovers*
  - ☐ PCR
- ☐ Rocky Mountain Spotted Fever IFA
- ☐ Tick Profile (Serology) *Ehrlichia canis, RMSF, Lyme, Anaplasma*

**CAPRINE / OVINE**

- ☐ Diarrhea Panel – *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Fecal Float, Smear*
- ☐ Biosecurity Panel – *CAE, CL, Johne's*
- ☐ Bluetongue
  - ☐ ELISA
  - ☐ PCR
- ☐ *Brucella abortus / B. suis*
- ☐ *Brucella melitensis*
  - ☐ BVD PCR
  - ☐ CAE/OPP/SRLV
- ☐ Johne's *(Submit Individual Samples)*
  - ☐ ELISA
  - ☐ PCR
  - ☐ PCR – Pooled in Lab
- ☐ *Leptospira spp.*
  - ☐ MAT – *5 serovers*
  - ☐ PCR
- ☐ Pregnancy ELISA

**EQUINE**

- ☐ Diarrhea Panel - *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Rotavirus Group A, Coronavirus PCR, Fecal Float, Smear*
- ☐ Ehrlichia PCR
- ☐ EIA ELISA
- ☐ Equine Herpesvirus 1 PCR
- ☐ Equine Herpesvirus 4 PCR
- ☐ Equine Influenza PCR
- ☐ General Herpesvirus PCR
  - ☐ Sequencing (if Positive)
- ☐ *Leptospira spp.*
  - ☐ MAT – 5 serovers
  - ☐ IPCR
- ☐ Piroplasmosis, *Babesia caballi*-ELISA
- ☐ Piroplasmosis, *Theileria equi*-ELISA
- ☐ Rotavirus Group A – *Immunocard Test*
- ☐ *Streptococcus equi* PCR
- ☐ Other:

**FELINE**

- ☐ Diarrhea Panel - *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Campylobacter jejuni Culture, Parvovirus PCR, Fecal Float, Smear*
- ☐ *Cytauxzoon felis* PCR
- ☐ Feline Parvovirus/ Panleukopenia PCR
- ☐ *Francisella tularensis* "Tularemia" PCR

**PORCINE**

- ☐ Diarrhea Panel - Suckling/Nursery – *Aerobic Culture with Susceptibility, Rotavirus Group A, Coronavirus PCR (TGE, PEDV, SDCoV), Fecal Float, Smear*
- ☐ Diarrhea Panel - Grower/Finisher – *Aerobic Culture with Susceptibility, Salmonella Culture, Coronavirus PCR (TGE, PEDV, SDCoV), Fecal Float, Smear, Lawsonia & Brachyspira hyodysenteriae/ B. hampsonii PCR*
- ☐ *Brucella abortus* & Pseudorabies gB ELISA Panel
- ☐ *Brucella abortus / B. suis*
- ☐ Coronavirus Multiplex PCR – *PEDV, TGEV, SDCoV*
- ☐ *Leptospira spp.*
  - ☐ MAT – 5 serovers
  - ☐ PCR
- ☐ *Pseudorabies gB* ELISA
- ☐ PRRS Virus
  - ☐ ELISA
  - ☐ PCR – NA/EU
- ☐ Swine Influenza Virus PCR

*Unless written agreements are in place prior to submission to OADDL, all submitted materials plus any biological or chemical material derived from the submission shall be the property of Oklahoma State University. Any use of such derived material is by permission of Oklahoma State University. OADDL reserves the right to forward samples to reference subcontractors for tests not currently available at OADDL.*

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# SUBMITTAL FORM

The list is somewhat short for dogs and cats!

**CANINE**

- ☐ Diarrhea Panel - *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Campylobacter jejuni Culture, Parvovirus PCR, Fecal Float, Smear*
- ☐ *Brucella canis* IFA
- ☐ Canine Distemper PCR
- ☐ Canine Herpesvirus PCR
- ☐ Canine Influenza PCR
- ☐ Canine Parvovirus PCR
- ☐ *Ehrlichia* sp.
- *Leptospira spp.*
  - ☐ MAT – *5 serovers*
  - ☐ PCR
- ☐ Rocky Mountain Spotted Fever IFA
- ☐ Tick Profile (Serology)
  *Ehrlichia canis, RMSF, Lyme, Anaplasma*

**FELINE**

- ☐ Diarrhea Panel - *Aerobic Culture with Susceptibility, Clostridium perfringens Culture, Salmonella Culture, Campylobacter jejuni Culture, Parvovirus PCR, Fecal Float, Smear*
- ☐ *Cytauxzoon felis* PCR
- ☐ Feline Parvovirus/ Panleukopenia PCR
- ☐ *Francisella tularensis* "Tularemia" PCR

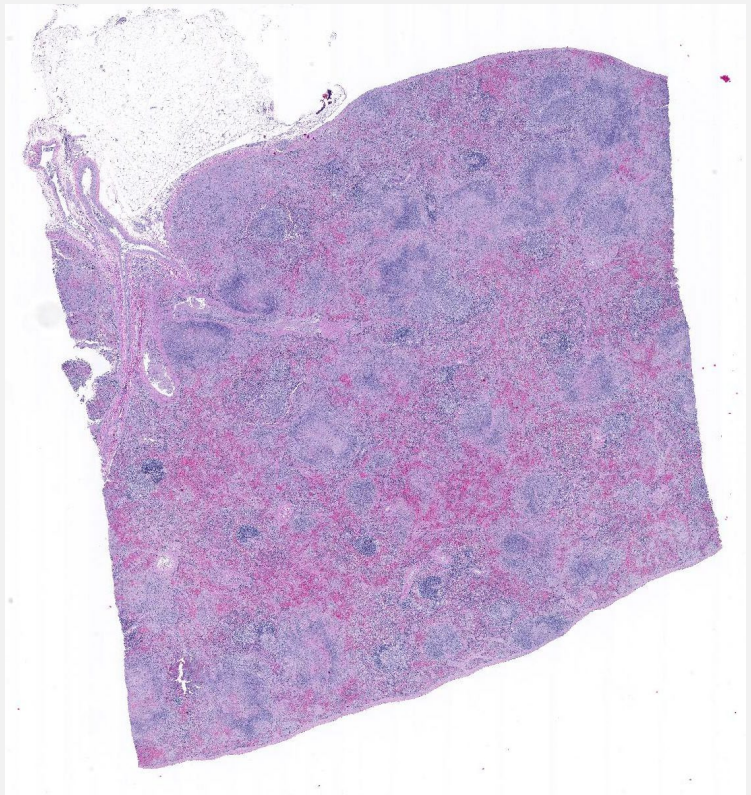
## Abortion panel

| CANINE | $250.00 |
|---|---|
| **Necropsy with cremation** (whole fetus & placenta)<br>**Histopathology**<br>**Bacteriology** (pooled aerobic culture (lung & stomach fluid; *Brucella* & *Campylobacter* culture (stomach fluid)<br>**Molecular Diagnostics / PCR** (CHV on liver)<br>**Serology** (*Brucella* card test on serum from dam) | |

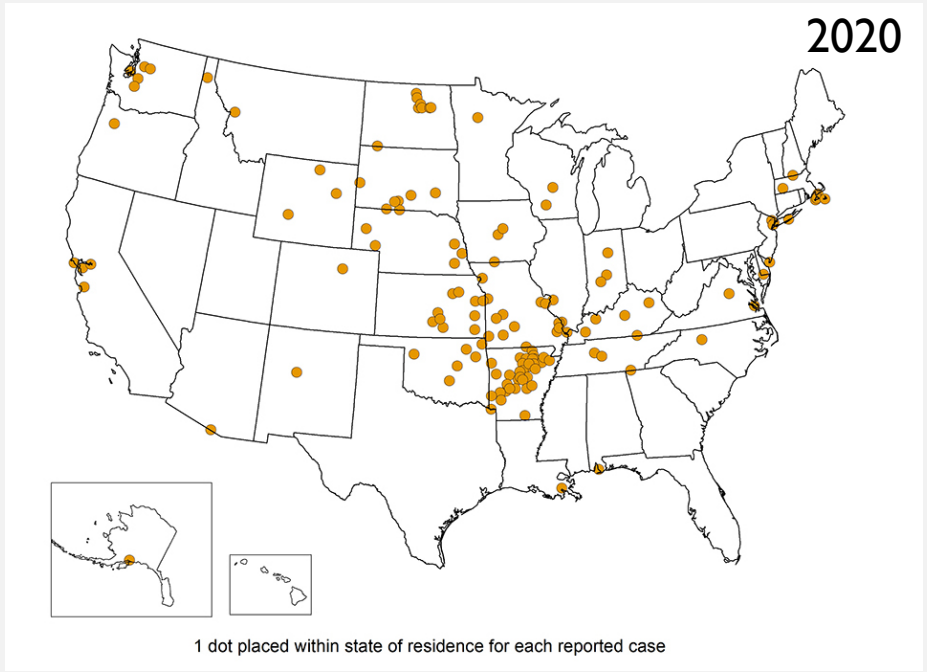
## Diarrhea panel

| CANINE/FELINE | $185.00 |
|---|---|
| Aerobic culture with antibiotic susceptibility<br>*Clostridium perfringens* culture with toxin typing by PCR<br>*Salmonella* culture with antibiotic susceptibility<br>*Campylobacter jejuni* direct culture<br>Parvovirus PCR<br>Centrifugal fecal flotation; direct fecal smear with staining | |

PUBLIC SERVICE ANNOUNCEMENT



https://www.askjpc.org/wsco/wsc_showcase2.php?id=azBPZmcxdzh5V25ocDg2S2VvR1dlQT09




https://www.cdc.gov/tularemia/statistics/index.html

## HHS and USDA Select Agents and Toxins

### 7 CFR Part 331, 9 CFR Part 121, and 42 CFR Part 73

The following biological agents and toxins have been determined to have the potential to pose a severe threat to both human and animal health, to plant health, or to animal and plant products. An attenuated strain of a select agent or an inactive form of a select toxin may be excluded from the requirements of the regulations.

More information can be found at https://www.selectagents.gov/sat/list.htm

**HHS Select Agents and Toxins**

1) Abrin
2) *Bacillus cereus* Biovar *anthracis**
3) Botulinum neurotoxins*
4) Botulinum neurotoxin producing species of *Clostridium**
5) Conotoxins (Short, paralytic alpha conotoxins containing the following amino acid sequence $X_1CCX_2PACGX_3X_4X_5X_6CX_7$)
6) *Coxiella burnetii*
7) Crimean-Congo haemorrhagic fever virus
8) Diacetoxyscirpenol
9) Eastern Equine Encephalitis virus
10) Ebola virus*
11) *Francisella tularensis**
12) Lassa fever virus
13) Lujo virus
14) Marburg virus*
15) Mpox virus
16) Reconstructed replication competent forms of the 1918 pandemic influenza virus containing any portion of the coding regions of all eight gene segments (Reconstructed 1918 Influenza virus)
17) Ricin
18) *Rickettsia prowazekii*
19) SARS-associated coronavirus (SARS-CoV)
20) SARS-CoV/SARS-CoV-2 chimeric viruses resulting from any deliberate manipulation of SARS-CoV-2 to incorporate nucleic acids coding for SARS-CoV virulence factors
21) Saxitoxin

**South American Haemorrhagic Fever viruses:**

22) Chapare
23) Guanarito
24) Junin
25) Machupo
26) Sabia

CDC USDA

# TIME IS OF THE ESSENCE

- Autolysis (rot) is our worst enemy!
  - Precludes gross/histologic evaluation
  - Infectious agents can degrade
  - Toxicants are often stable
    - Some are NOT (e.g., cyanide)

- Autolysis is accelerated by
  - Ambient temperature
  - Obese body condition
  - Fever and inflammation

# A WORD ON SAMPLE COLLECTION

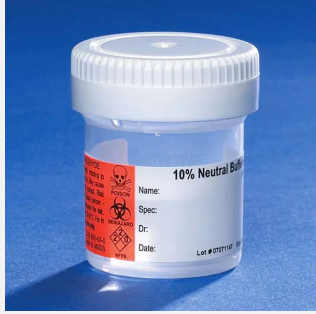
## BACTERIAL

- Culture
  - Aerobic → respiratory, *E. coli*
  - Anaerobic → *Clostridium* spp.
  - Others → what do you suspect?



## VIRAL (MOSTLY)

- Molecular (PCR)
  - NO media!
    - Swab +/- 0.5 ml saline
    - Fresh tissue




# FORMALIN-FIXED SAMPLES

**Postmortem Examination Sheet**

**Date:**_____ **Time:**_____ **Accession Number:**_____

**External Exam:**
- ☐ Body condition
- ☐ Coat color
- ☐ External markings
- ☐ Ear tag(s)
- ☐ Tattoos/brands
- ☐ Shaved areas
- ☐ Abrasions/incisions
- ☐ Catheters
- ☐ Bandages
- ☐ Degree of autolysis

**Body Cavities:**
- ☐ Peritoneum
- ☐ Pleural
- ☐ Pericardial
- ☐ Adipose tissue

**Integumentary System:**
- ☐ Skin
- ☐ Mucocutaneous areas
- ☐ Mammary glands
- ☐ Hooves/claws
- ☐ Foot pads

**Cardiovascular System:**
- ☐ Heart
- ☐ Arteries/veins
- ☐ Lymphatics

**Respiratory System:**
- ☐ Lungs
- ☐ Trachea
- ☐ Larynx
- ☐ Guttural pouches
- ☐ Air sacs

**Gastrointestinal System:**
- ☐ Oral cavity
- ☐ Esophagus
- ☐ Crop
- ☐ Forestomachs
- ☐ Stomach
- ☐ Intestines
- ☐ Liver
- ☐ Pancreas
- ☐ Proventriculus/ventriculus

**Urogenital System:**
- ☐ Kidneys
- ☐ Ureters
- ☐ Urinary bladder
- ☐ Urethra
- ☐ Gonads or Uterus
- ☐ Accessory sex glands
- ☐ Vagina or Penis

**Hemolymphatic System:**
- ☐ Thymus
- ☐ Spleen
- ☐ Lymph nodes
- ☐ Bone marrow

**Endocrine System:**
- ☐ Pituitary gland
- ☐ Thyroid glands
- ☐ Parathyroid glands
- ☐ Adrenal glands

**Musculoskeletal System:**
- ☐ Skeletal muscles
- ☐ Bone
- ☐ Joints

**Nervous System:**
- ☐ Brain
- ☐ Spinal cord
- ☐ Peripheral nerves

**Special senses:**
- ☐ Eyes
- ☐ Ears

**Morphologic Diagnosis(es):** _____

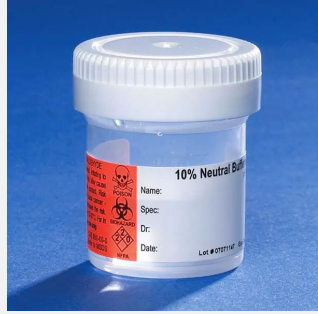
_____

**Conclusions:**

The Big Five:
1. Heart
2. Lung
3. Liver
4. Kidney
5. Spleen

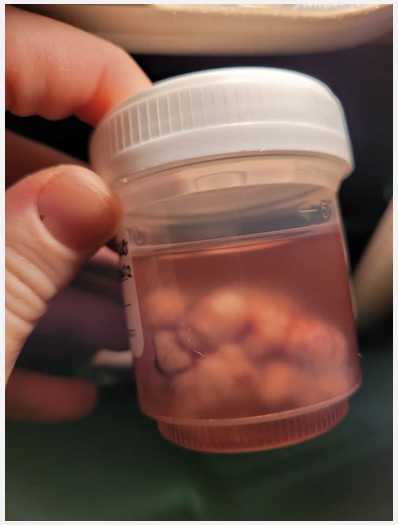
Plus…
- GI
  - Representative sections
- Brain
- Endocrine glands
- Lesions of interest

Bottom line: you only have one chance to collect tissues during a necropsy… better to take too much than too little!

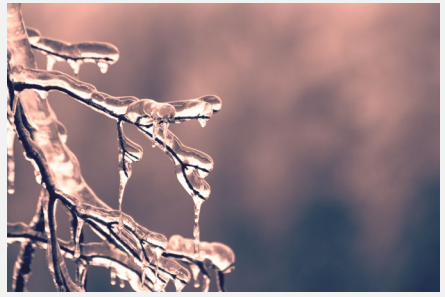


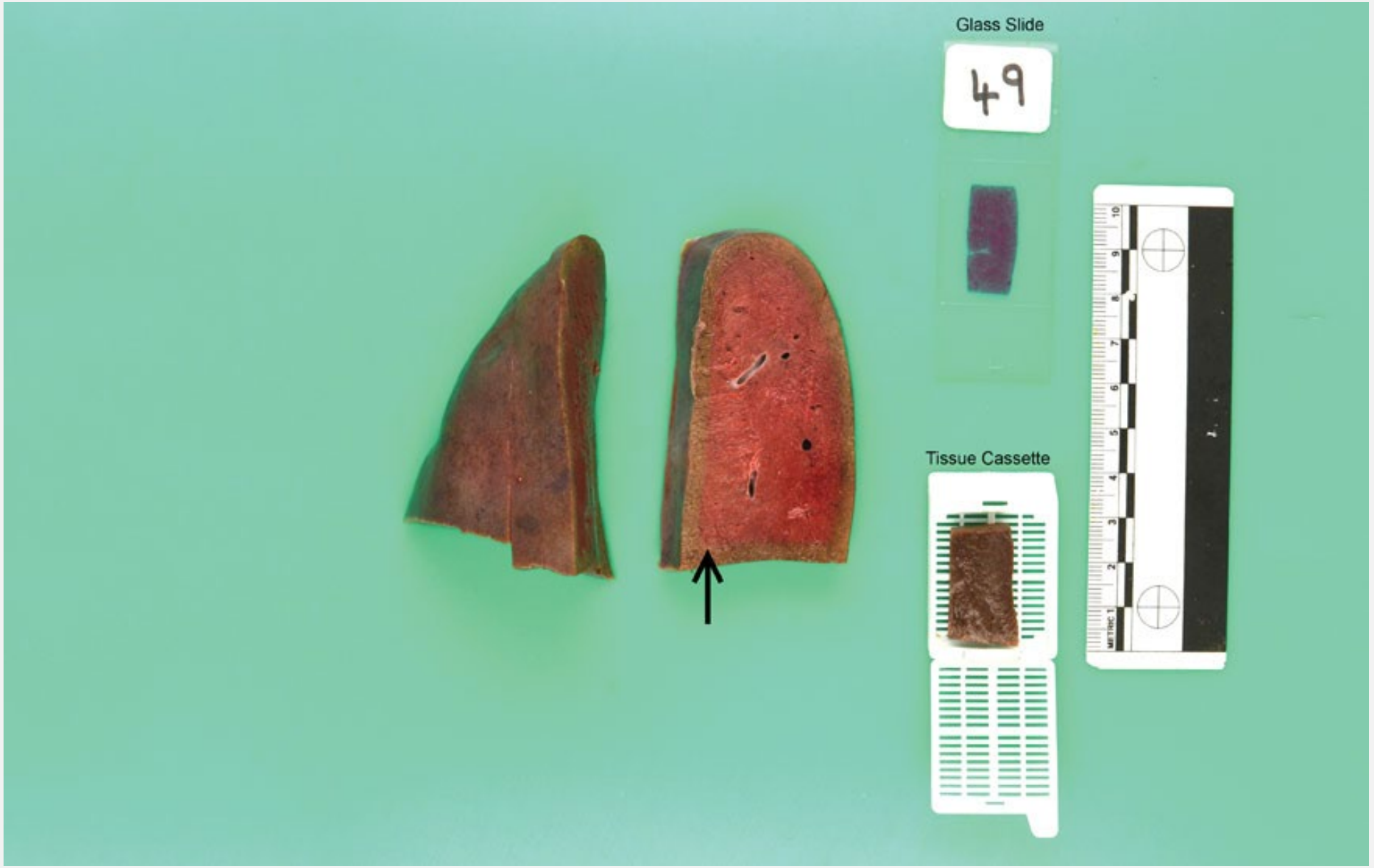

# FORMALIN-FIXED SAMPLES

- 10% formalin
- 1:10 ratio tissue to formalin
- 1 $cm^3$

Note: in winter months, 1:10 ratio ethanol to formalin to prevent freezing!






Royal Veterinary College

# ABOUT ME, CONTINUED…

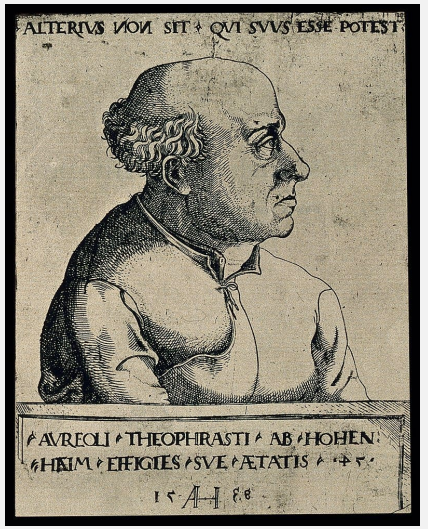
- Have a masters degree in toxicology
- This does NOT mean I'm a toxicologist
  - More of an "enthusiast"
- Currently serve as the toxicology consultant at OADDL


"The Poison Garden"

Alnwick Castle, UK

# TOXICOLOGY 101

"The dose makes the poison" ~Paracelsus (1493-1541)



The Father of Toxicology

HEALTH Health Care Medical Mysteries Science Well+Being

HEALTH & SCIENCE

## Marathon runners who drink too much water are at risk of a deadly condition

By Mark Henricks
October 24, 2011 at 5:24 p.m. EDT

FITNESS

## Strange but True: Drinking Too Much Water Can Kill

In a hydration-obsessed culture, people can and do drink themselves to death.

By Coco Ballantyne on June 21, 2007

FOR JOURNALISTS FOR FACULTY AND STAFF CONTACTS NEWS ARCHIVE 2022 TOP 1

## Excess vitamin E intake not a health concern

April 15, 2013

CORVALLIS, Ore. - Despite concerns that have been expressed about possible health risks from high intake of vitamin E, a new review concludes that biological mechanisms exist to routinely eliminate excess levels of the vitamin, and they make it almost impossible to take a harmful amount.

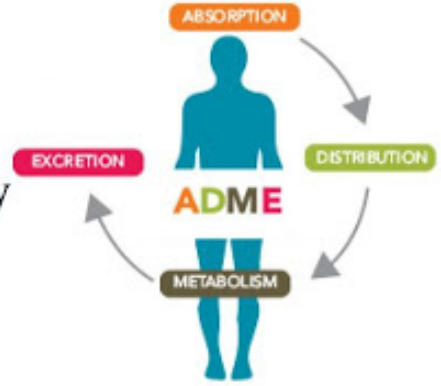
FACT CHECK fact-checking Add Topic +

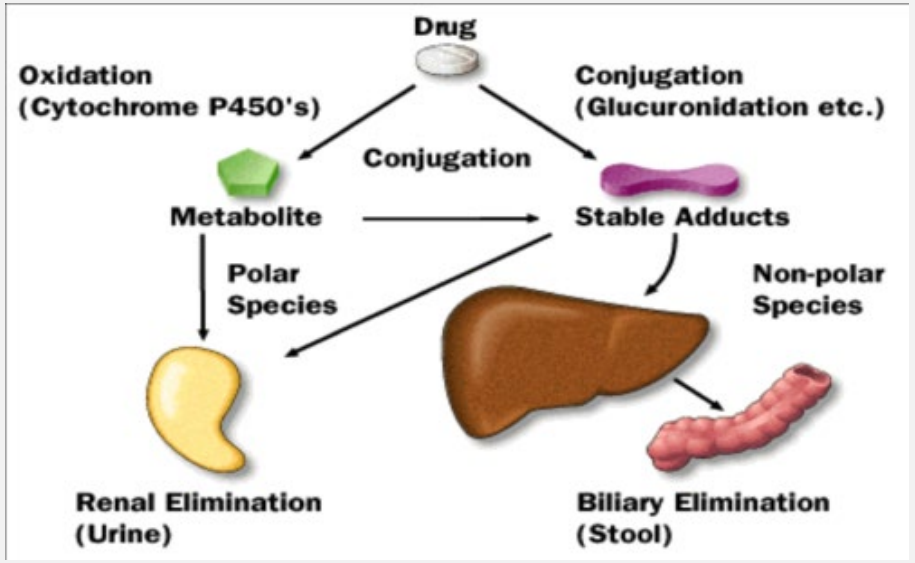
## Fact check: Apple seeds do contain cyanide, but not enough to kill

Ella Lee
USA TODAY
Published 4:43 p.m. ET Aug. 20, 2020

# ADME

- **A**bsorption – process by which the drug enters the body (more specifically the blood)
- **D**istribution – movement of the drug between various compartments in the body
- **M**etabolism – mechanisms by which the drug is structurally altered into another chemical entity
- **E**limination – clearance of drug and its metabolites from the body




The point of metabolism is to take a compound and make it *hydrophilic* enough to excrete…

# VETERINARY TOXICOLOGY

- Less than 1% of reported cases are intentional
  - "Accidental" intention (e.g. giving acetaminophen to a cat)
  - Malicious: less than 0.5% of reported cases
- Dogs most common → cats → everyone else
- Variable results in prosecution and justice

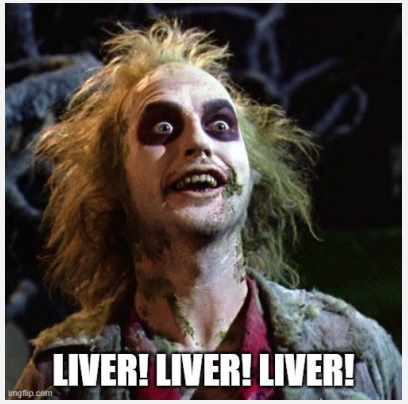
"The neighbor poisoned my dog…"

# WHAT TO SAMPLE?

- Firstly, if you at all suspect nefarious/malicious intent, best to punt to the lab…

- Toxicological samples:
  - Liver
  - Kidney
  - GI contents
  - Others


# WHAT TO SAMPLE?




- Liver
  - ~100 grams
  - FRESH (not formalin-fixed)

The steak pictured is about 100g and the thickness of a deck of cards

# WHAT TO SAMPLE?

- Kidney
  - Again, ~100 grams
  - +/- urine
    - ~5-10 ml

- Good for nephrotoxins…
  - Can you think of any *seasonal* nephrotoxins?

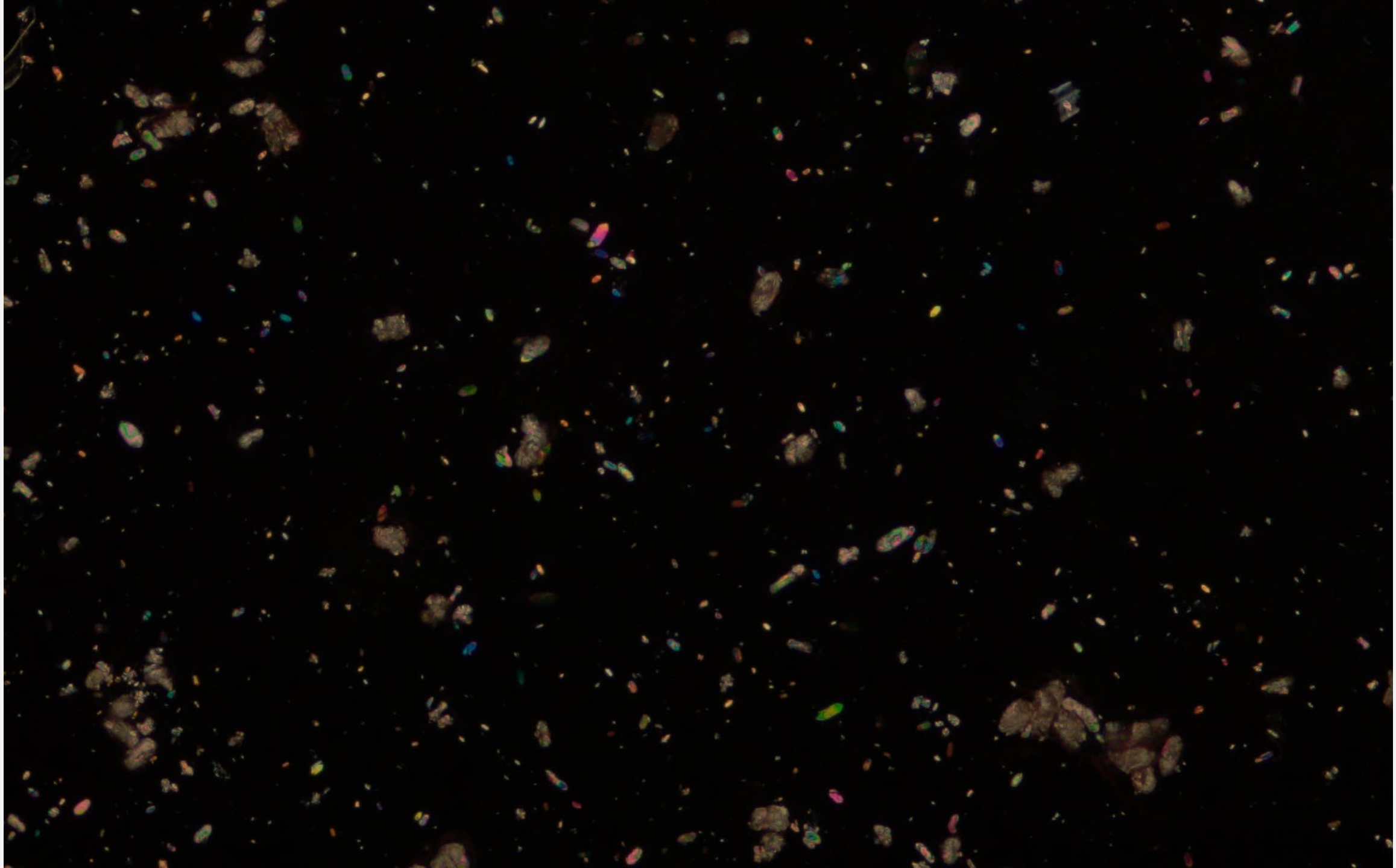
Jankowski, M.A., et al. (2013). Kidney biopsy in dogs and cats. Pakistan Veterinary Journal, 33, 133-138.

# ETHYLENE GLYCOL

- Lethal dose
  - 6.6 ml/kg in dogs
  - 1.5 ml/kg in cats
- EG is oxidized by ADH in the liver → →
  - Glycoaldehydes
  - Glycolic acid
  - Glyoxylate
  - Oxalate
- Clinical presentation
  - Peracute (30 minutes – 12 hours)
    - Intoxication, GI signs
    - CNS signs
    - May briefly "recover"
  - Acute (12-72 hours)
    - Oliguric to anuric renal failure
- Metabolic acidosis; acidic, isosthenuric urine; crystalluria

# ETHYLENE GLYCOL

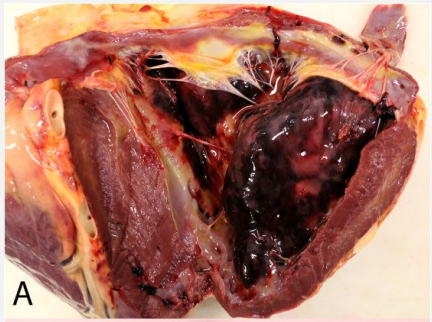
Dr. Raquel Rech (my wonderful mentor), Texas A&M University



# WHAT TO SAMPLE?

- Stomach contents
  - ~50-100 grams
  - Good for acute deaths (<6-8 hours from suspected exposure)

- Heart blood
  - 5-10 ml
  - Again, think acute deaths…




- Others
  - Brain
  - Adipose tissue
  - Lung

**Table 1.** Sample Collection For Toxicology.

| Sample | Amount | Storage | Analysis |
|---|---|---|---|
| Liver | 300 g | Chilled, frozen | Heavy metals, pesticides, pharmaceuticals |
| Kidney | 300 g | Chilled, frozen | Heavy metals, ethylene glycol (Ca:P ratio), pharmaceuticals, plant toxins |
| Brain | Half brain | Chilled, frozen (unfrozen for acetylcholinesterase activity) | Sodium, acetylcholinesterase activity, pesticides |
| Fat | 300 g | Chilled, frozen | Organochlorines, PCBs, bromethalin |
| Ocular fluid | Entire eye | Chilled | Potassium, nitrates, magnesium, ammonia |
| Retina | Entire eye | Chilled, not frozen | Acetylcholinesterase activity |
| Lung/spleen | 100 g | Chilled, frozen | Paraquat, barbiturates |
| Lung | Entire lobe | Chilled, placed in airtight container | Volatile agents |
| Injection site | 100 g | Chilled | Pharmaceuticals |
| Whole blood | 5–10 mL | Chilled | Heavy metals, acetylcholinesterase activity, insecticides |
| Serum | 5–10 mL | Chilled | Some metals, pharmaceuticals, alkaloids, electrolytes |
| Urine | 5–100 mL | Chilled | Pharmaceuticals, heavy metals, alkaloids |
| Milk | 30 mL | Chilled | Organochlorines, PCBs |
| Ingesta/feces | $\leq$500 g | Chilled | Metals, plants, mycotoxins, other organic toxicants |
| Hair | 3–5 g | Dry, store in paper | Pesticides, some heavy metals |
| Feed | 1 kg composite | Dry: store in paper<br>Wet: freeze | Ionophores, salt, pesticides, heavy metals, mycotoxins, nutrients, botulism |
| Plant | Entire plant, $\geq$2 samples | Dry; press between sheets of newspaper | Alkaloids, glycosides, nitrates, pesticides |
| Water | 1–2 L | Glass containers | Pesticides, heavy metals, salt, nitrates, blue-green algae |
| Soil | 500 g | Glass containers | Pesticides, heavy metals |
| Insects, insect casings | 3–5 g ($\sim$100 maggots)[a] | Live: glass vials[b]<br>Dead, casings: glass vials | Live: forensic entomology<br>Dead: testing for pharmaceuticals, heavy metals, organic toxicants |

[a]Include representatives from all life cycles present.
[b]Place half in vial (no more than 1 maggot thick at bottom) with moist paper towel and raw meat, seal carefully to prevent escape; place other half in 75–90% ethanol or 50% isopropyl in glass vials.

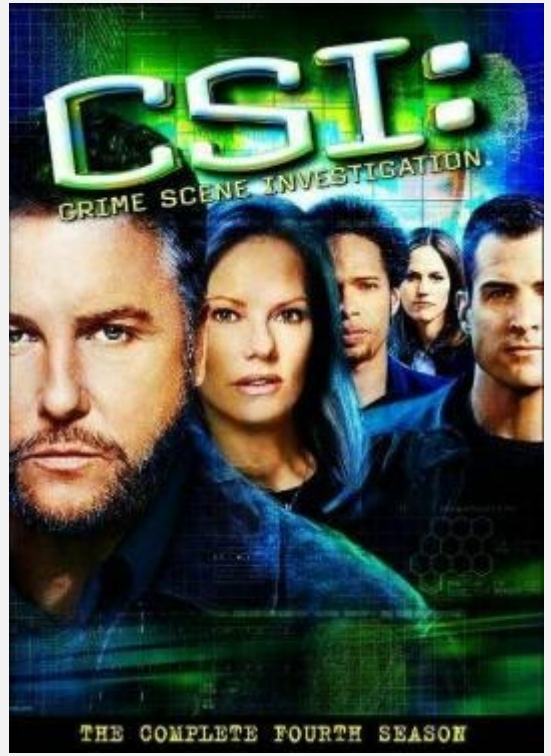
Gwaltney-Brant SM. Veterinary Forensic Toxicology. Vet Pathol. 2016 Sep;53(5):1067-77.

# SOME CAVEATS

- Toxicological analysis requires LARGE sample sizes
  - Dry weights drastically reduce initial sample size
- Toxicological analysis can be EXPENSIVE
  - Lots of different instrumentation
  - Client communication is important
- Toxicological analysis can be TIME-CONSUMING
  - See above

# ONE MORE CAVEAT

- This isn't CSI
  - There's no such thing as a one-size-fits-all "toxicology screen"
    - Some compounds require gas vs liquid chromatography
  - However… lots of tox screens out there
    - Helps to know what you're suspecting!



| Name ↑ | Description | Species | Price | |
|---|---|---|---|---|
| Drug Screen – Drugs of Abuse (LC/MS) | Detection of amphetamines, benzodiazepines, promazines, barbiturates, opiates, marijuana, and other drug types by liquid chromatography/mass spectrometry. Targets include: amphetamine, methamphetamine, MDMA, MDA, bromazepam, demoxepam, diazepam, etizolam, flunitrazepam, lorazepam, midazolam, nordazepam, prazepam, temazepam, acepromazine, 2-(1-hydroxyethyl) promazine sulfoxide (2-heps), chlorpromazine, propionylpromazine, promethazine, allobarbital, aprobarbital, phenobarbital, pentobarbital, secobarbital, alfentanil, buprenorphine, butorphanol, codeine, fentanyl, heroin, hydrocodone, levorphanol, morphine, oxymorphone, […] Specimen: 5 mL serum or 10 mL urine | Bovine, Camelid, Canine, Caprine, Equine, Feline, Ovine, Porcine | $150.00 | Details |
| Drug Screen – NSAIDs (LC/MS) | Detection of NSAIDs by liquid chromatography/mass spectrometry. Standard targets include acetaminophen, carprofen, celecoxib, deracoxib, ethacrynic acid, etodolac, fenoprofen, firocoxib, flufenamic acid, flunixin, flurbiprofen, indomethacin, indoprofen, ketoprofen, ketorolac, mefenamic acid, naproxen, oxyphenbutazone, phenylbutazone, piroxicam, tenoxicam, tolfenamic acid, and tolmetin. Detection of acetylsalicylic acid (aspirin), salicylic acid, and salicylates is available for an additional fee (50% of […] Specimen: 5 mL serum | Bovine, Canine, Caprine, Cervid, Equine, Exotic, Feline, Ovine, Porcine | $80.00 | Details |

When in doubt, give us a call!

**Pathogen:** Mass Spectrometry Toxicant Screen
**Species:** All Species
**Section:** Analytical Chemistry Services
**Test:** GC-MS and LC-MS
**Standard Fee:** $200.00
**Days Tested:** Tu
**Turn-Around:** 1-3 days
**Specimen:** feed (200g), GI contents (50g), water (100mL), serum/plasma (5mL), tissues (50g)
**Additional Comments:** The gas chromatography-mass spectrometry (GC-MS) screen offers the possibility of detecting potential toxicants in a sample. Data is matched to a library of mass spectra that includes more than 200,000 compounds. The GC-MS screen is capable of detecting pesticides (organophosphorus, carbamate, pyrethroid, and chlorinated), industrial pollutants, natural products, alkaloids, vitamins, and drugs. This test will not detect mycotoxins, heavy metals, anticoagulants, or ionophores. The liquid chromatography-mass spectrometry (LC-MS) screen offers possibility of detecting potential toxicants in a sample. Data is matched to a library containing more than 9 million spectra. The LC-MS screen is capable of detecting a wide variety of environmental contaminants and toxicants as well as drugs (antibiotics, anthelmintics, growth promoters, and ionophores). This test will not detect chlorinated pesticides and heavy metals. If the specimen of interest is not listed or if you have questions regarding suspected compounds, please contact the lab for further information.

# VETERINARY TOXICOLOGY LABS

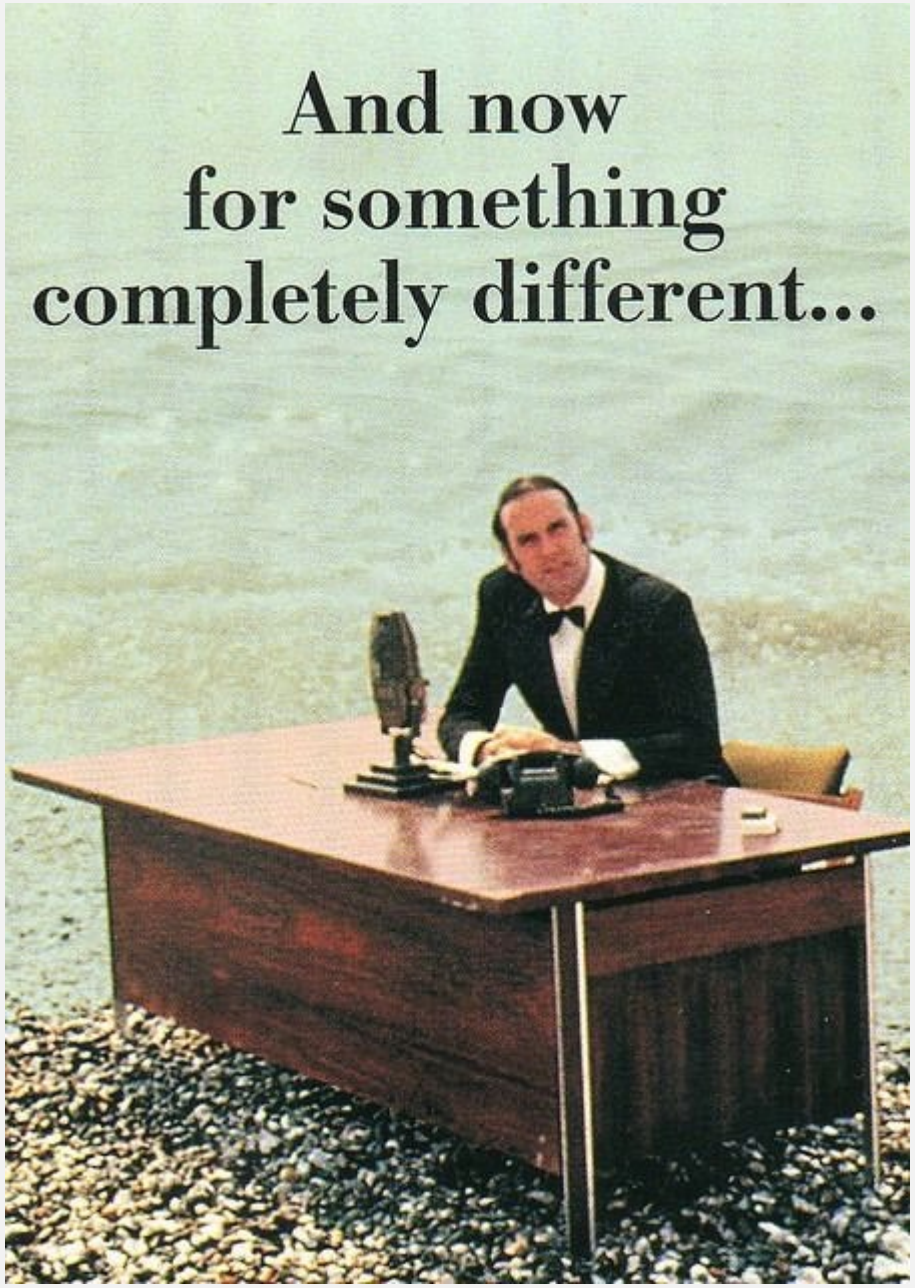
- Not every lab has in-house toxicology testing…
  - *Very* small handful of veterinary toxicologists out there
  - AAVLD-accredited


NDSU VETERINARY DIAGNOSTIC LABORATORY

IOWA STATE UNIVERSITY
Veterinary Diagnostic Laboratory


UK UNIVERSITY OF KENTUCKY College of Agriculture
UKVDL

Kansas State Veterinary DIAGNOSTIC LABORATORY


And now
for something
completely different...

# THE TELL-TALE HEARTS

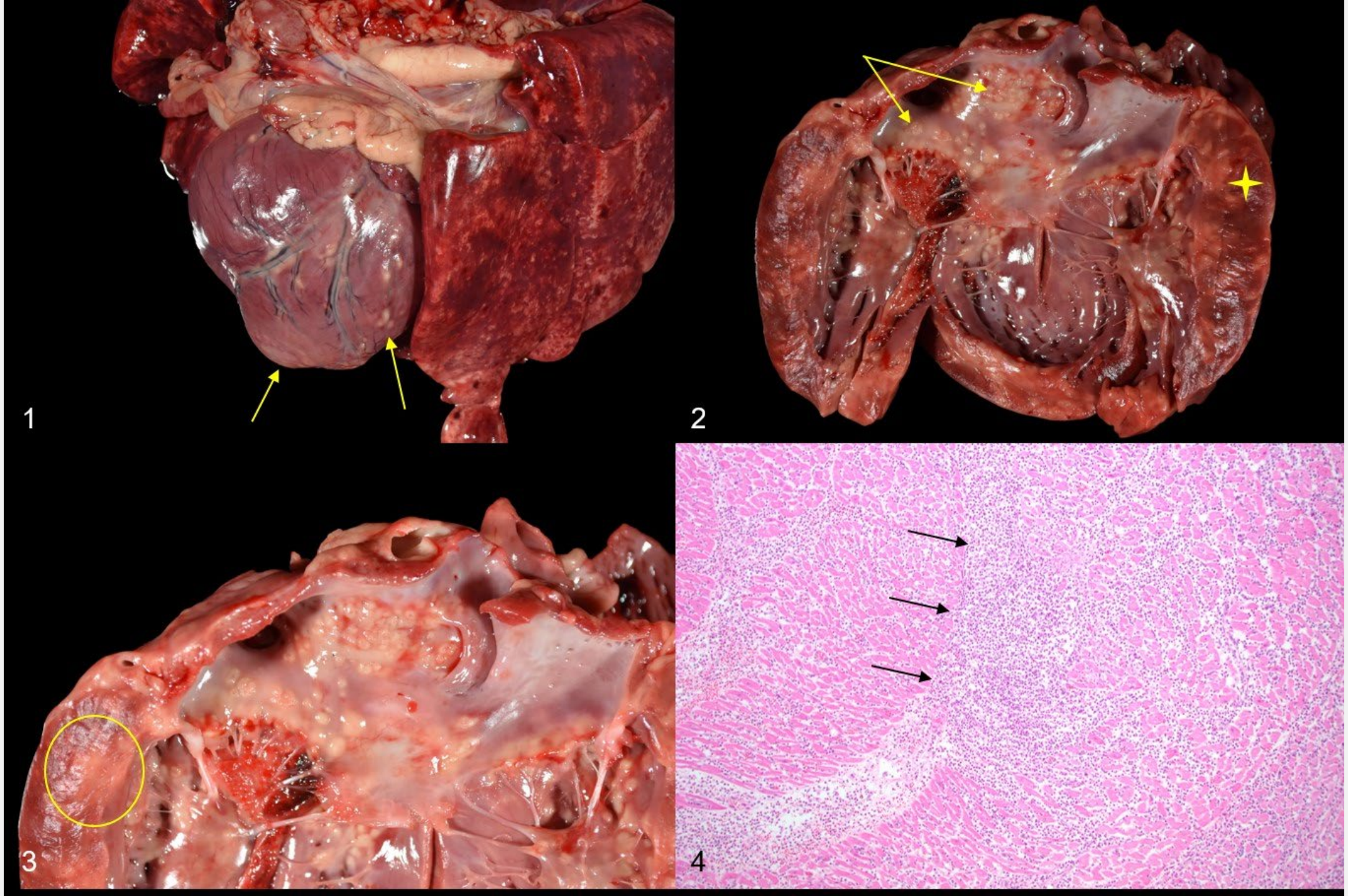
- Two dogs, two cases of myocarditis, two different causes…
- Case 1 → Oklahoma
- Case 2 → Texas

OADDL
College of Veterinary Medicine

# CASE 1

- 1-year-old MI Border Collie

- History:
  - Acute onset of fever, lethargy, ataxia
  - Initially improved with enrofloxacin and doxycycline
  - Began to decline → added prednisone
  - Died 4 days after onset of clinical signs


1
2
3
4

# CASE 1


- *Bartonella henselae*
  - "cat scratch fever"
  - Dogs, humans >>> cats
    - Also whales

- Transmitted by ticks and fleas
  - Direct vector-borne transmission
  - Flea dirt under kitty nails
  - Other routes… translation: be careful!

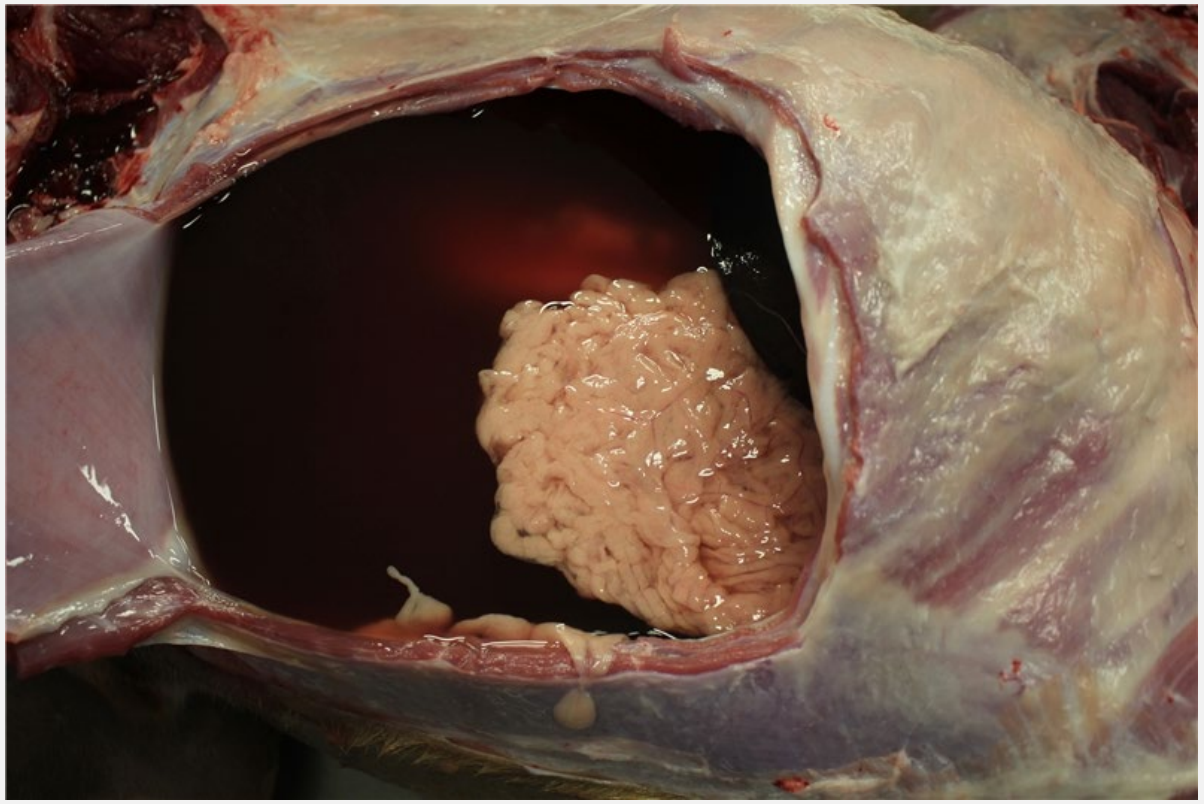
- Canine and feline serology (IFA) available
  - Some PCR assays out there

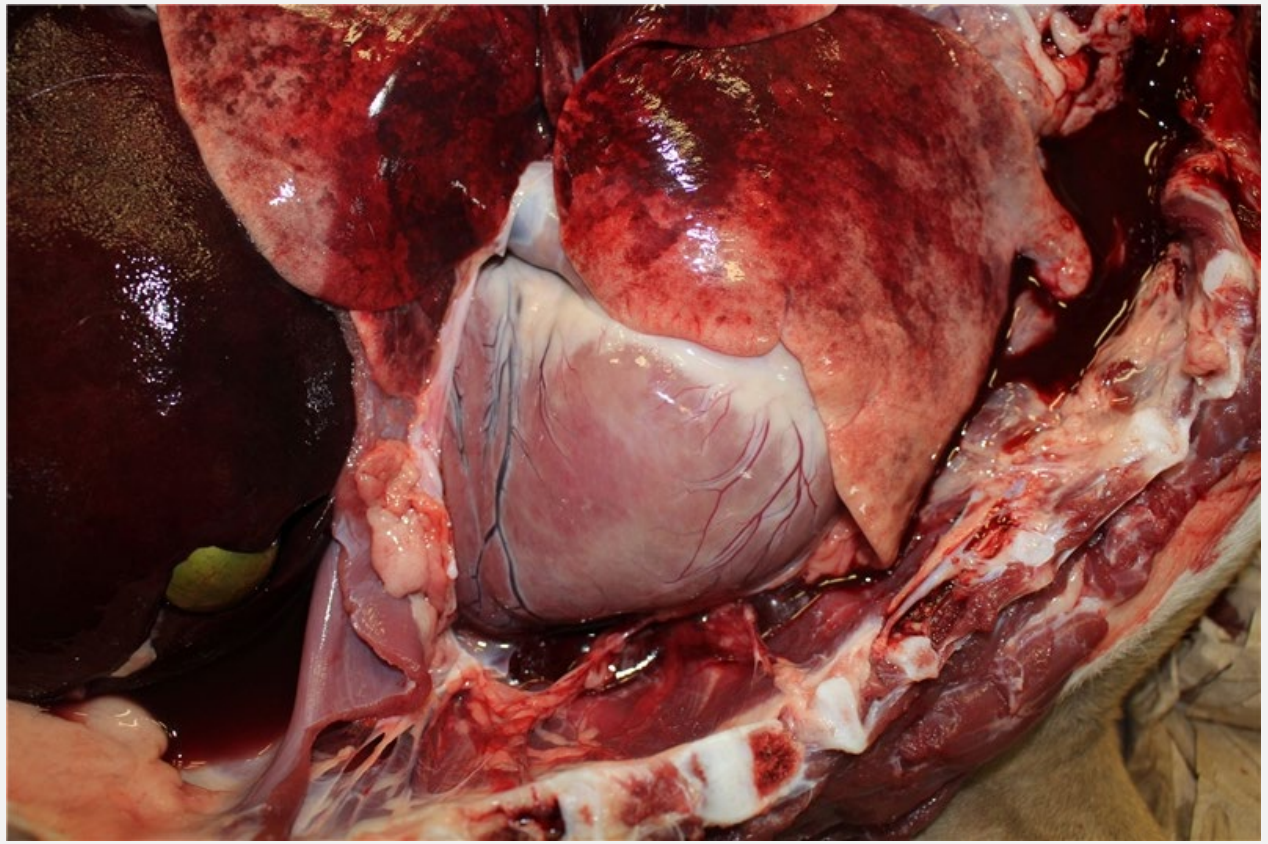
# CASE 2

- 2-year-old MI German Shorthaired Pointer

- History:
  - Active working dog
  - Acute onset of lethargy, vomiting
  - Died 2 days after onset of clinical signs

# CASE 2





Dr. Raquel Rech (my wonderful mentor), Texas A&M University

# DAMNITV

- Differentials?
  - Degenerative or Developmental
  - Anomalous
  - Metabolic or Mechanical
  - Neoplastic or Nutritional
  - Idiopathic, Inflammatory, or Immune-mediated
  - Toxic or Traumatic
  - Vascular

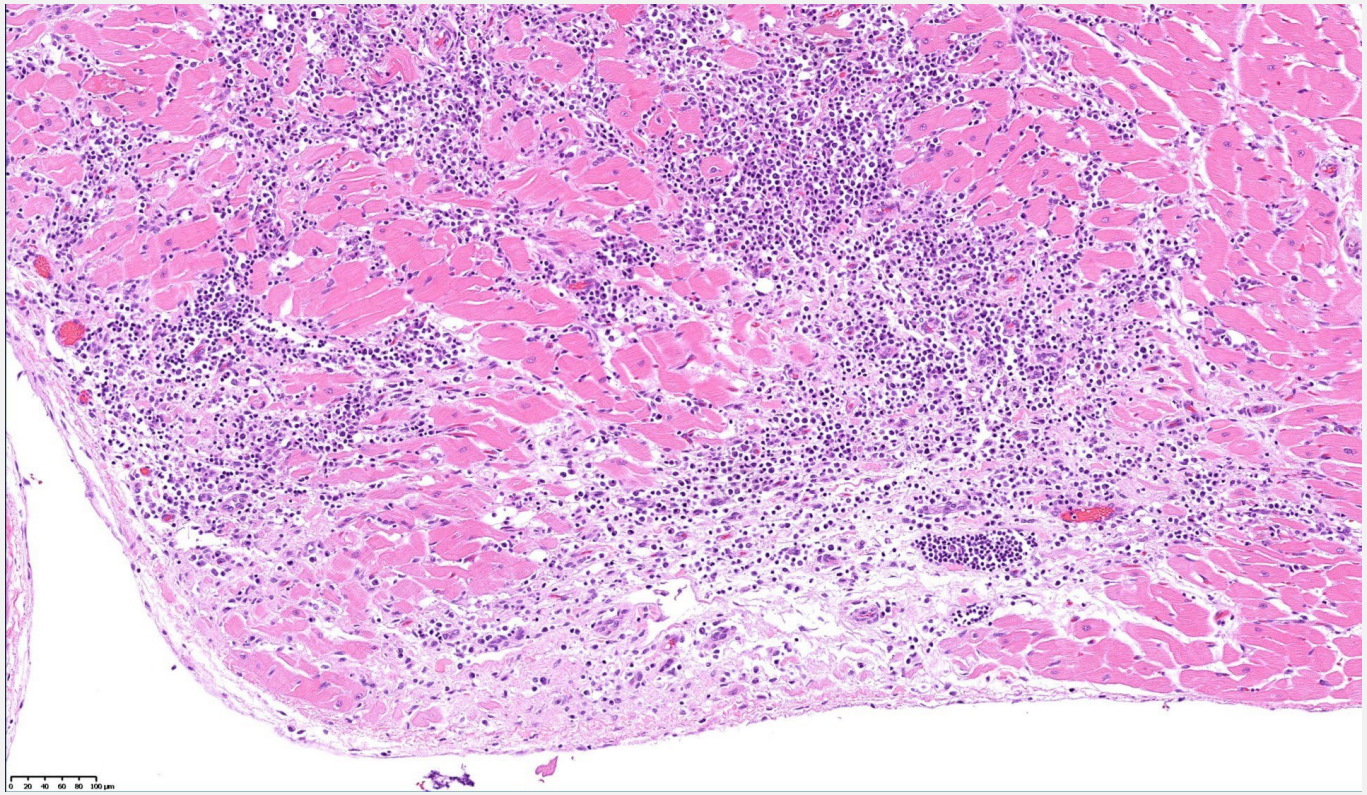
# DAMNITV

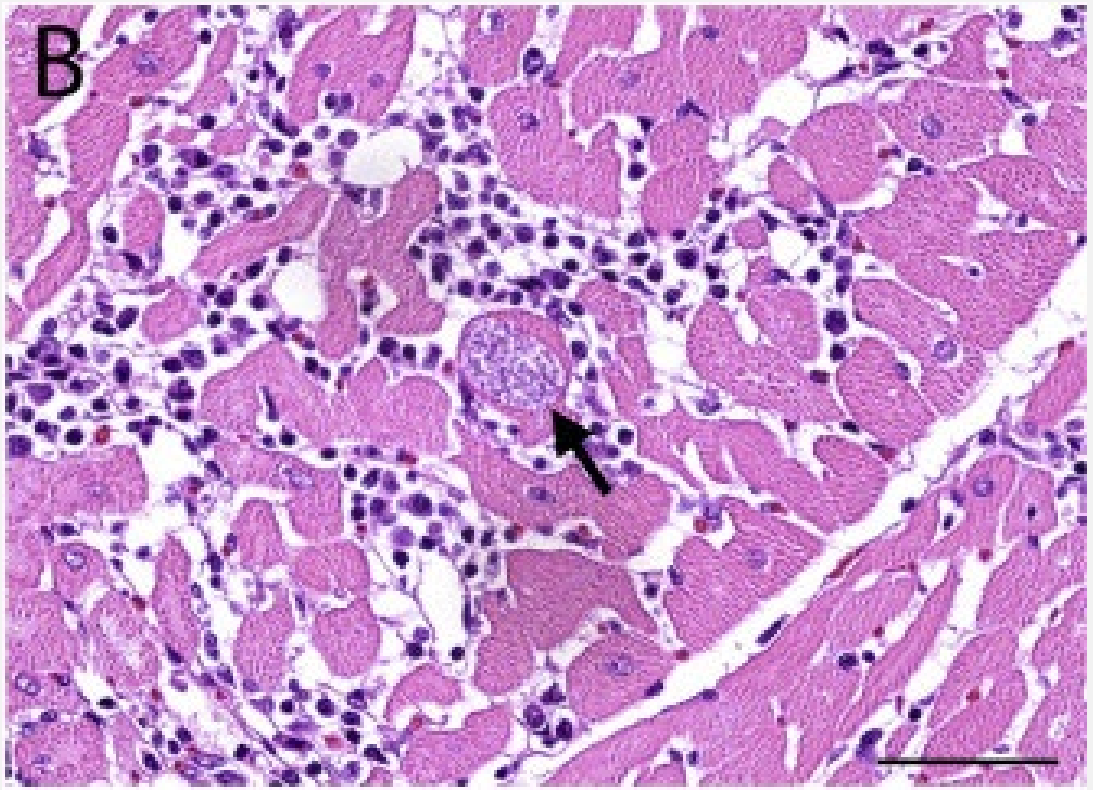
- Differentials?
  - Degenerative → valvular disease, pheochromocytoma
  - Anomalous → congenital anomaly
  - Metabolic → ?
  - Neoplastic → kinda young, but you never know
  - Nutritional → grain-free or other diet
  - Idiopathic
  - Inflammatory → non-infectious vs. infectious
  - Immune-mediated → ?
  - Toxic → lots of cardiotoxins out there
  - Traumatic → ?
  - Vascular → ?

# INFECTIOUS CAUSES

- Parasitic
  - *Dirofilaria immitis*
- Bacterial
  - *Bartonella henselae*
  - *Erysipelothrix rhusio.*
  - Tick-borne
  - Others
- Viral
  - West Nile Virus
  - Parvovirus (neonates)
- Fungal
- Protozoal
  - *Leishmania* spp.
  - Others…?

# SAY HELLO TO MY LITTLE FRIEND





# CHAGAS DISEASE

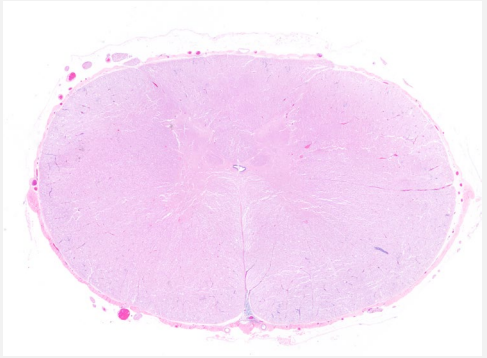
- *Trypanosoma cruzi*
- Transmission:
  - Triatomine "kissing bugs"
    - In vector feces → enters wounds or mucous membranes
  - Numerous wildlife reservoirs
    - Cats are more likely carriers
- Fatal myocarditis in dogs, humans, others
  - Infected for life

Carlos Chagas

Shoutout to soon-to-be Dr. Karigon Rion for bringing this to our attention!

# CHAGAS DISEASE IN OKLAHOMA

- 3.6% seroprevalence in ~300 owned or shelter dogs (Bradley et al., 2000)
  - 13.2% in shelter dogs (K. Allen, OSU)
- 62.5% seroprevalence in raccoons* (John and Hoppe, 1986)
- 0.27% prevalence in Mexican free-tailed bats (Nichols et al., 2017)



# CHAGAS DISEASE

November 8, 2023

Animal Health SmartBrief
In partnership with the American Veterinary Medical Association

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News for animal health professionals SIGN UP · SHARE

VETERINARY MEDICINE UPDATE

## Thousands of dogs in US infected with Chagas disease

Nearly 13% of dogs in the US have Chagas disease, a parasitic infection transmitted through the bite of an infected kissing bug, by consuming an infected bug or contaminated food, or from a mother dog to her puppies. Signs of the disease include lethargy, fever and swollen lymph nodes, but 95% of the cases veterinarian Roy Madigan sees are asymptomatic, and owners of dogs with Chagas disease should be tested themselves, says Dr. Madigan, who leads the Canine Chagas Treatment Study at Joint Base San Antonio.**Full Story:** KSAT-TV (San Antonio) (11/7)

# LAST BUT NOT LEAST

# IMPOSTER SYNDROME

- 4-year-old MN DSH

- History:
  - Progressive weight loss and anorexia over ~4 months
  - Icterus
    - Increases in ALKP, ALT, GGT, globulin, total bilirubin
  - Abdominal U/S: splenomegaly, lymphadenomegaly

- Presumed clinical diagnosis: cholangiohepatitis (medically managed)

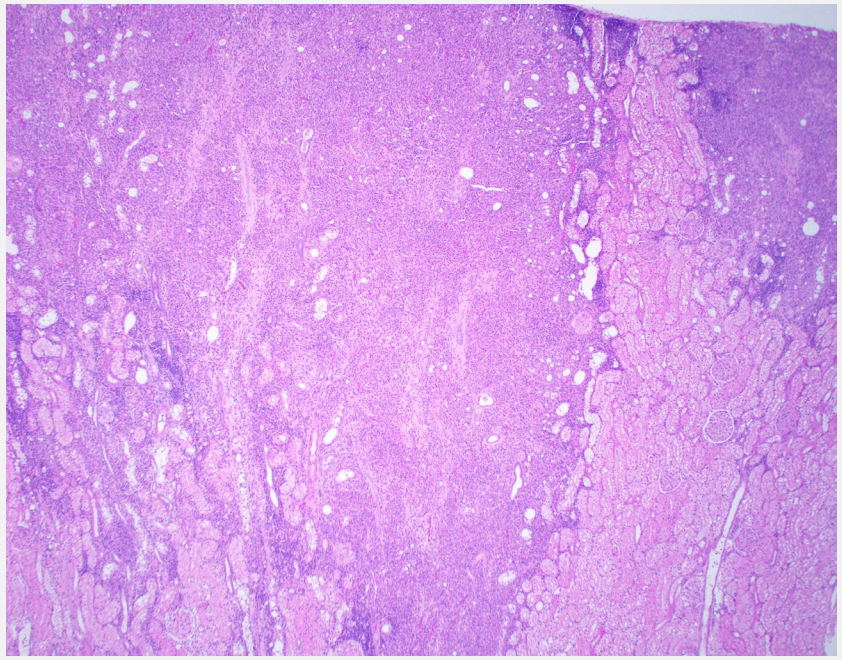
# IMPOSTER SYNDROME

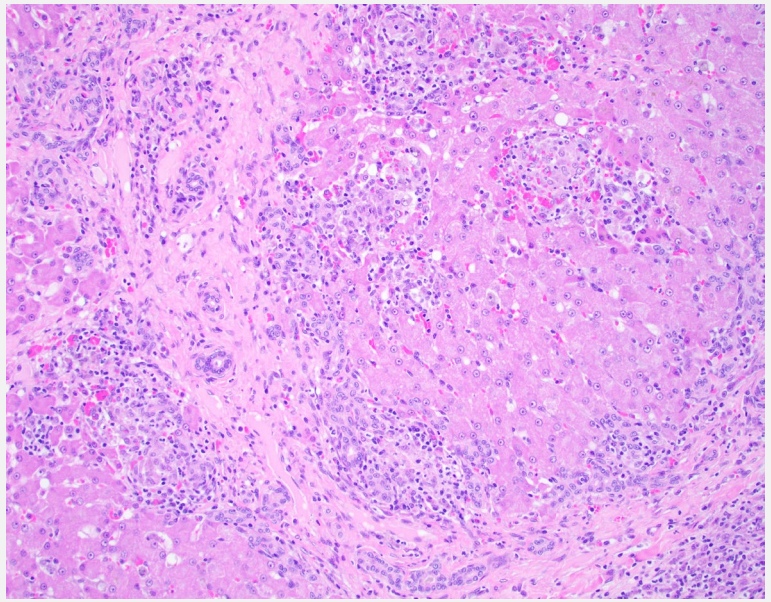
- Recheck at 7 days:
  - Icterus and hyperbilirubinemia resolved
  - 6-fold increase in ALKP, ALKT, GGT

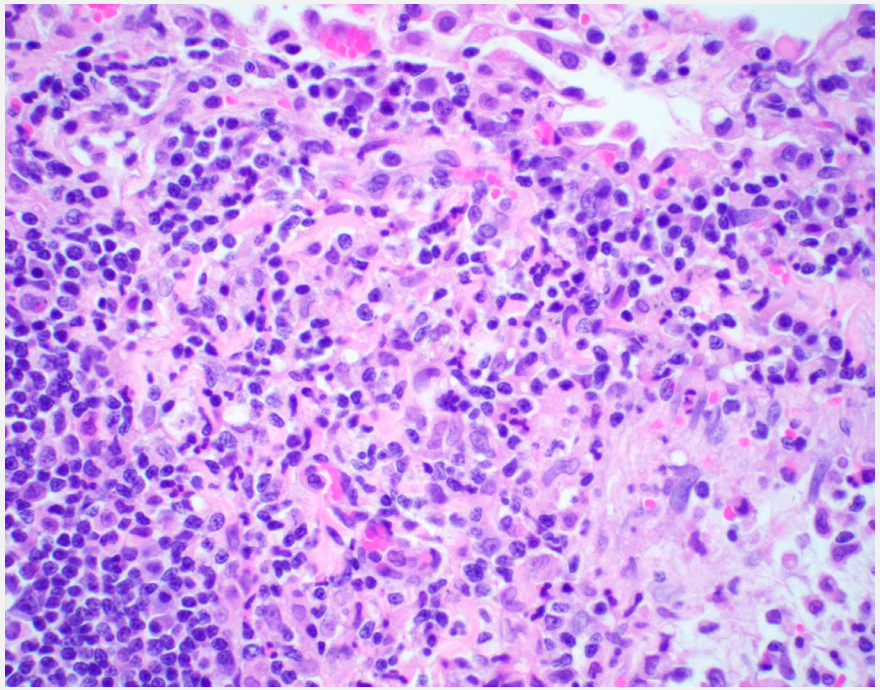
- Additional diagnostics:
  - Liver and spleen cytology aspirates unremarkable
  - *Toxoplasma gondii* PCR and serology: negative
  - FeLV, FIV: negative
  - *Dirofilaria immitis*: negative
  - *Histoplasma* spp. quantitative urine antigen testing (MiraVista): negative 2X

- Unfortunately euthanized due to poor prognosis

# HISTOPATHOLOGY

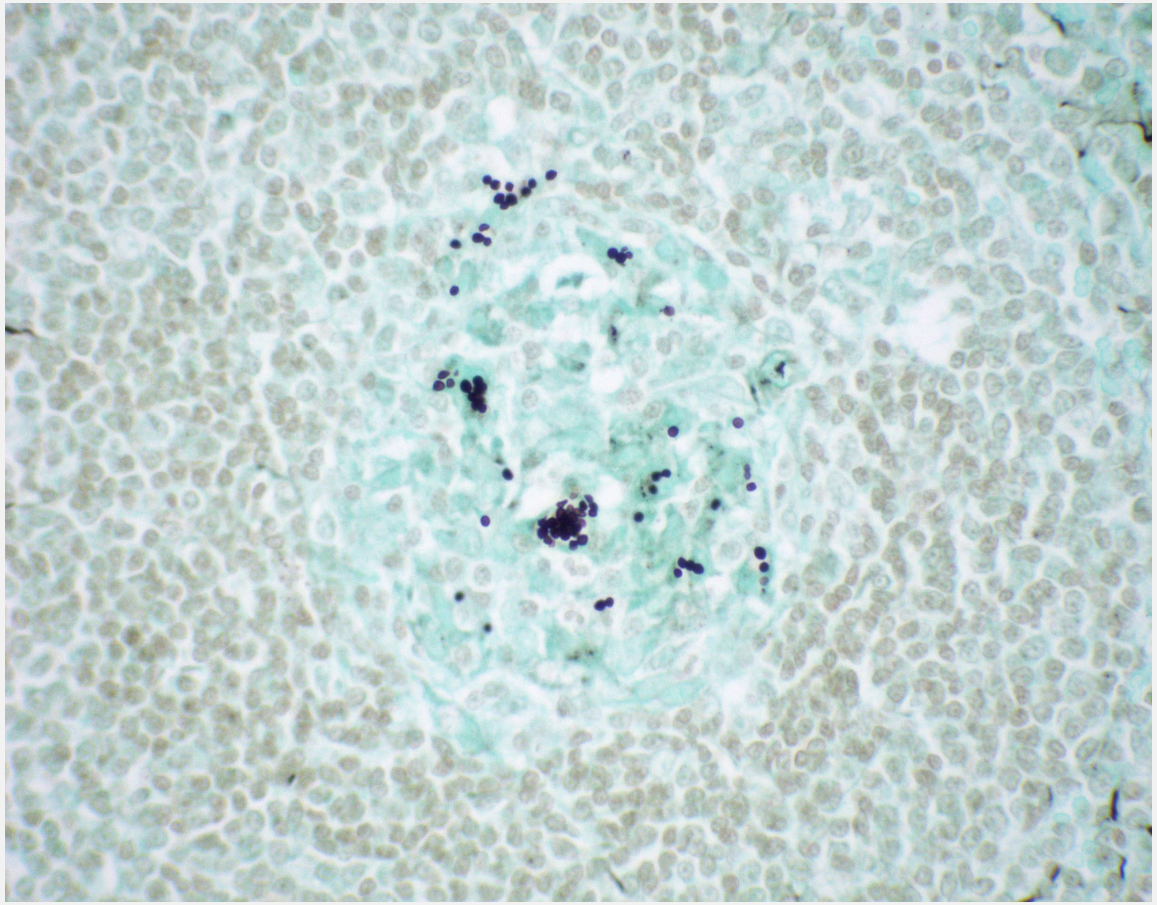


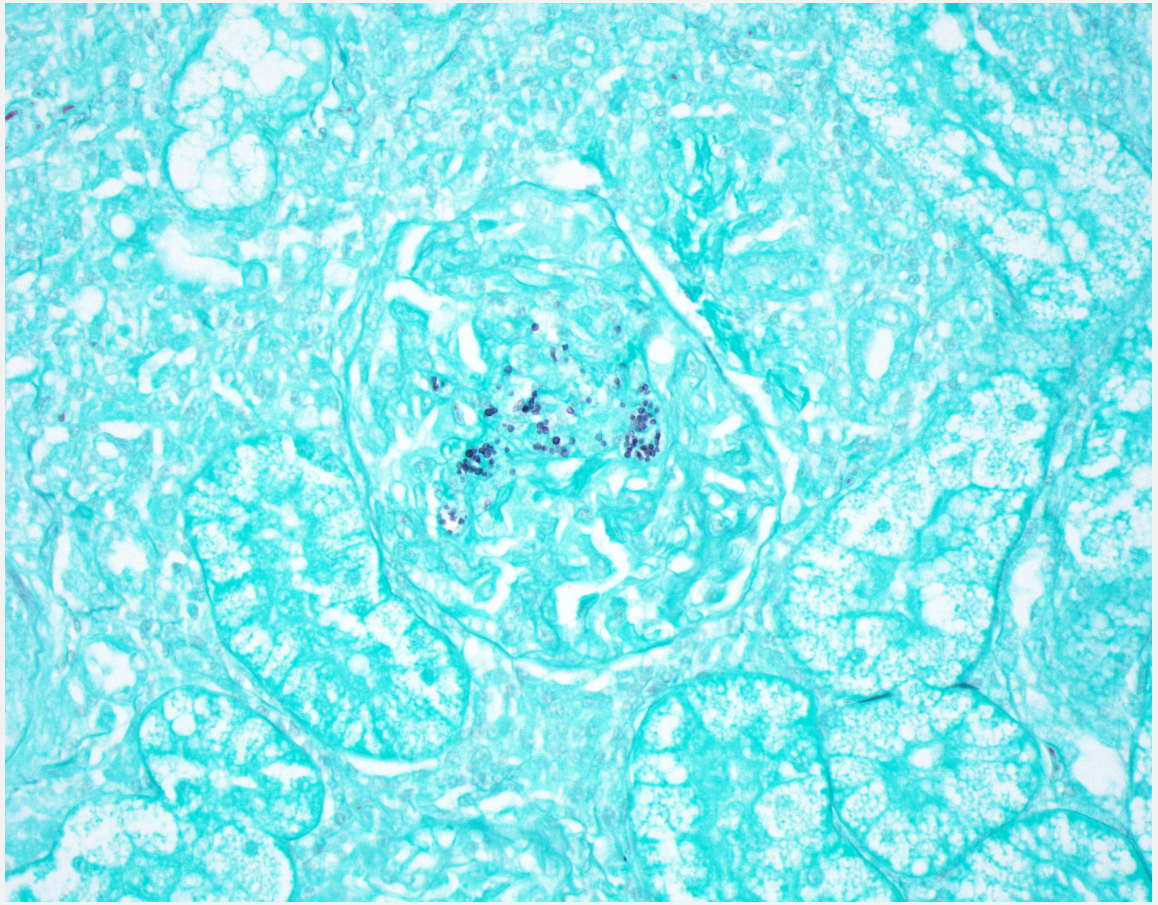




H&E stain

# HISTOPATHOLOGY





GMS special stain

# WAIT A MINUTE…

- Antemortem diagnostics: *Histoplasma* spp. quantitative antigen testing
  - MiraVista Veterinary Diagnostics
  - Negative on 5/6/2022 and 8/9/2022

- University of Florida CVM Molecular Fungal ID Laboratory
  - FFPE sections of liver and kidney for Panfungal PCR and sequencing
  - 99.85% identity with *Cystofilobasidium* spp.

Courtesy of Dr. Scott Mitchell DVM, DACVP

# CYSTOFILOBASIDIUM SPP.

- Sexual stage of *Cryptococcus* spp.
  - Single case report in human literature (meningoencephalitis)
  - No veterinary cases reported

- Histologically nearly identical to *Histoplasma* spp.!

- Ultimately: It is unclear if this is an exceedingly rare infection, if it rarely causes clinical disease and is thus underreported, or is frequently misdiagnosed as histoplasmosis

Courtesy of Dr. Scott Mitchell DVM, DACVP

# ANY QUESTIONS?