



Paving The Way For Regulated FIP Treatment in Canada in 2022: Case Series Study Combining GS-441524 and Mefloquine

Presented by Dr. Jeff Aramini

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- Duration: 60 minutes, including Q&A.
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Meet Our Speaker

Dr. Jeff Aramini, DVM, PhD, MSc, EMTM

- Veterinarian, epidemiologist, and healthcare entrepreneur
- Graduated from the Western College of Veterinary Medicine
- President and co-founder of PetNation



21 January, 2026 | Clearpoint Pharmacy



Paving the way for Regulated FIP Treatment in Canada in 2022 - Dr. Jeff Aramini

Case Series Study Combining GS-441524 and Mefloquine

Acknowledgements



Sue Namedof



Dr. Oren Levstein

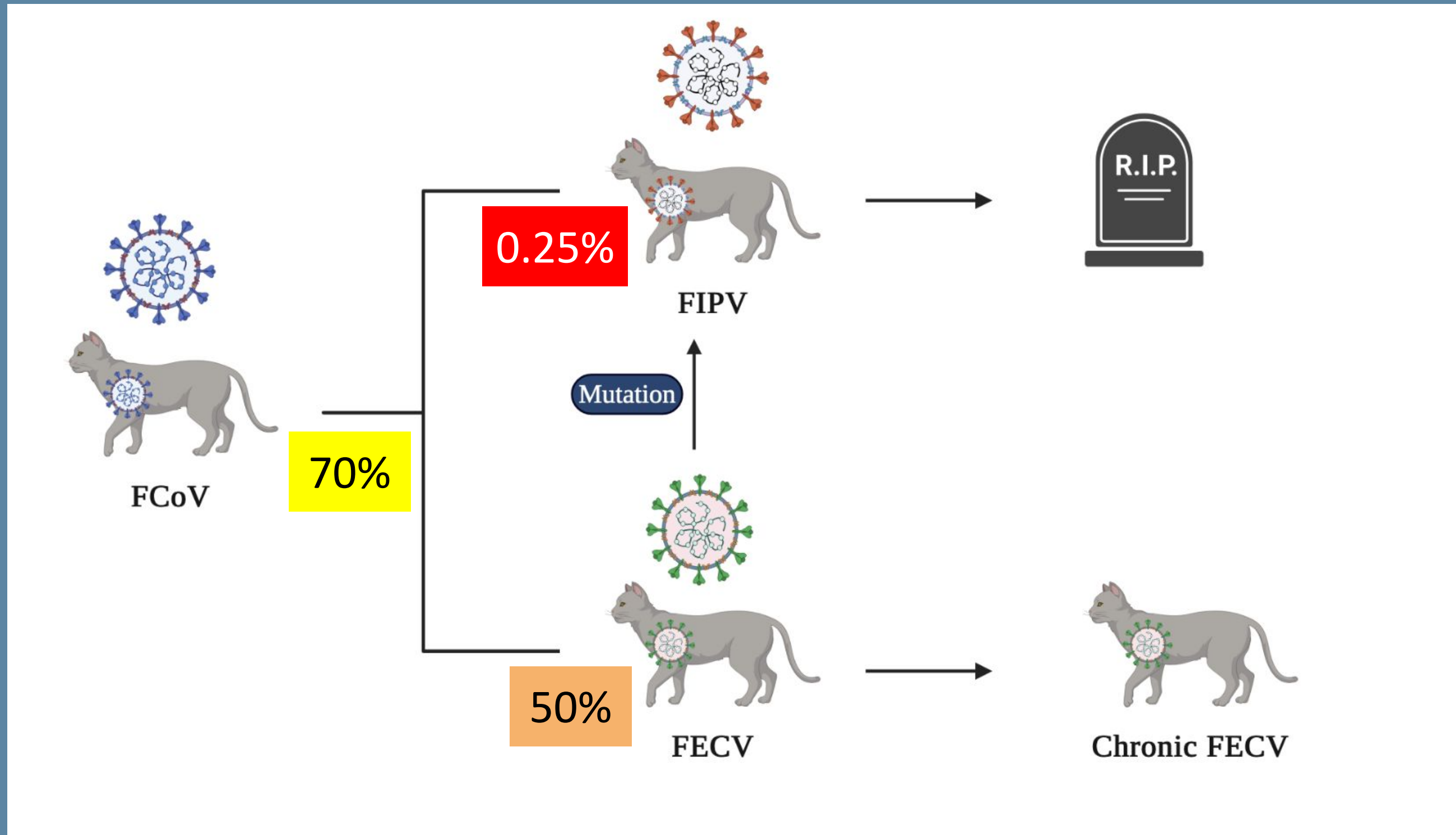
Doina Nugent



Background

- Feline Infectious Peritonitis (FIP) is a viral disease in cats caused by a rare mutation of the feline coronavirus (FCOV)
- Long considered as 100% fatal
- The nucleotide analog GS-441524 has been shown to be an effective treatment for most affected cats.
- In 2022, the medication was not yet easily available for veterinarians in North America
- Had to be bought on the "black market" at considerable expense
- Treatment involved 84 days of painful subcutaneous injections

Background - Epidemiology



Background - Epidemiology

What actually determines who gets FIP?

Cats that develop FIP tend to have:

- Ineffective **cell-mediated immunity**
- Poor control of viral replication in macrophages
- Dysregulated inflammatory cytokine responses

Cats that resist FIP:

- Contain the virus at the intestinal level
- Prevent macrophage-driven systemic spread

Genetics

Evidence supports:

- Heritable susceptibility
- Certain bloodlines overrepresented
- Polygenic risk (not a single gene)

This helps explain:

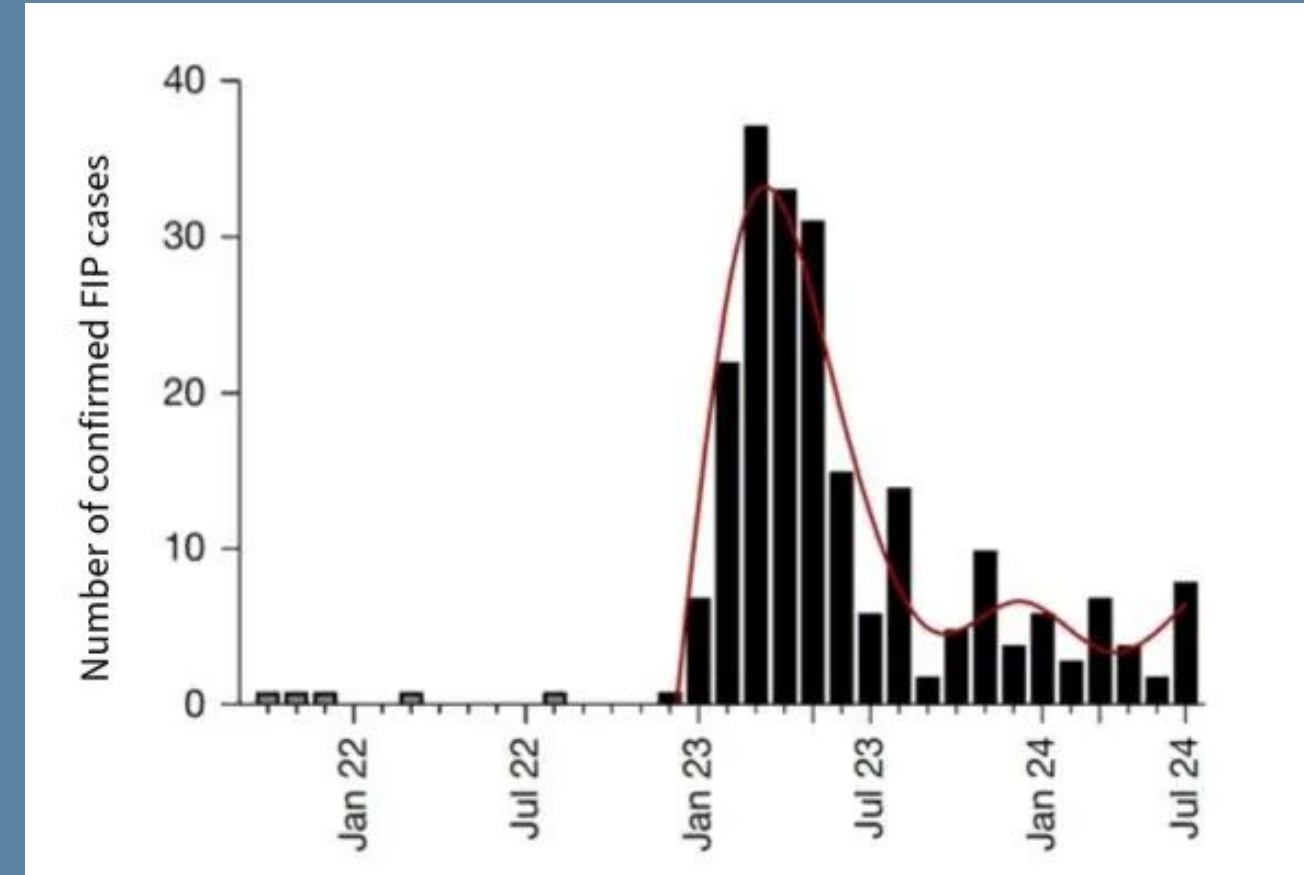
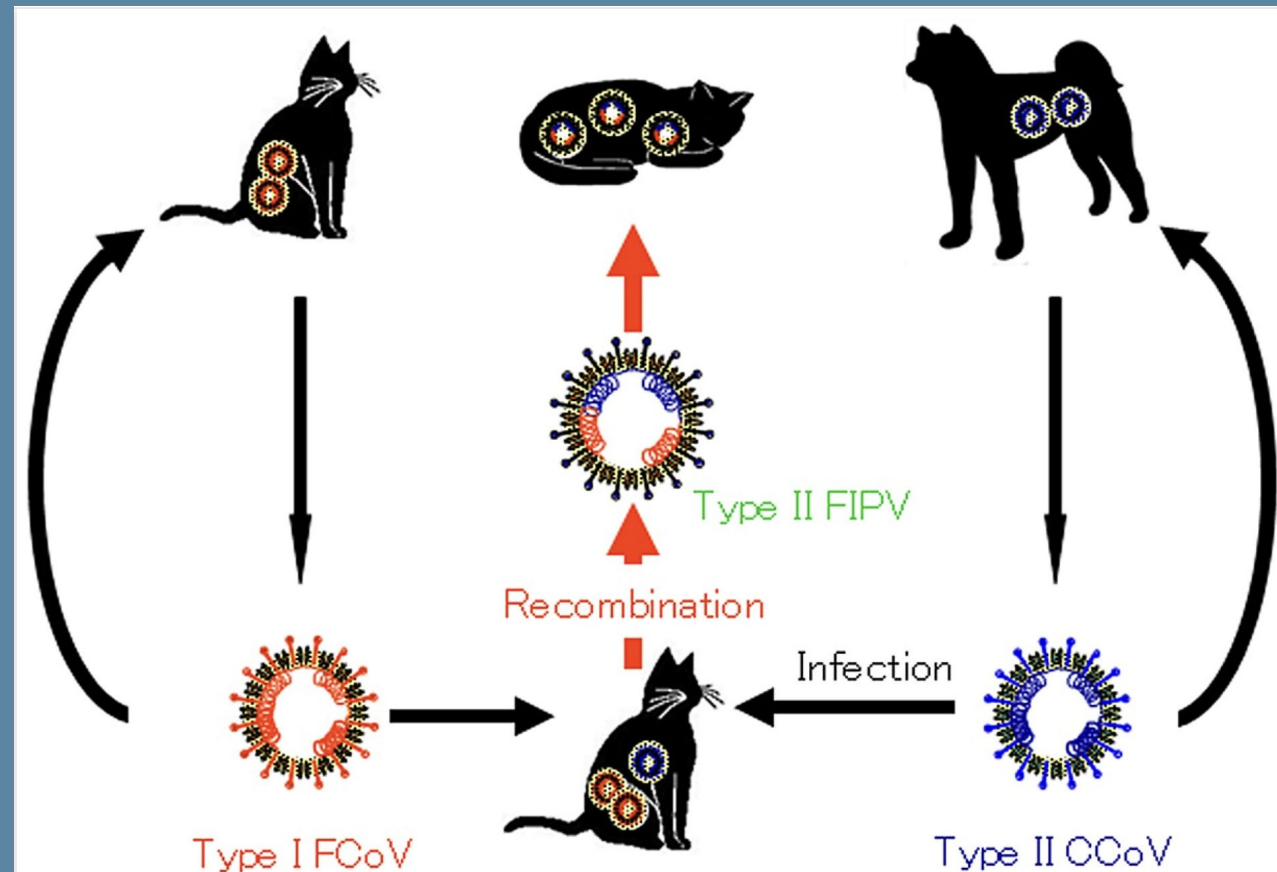
- Littermates affected
- Cattery “clusters”
- Why some cats never get FIP despite heavy exposure

FIP-causing variants are *not* transmitted strains

Critical distinction:

- **Enteric FCoV strains** circulate between cats
- **FIP-causing variants arise by mutation within an individual cat**
- These mutated viruses are:
 - Poorly transmissible
 - Usually unique to that cat

Background - Epidemiology



2023 Cyprus

Likely involved **Type II FCoV**

- Recombination between **feline coronavirus** and **canine coronavirus**

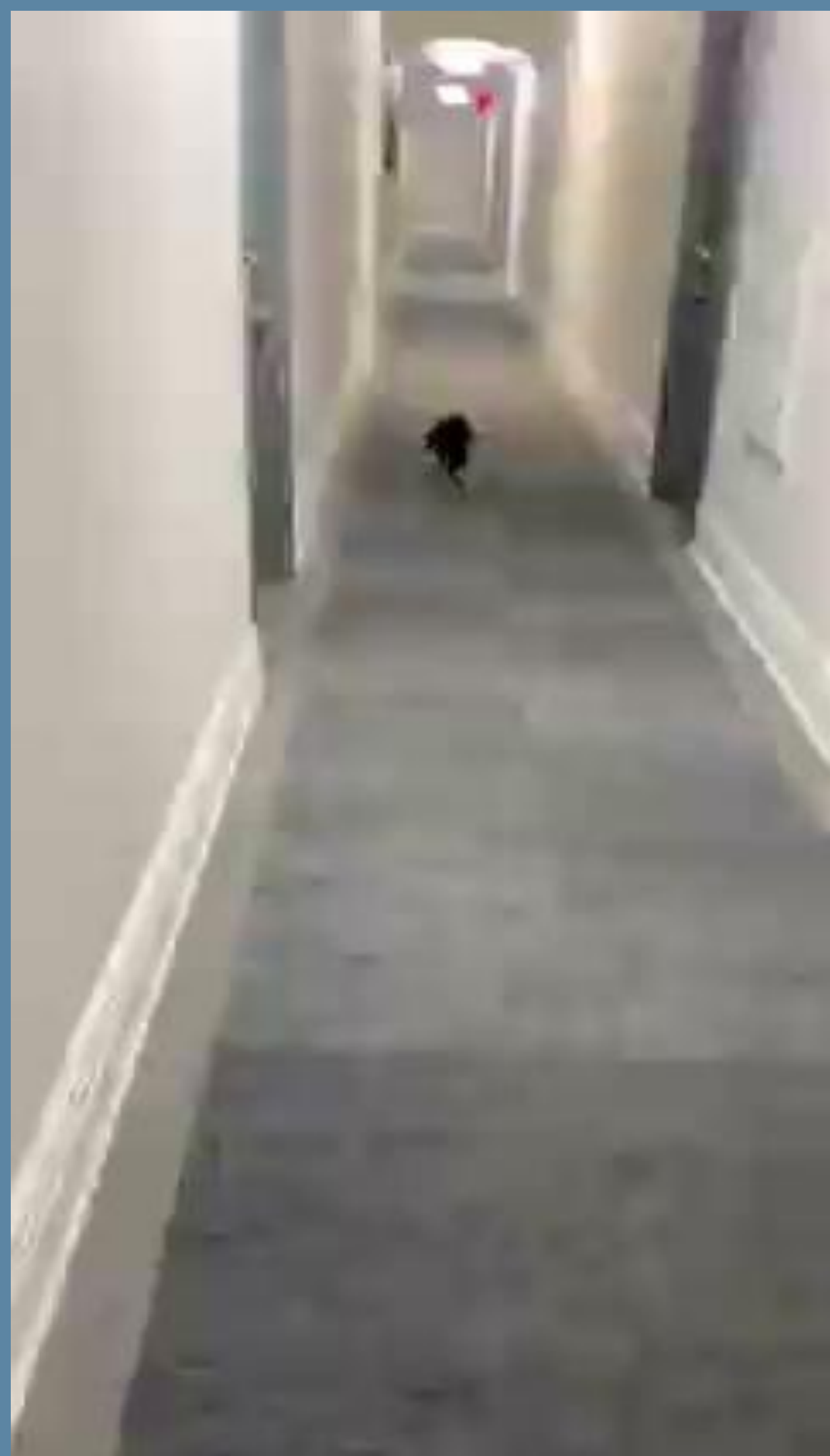
Showed features of:

- **Higher transmissibility**
- **Greater enteric pathogenicity**
- Increased likelihood of **systemic disease**
- **enteric transmissibility** appeared higher in the Cyprus outbreak, but *FIP itself* was still not directly contagious cat-to-cat.



Wet Fip

Mavis





Jan 8th



Jan 21

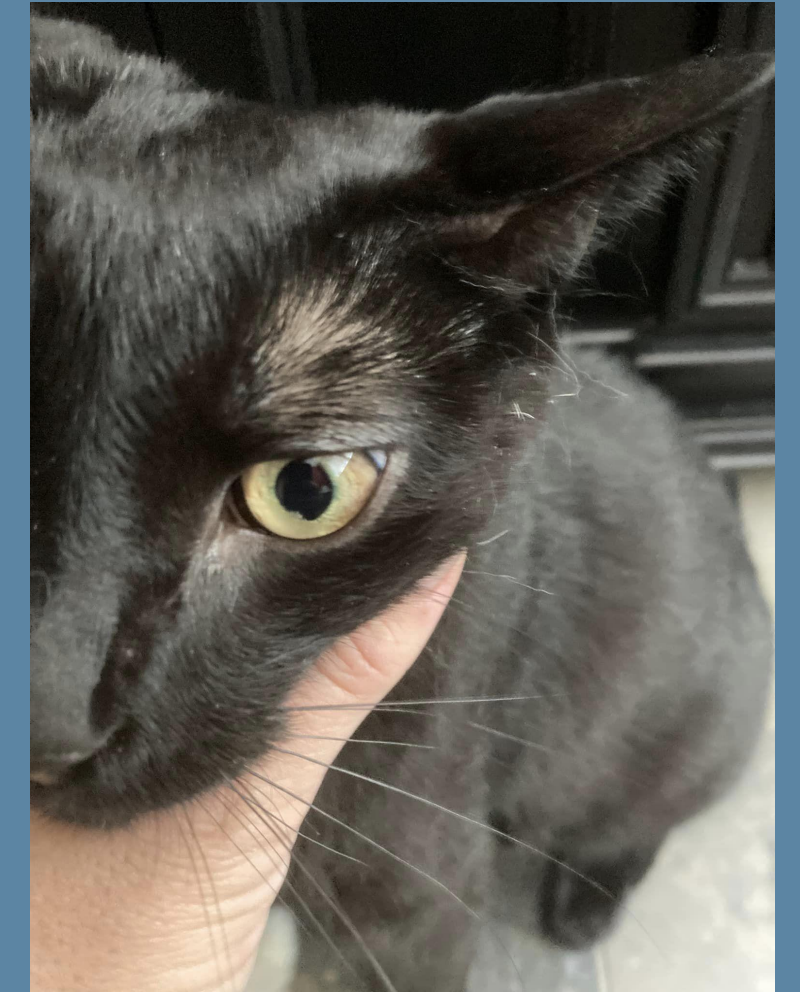
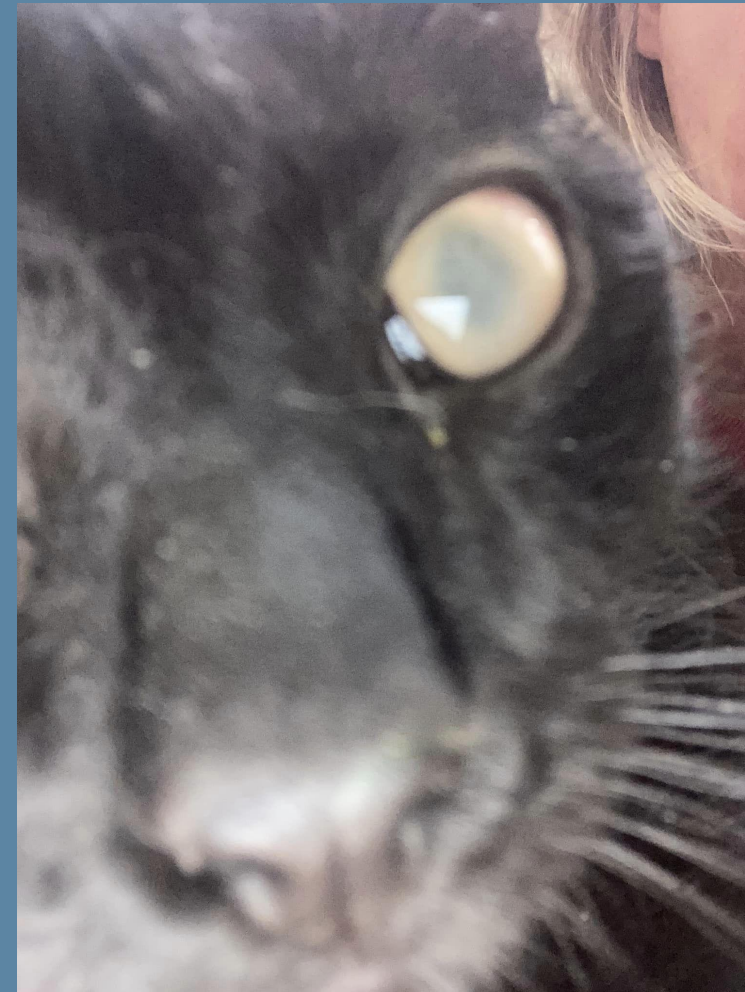


Jan 30



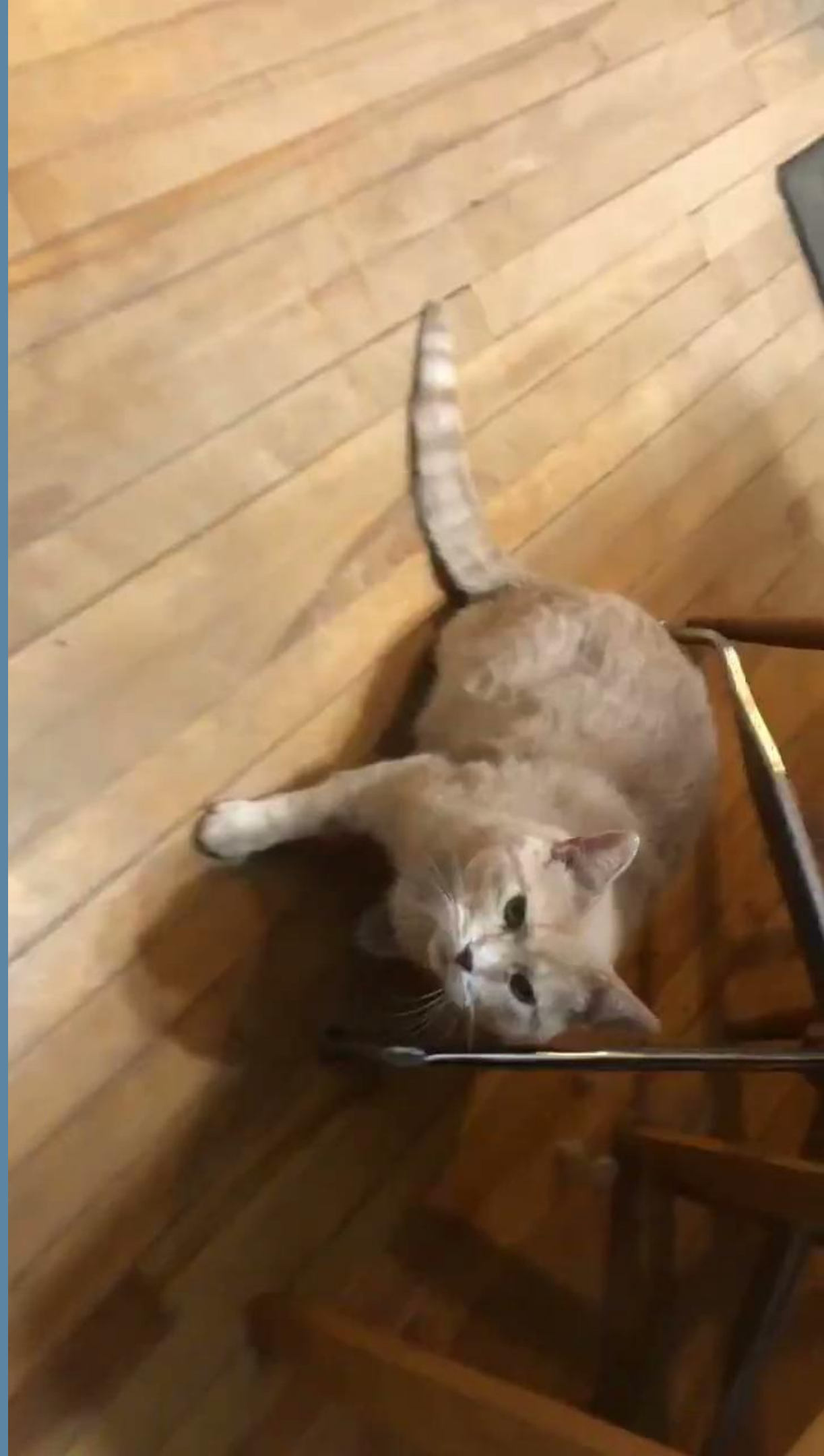
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Ocular FIP



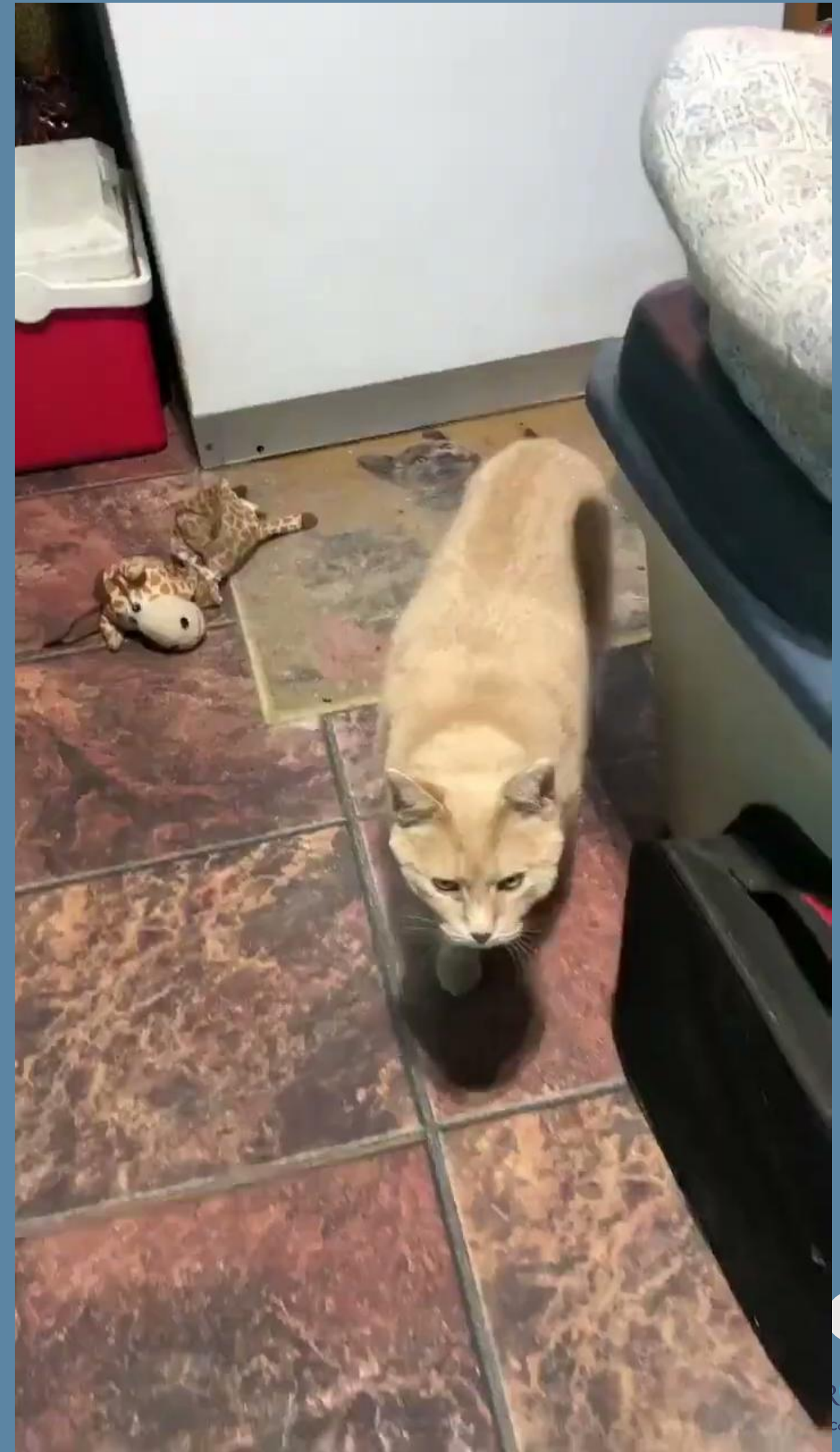
Tom

Riffy



Neuro FIP

Bobby



Neuro FIP



Cali

Study Background

- In 2022, I designed and began a case series study in Ontario, Canada
 - To help with drug access
 - To help provide treatment insights
- Peer reviewed protocol
- Used research-quality oral medications, compounded at an Ontario pharmacy, overseen by a Licensed Ontario DVM
- Open only to residents of Ontario (in-person and remote)
- Made FIP treatment much more affordable, accessible, and less painful
- November 2022 - April 2025, treated 600+ cases of FIP as part of the trial

Treatment Protocol - Combining GS441524 and Mefloquine

Every cat followed same protocol:

- Combining GS-441524 and Mefloquine (MQ)
- MQ has both immune/inflammatory modulating and antiviral effects
- Suspected by vets in UK/Australia to reduce chances of remission
- GS-441524 and Mefloquine used together to limit GS resistance and relapses/treatment failure



Treatment Protocol - Combining GS441524 and Mefloquine

Why Mefloquine

- Quinoline antimalarial with **in-vitro antiviral activity** against some **enveloped RNA viruses**
- Demonstrated **SARS-CoV-2 inhibition in cell culture**
- High intracellular accumulation → theoretical interference with **endosomal viral entry**
- Early COVID era prompted interest in **drug repurposing**

Considerations

- Very long $\frac{1}{2}$ life
 - Requires compounding and careful dosing
- Can cause GI upset
- Reported side effects in people: psychosis



Preliminary Results - Breed

	Study		Population	
DLH	7.2%		10.3%	
DMH	5.7%	79.3%	4.1%	96.9%
DSH	66.4%		82.5%	
Ragdoll	2.9%		1.0%	
Siamese	1.6%		1.0%	
Bengal	2.8%	13.1%	0.3%	3.1%
Purebred Other	5.9%		0.8%	
	100.0%		100.0%	

- Consistent with other studies, purebred cats appear to have roughly **4 times** the risk of being diagnosed with FIP compared to what you might expect based on their population proportion
- This supports genetic/environmental predisposition in purebred lines

Preliminary Results - Gender

	Study		Population	
F	9.7%	35.3%	4.0%	51.0%
F/S	25.7%		47.0%	
M	19.0%	64.7%	4.0%	49.0%
M/N	45.7%		45.0%	
	100.0%		100.0%	

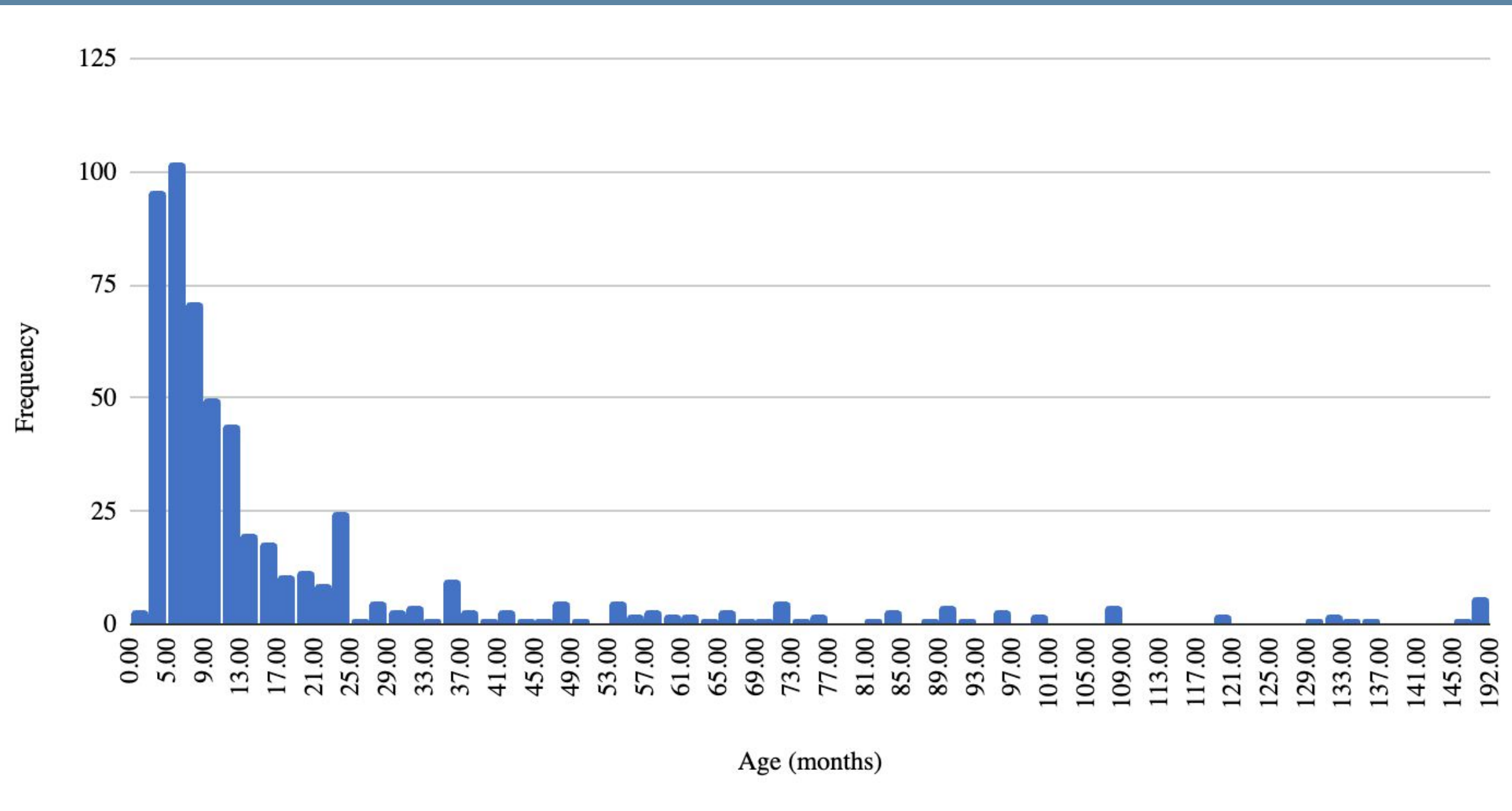
- Intact cats (especially males) are disproportionately affected by FIP, while spaying/neutering (particularly in females) appears protective
- This is a well-established risk factor, linked to hormonal/immune effects (e.g., testosterone suppressing cell-mediated immunity in intact males) and behavioral factors (intact cats roam more, increasing FCoV exposure)

Preliminary Results - FIP Type

D	17.2%		Neuro	
DN	3.1%			
DO	2.2%			
DON	0.7%	39.8%		21.7%
N	11.2%			
O	3.3%			
ON	2.1%		Ocular	
W	51.5%			
WD	1.0%			
WN	4.3%	60.2%		11.00%
WO	3.1%			
WON	0.3%			

- Effusive dominates in most retrospective and treatment studies, likely because easier to diagnose (detection bias)
- Dry forms underrepresented in older data but more recognized now with better diagnostics; they often present with ocular (uveitis common) or neurological signs

Preliminary Results - Age



- **Highest risk:** kittens & young cats (<2 years)
- **Lower but real risk:** older, immunocompromised cats
- **Never rule out FIP based on age alone**
- **Early suspicion in young cats saves lives**

Immature immune system

- Incomplete cell-mediated immunity

High likelihood of recent FCoV infection

- Especially after weaning

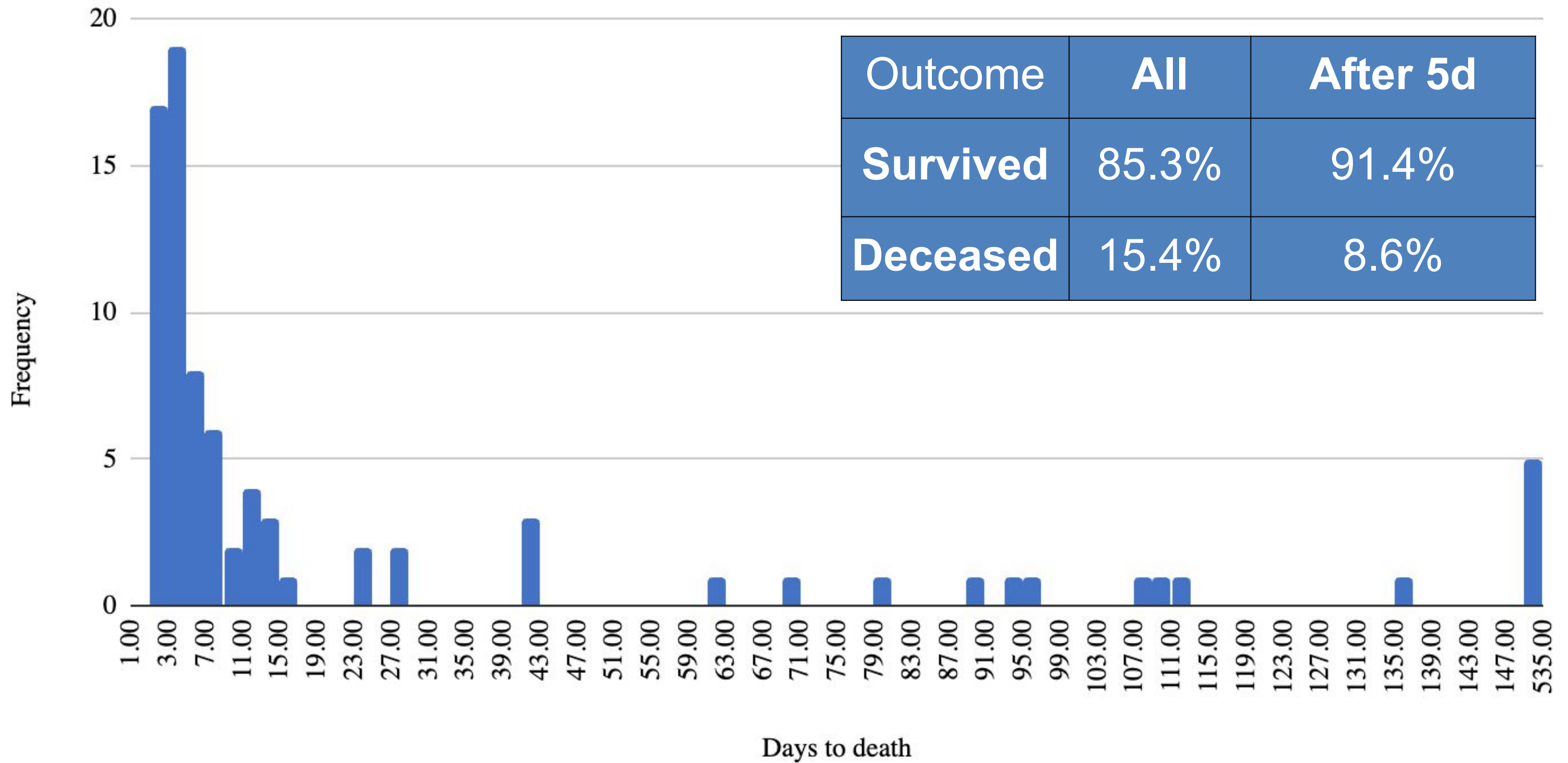
High viral loads

- Multi-cat environments → repeated exposure

Stressors common in youth

- Weaning
- Rehoming
- Shelters
- Boarding
- Surgery (e.g., neutering)

Preliminary Results - Outcome



Preliminary Results - Outcome

	Number	Survived	Relapse	Survived
D	93	92.5%	4	3
DN	14	64.3%		
DO	12	83.3%		
DON	4	75.0%		
N	61	80.3%	2	0
O	18	94.4%	1	1
ON	9	88.9%		
W	286	83.2%	1	1
WD	6	100.0%		
WN	24	91.7%	1	0
WO	18	94.4%	1	1
WON	1	100.0%		

Learning Outcomes

Diagnosing FIP and Treating Diagnostically

FIP usually diagnosed through comparative analysis of clinical signs, physical exam, laboratory findings, imaging, etc.

- **Confirmatory PCR test** is available and relatively easy
 - Fluid (chest/abdomen), blood, CSF, aqueous humour
 - High specificity - moderate sensitivity
 - BUT typically takes 3-7 days for results
- Using "**response to medication**" as a diagnostic test
 - FIP is ideal candidate as 90+% of FIP cats show clear response to medication within about 72-96 hours
- All study cats started on 2-3 week supply of medication

Learning Outcomes

Diagnosing FIP - Clinpath

CBC

- Anemia (non-regenerative) - occasionally severe (IMHA)
- Neutrophilia

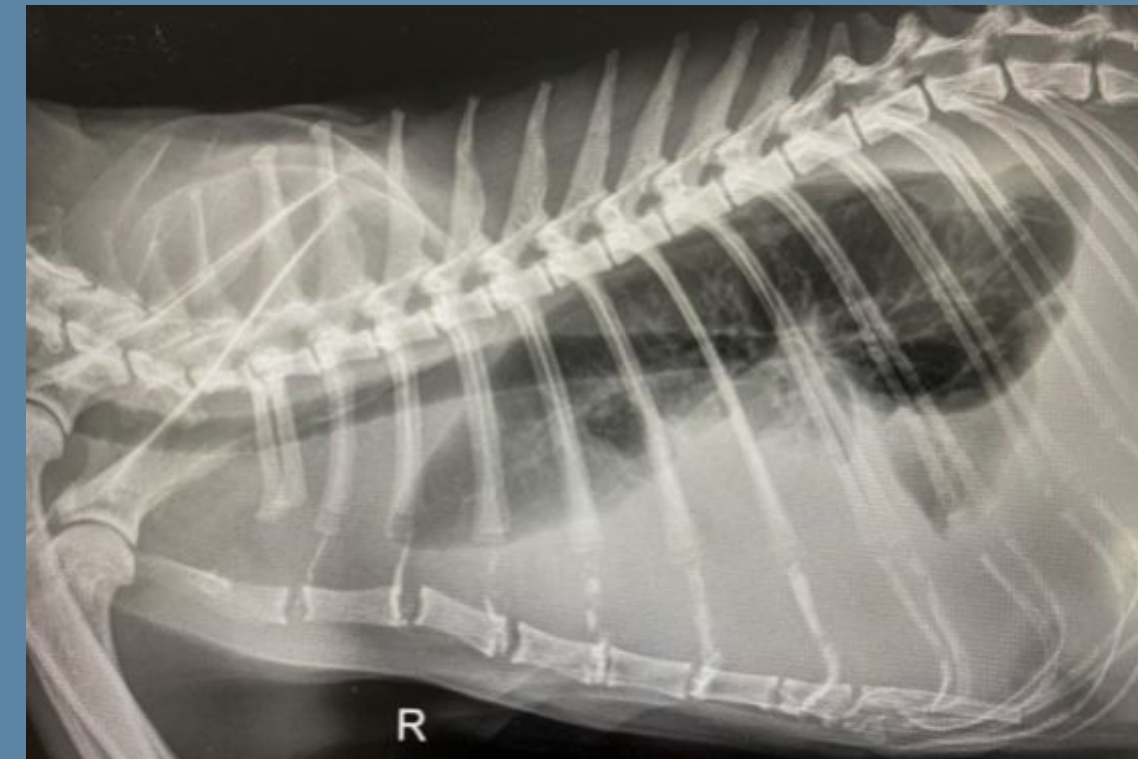
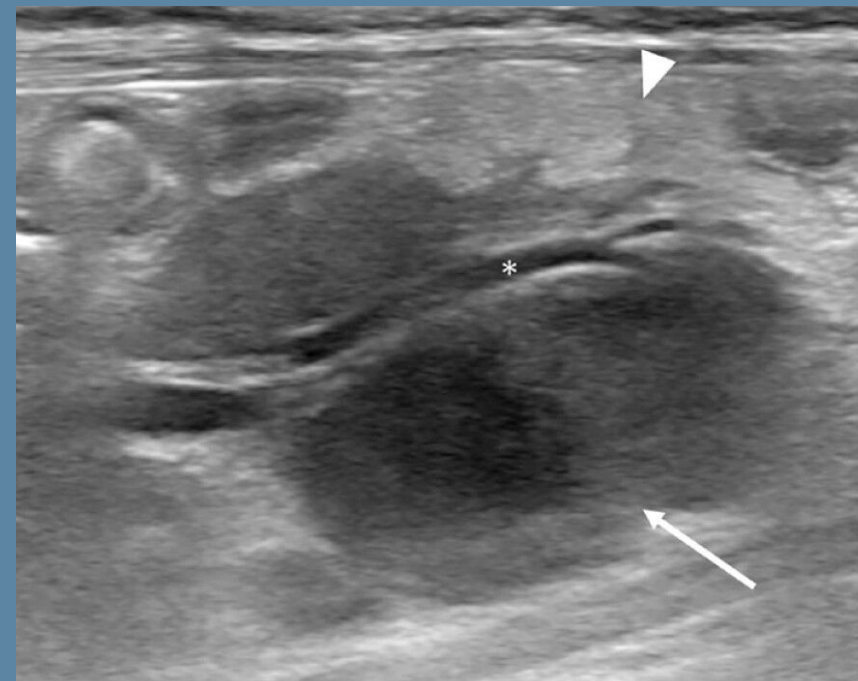
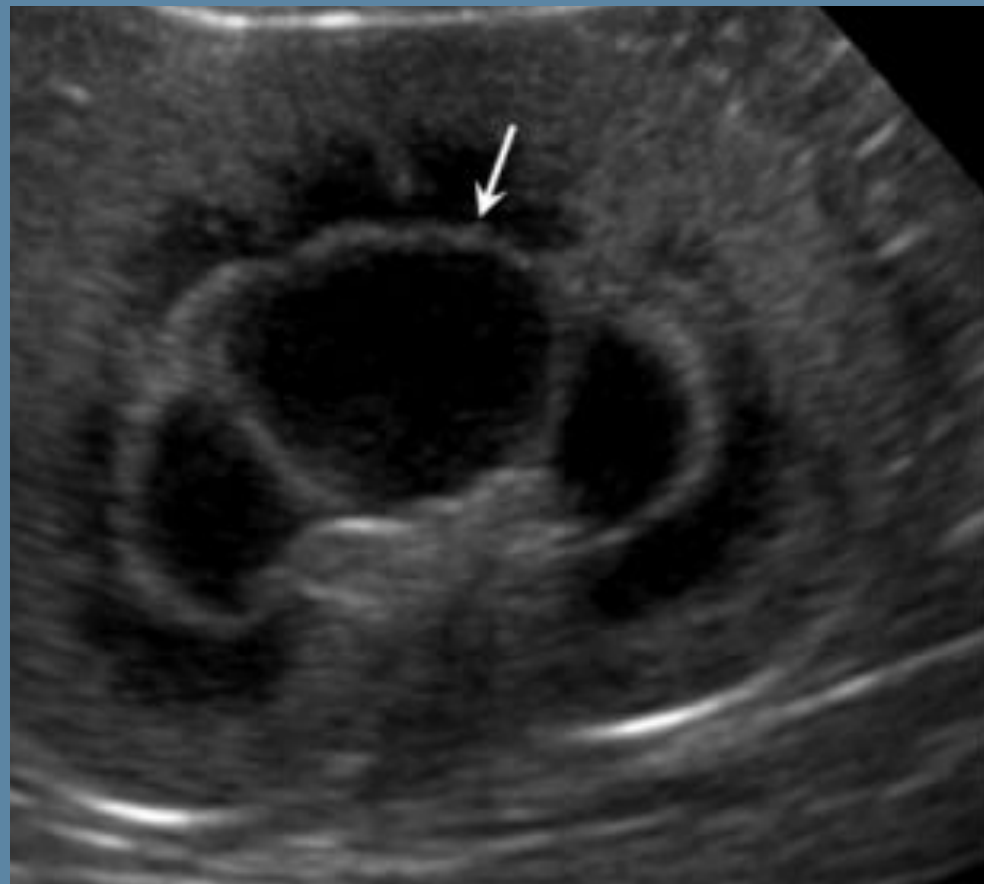
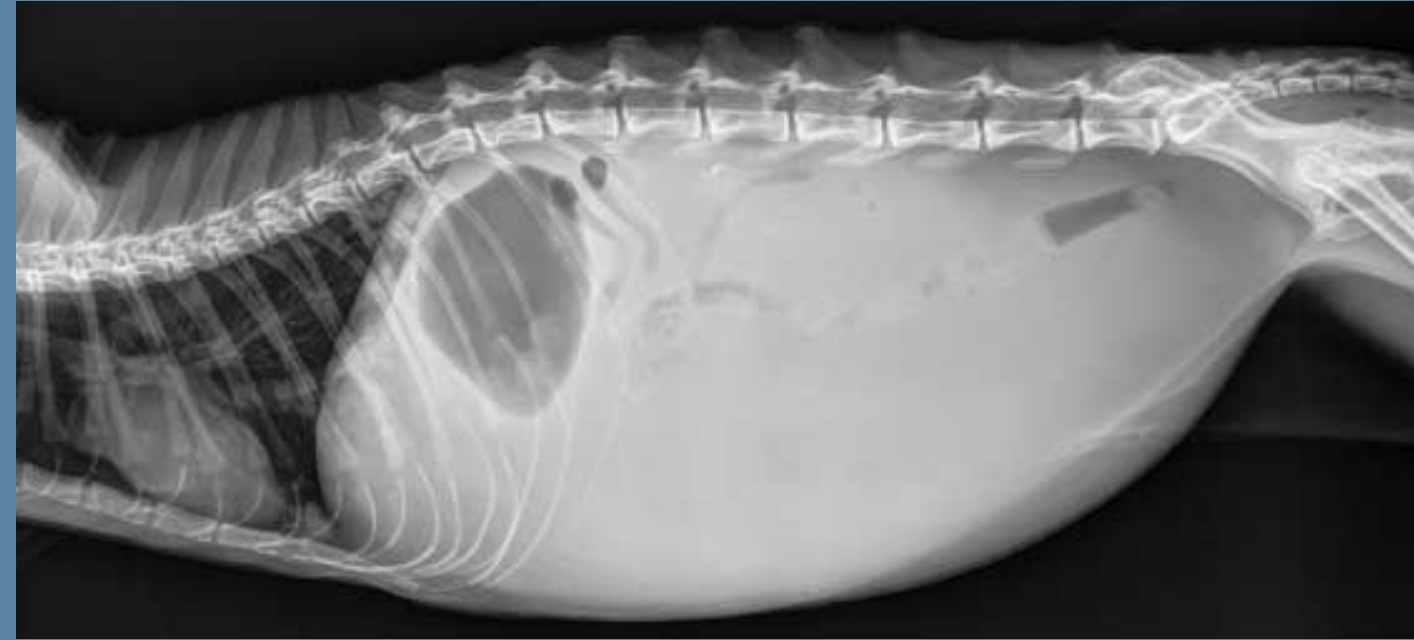
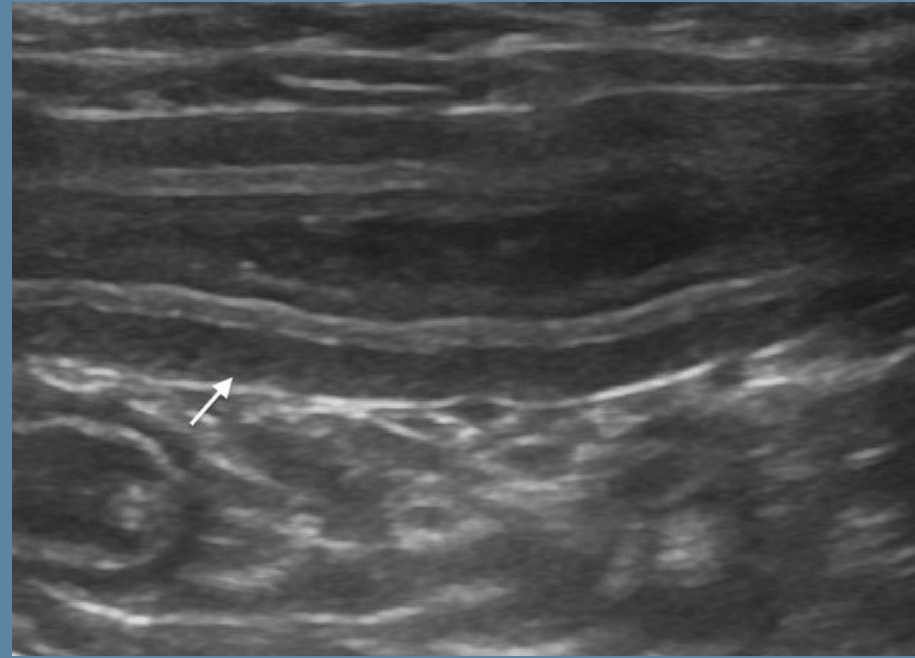
CHEMISTRY

- Low albumin, elevated globulin, $A/G < 0.6$
 - Diarrhea can complicate
- Elevated Bilirubin
 - Almost always mid-high/normal at least
- Elevated liver enzymes (sometimes)



Learning Outcomes

Diagnosing FIP - Imaging



Learning Outcomes

Importance of Early Treatment

Start FIP medication upon tentative diagnosis of FIP:

- Cats can go from stable to
 - Anemic crisis
 - Respiratory crisis because of fluid build-up around the lungs
 - Seizures with neuro pathology, etc. within 24-48 hours
- Few if any adverse effects of FIP medications
- Starting FIP meds diagnostically presents little or no risk

Learning Outcomes

Value of Supportive Treatment

Steroids - risk of IMHA (leading cause of early death)

- Dexamethasone 0.1mg/kg q24h x 5d, then 0.05mg q24h x 10d

Supportive feeding and hydration

Draining of pulmonary effusion

- Typically outpatient, often only 1x needed

Draining of abdominal fluid

- Only if affecting breathing

Blood transfusions

Controlling seizures

- Phenobarbital x 30d then wean

Administration of FIP medication via a nasogastric tube

Learning Outcomes

When to think of FIP as part of your ddx List

When FIP Should Be Top 3

FIP should be **high on the list** when you see:

Young cat + persistent fever OR failure to thrive OR neuro/ocular signs ± effusion

Even if:

- Appetite is still present
- The cat looks “too good” to be dying
- No diagnostics yet support it

In young cats, systemic illness plus fever, ocular, neurologic, or effusive signs should make FIP a leading differential - before labs ever come back.

When FIP Can Stay Lower (Initially)

FIP is **less likely early** if:

- The cat is older and stable
- Signs are acute and localized
- There is a clear alternative explanation (e.g., trauma, obvious URI, single-system disease)
- Rapid, sustained improvement occurs with appropriate therapy

Learning Outcomes

Wet FIP Pearls



Pleural (or pericardial) effusion

- DO NOT be scared to tap!
- Typically only have to tap ONCE
- Ultrasound positioned
- 22GA butterfly connected to 3-way stop cock
- Need to reposition a few times
- Monitor for minimum 60min
- Can treat as outpatient

Abdominal

- Fight the urge to drain - drain only if impacting on breathing
- Risk of hypovolemia/circulatory compromise

Furosemide is contraindicated:

- Furosemide removes **intravascular water**, not inflammatory effusion
- Concentrates intravascular proteins transiently
- Increases renal losses and dehydration

Learning Outcomes: Dry FIP Pearls



Often mistaken for intestinal lymphoma

- Enlarged mesenteric lymph nodes and thickened small intestines

Jaundice (Transient)

- Granulomatous hepatitis
- Intrahepatic cholestasis
- Extrahepatic biliary compression
- Systemic inflammatory (sepsis-like) effects
- Anorexia-associated cholestasis
- Hemolysis

Diarrhea / PLE

- Diarrhea/PLE can complicate diagnosis by interfering with A/G ratio

Pyelonephritis

- Do a UA to rule out!



Learning Outcomes: Neuro FIP Pearls

- Young cat >> think FIP
 - MUCH more common than Toxoplasmosis
- Often bloodwork = normal
- Can test CSF
- Improvement in symptoms typically starts within 48-72h
- With spinal cord pathology - incontinence (urine and fecal) seem to be last to be corrected
- Can have permanent symptoms
- If seizure activity - phenobarbital for 30 days, then try to wean
- GS441524 dose divided in 2 (q12h)
- Typically give high-dose Clindamycin for 30 days (both for potential Toxo and for anti-inflammatory properties)
 - Clindamycin reduces proinflammatory cytokines such as TNF- α and IL1- β

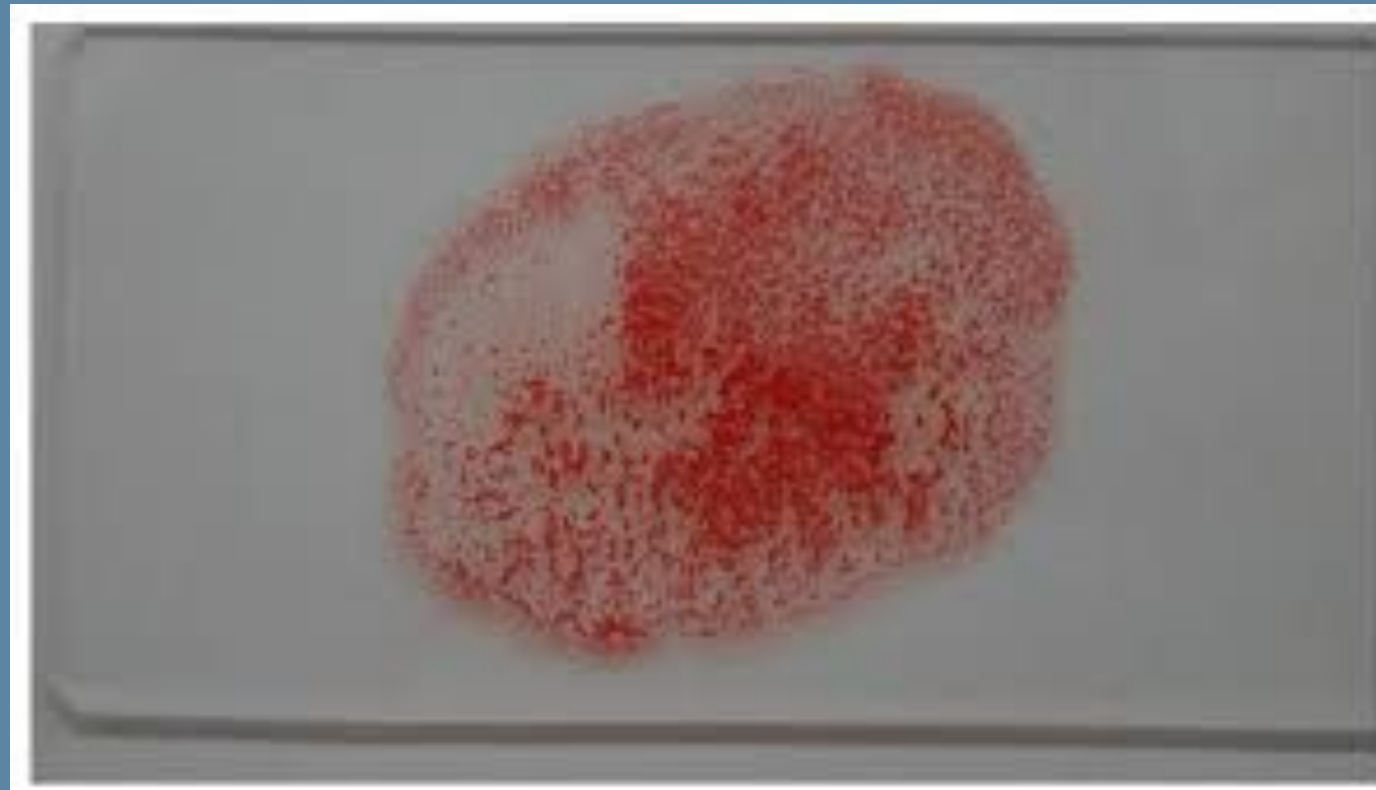
Learning Outcomes: Ocular FIP Nuggets



- Uveitis (uni or bilateral)
- Aqueous flare
- Rubeosis iridis
- Anisocoria
- Bloodwork can be normal
- Aqueous humor paracentesis for PCR
- Prednisolone acetate 1% q8h for 15-30 days
- Occasionally have to continue long-term
 - Immune-mediated sequelle

Learning Outcomes

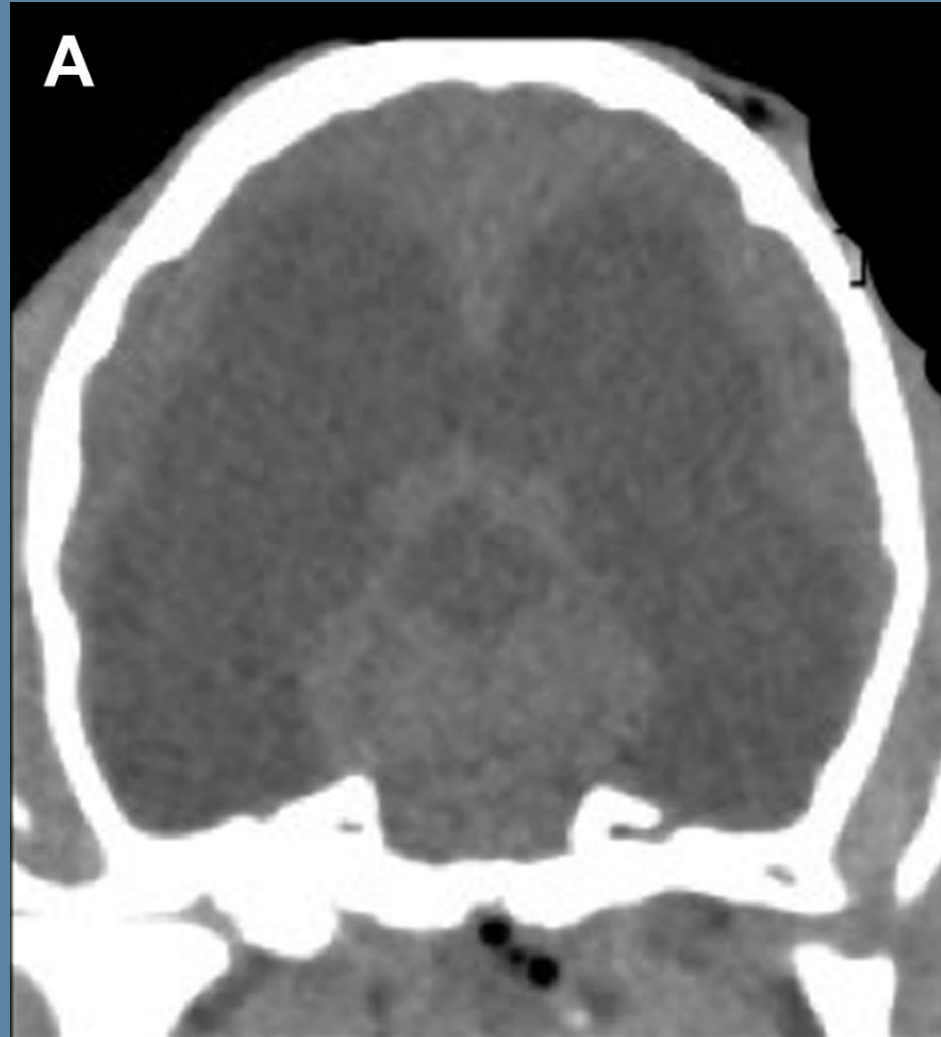
FIP Sequelle - IMHA



- **NOT rare**
- Can happen very quickly (over 24 hours)
- Main reason I start all cats on dexamethasone
 - 0.15mg/kg SQ followed by 0.25 - 0.5mg PO q24h x 5d, then q48h x 10d
- If IMHA - consider blood transfer if indicated
 - Prognosis at this point = 50%
 - Whole blood from donor
 - Can do in general practice!

Learning Outcomes

FIP Sequelle - Others



- Congestive heart failure
- Ataxia, fecal and/or urine incontinence
- Ongoing seizure activity
- Immune mediated uveitis
- Hydrocephalus
- IMHA
- Gingivitis-Stomatitis Complex?
- CKD?

Learning Outcomes

Don't be fooled - FIP Impersonators



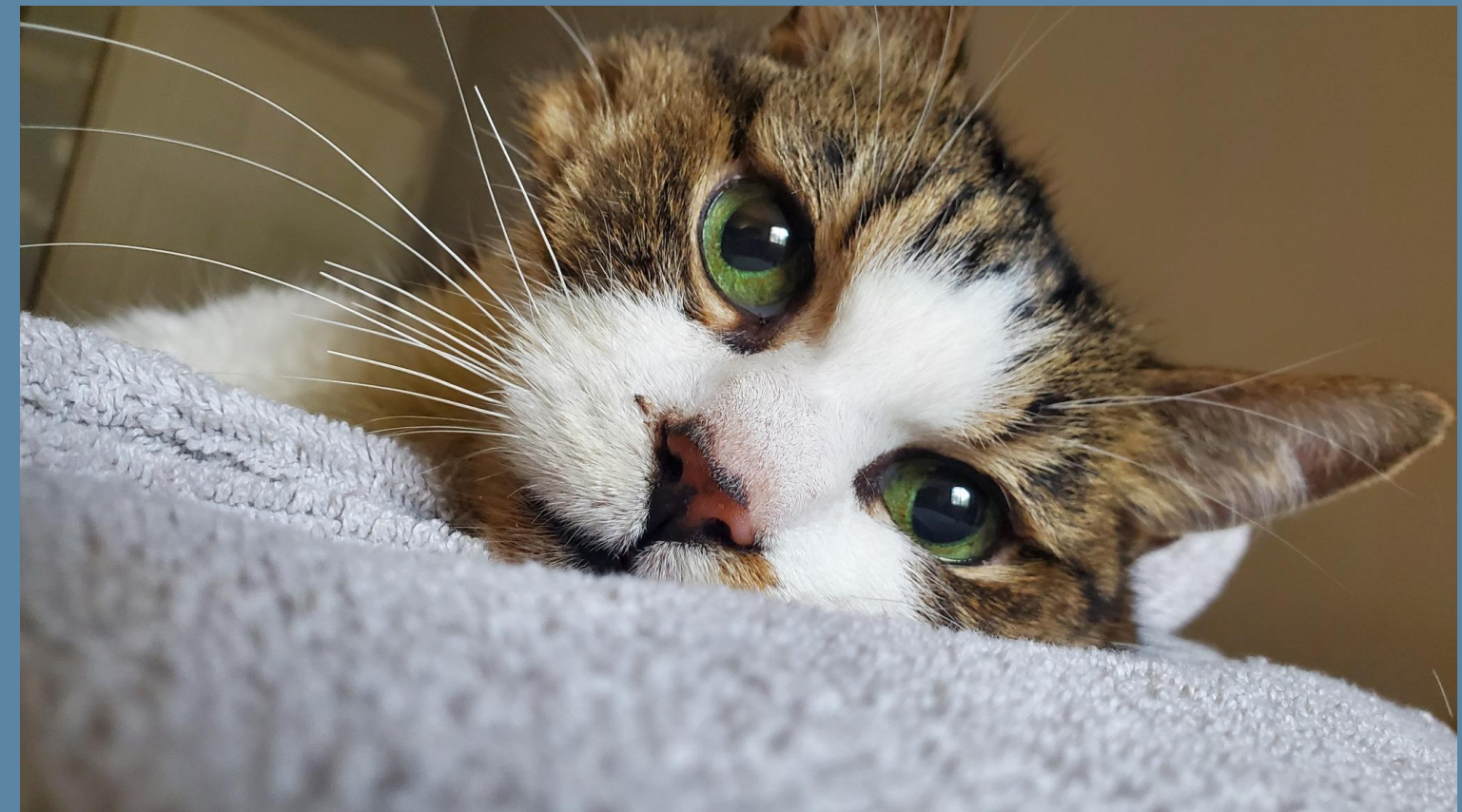
- Wet: Chylothorax
- Dry: Pyelonephritis, Cholangiohepatitis
- Neuro: Toxoplasma, Neospora
- Ocular: Toxoplasma, Bartonella, Mycoplasma
- Low A/G ratio = inflammation or protein loss; FIP is just one cause

Learning Outcomes

Dosing for Desired Treatment Response

Efficacy of GS-441524 depends significantly on proper and consistent dosing

Effusive (Wet)	12 - 17 mg/kg (q24h)
Non-Effusive (Dry)	12 - 17 mg/kg (q24h)
with Ocular	17 - 20 mg/kg (q24h)
with neurological	12.5mg/kg + (q12h)



Learning Outcomes Protocol

First visit

- diagnostics & tentative dx
 - CBC, Full Chemistry, UA, imaging, +/- PCR
- Supportive treatment (drain fluid, seizure meds, hospitalization, transfusion, etc)
- Start treatment protocol
 - GS (+/- Mefloquine)
 - Dexamethasone
 - 0.15mg/kg SQ
 - 0.25mg-0.5mg q24h x 5d, then q48h x 10d
 - Short course of antibiotics (Convenia or Clavaseptin)

Recheck 30d & end of treatment period (recommend 84d, minimum 60d)

- Imaging + CBC and Full Chemistry

No longer recommend post-treatment recheck

No vaccinations or procedures until 90d post treatment (minimum 30d)

Learning Outcomes Tips



- Start with GS q12h for 5-10 days for all forms, not just neuro
- Start with 2-4 weeks of treatment, particularly if not certain of diagnosis
- Started with capsules, now use 50mg tablets that can be split
- If using liquid - stress mixing!
- Tablets have long half-life in freezer (up to 2 years) - recommend always having in clinic
- Diarrhea NOT uncommon at start of treatment - success with GI biome
- Give 1 hour apart from a meal - but have given with treats
- Not every case is FIP :-)

Unanswered Questions and Need for further Research

Questions remaining in FIP treatment largely revolve around:

- Refining treatment protocols
- Managing more challenging cases

Areas for further research include:

- Optimal treatment duration
- Predicting non-response and relapse
- Differentiating between relapse and reinfections
- Determining long-term outcomes

PetNation

Feel free to reach out any time

- Happy to provide advice/recommendations
- Feel free to refer for treatment or hospitalization
- Share your experiences

Jeff Aramini

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jeff@petnation.ca





QUALITY & SAFETY STANDARDS FOR COMPOUNDED VETERINARY PRODUCTS



QUALITY & SAFETY STANDARDS

(Compounded GS-441524 and Molnupiravir)



Compounded using high-quality ingredients from a Health Canada–approved Canadian GMP wholesaler



Certificate of Analysis (CoA) issued for the product confirming regulatory compliance



Potency validated for a 6-month Beyond-Use Date (BUD) to ensure stable, consistent results for GS-441524



Veterinary & Client Support (Compounded GS-441524 and Molnupiravir)

Educational Resources

Dosing guides, treatment protocols, and client handouts

Access to our Veterinary Portal for online ordering, success stories, blog updates, and resources for veterinarians and pet owners

21 January, 2026 | Clearpoint Pharmacy

Comprehensive FIP case Tracking and Follow-up

For every case we treat, we record the cat's gender, age, weight, and diagnosis (type of FIP)

At the 2-week follow-up with the cat owner we:

- Ensure they have an appointment booked with their veterinarian
- Document symptom progress
- Send an update to the veterinarian
- Complete a final follow-up at the end of treatment to provide a full case summary.

Pharmacist Qualified and Educated on FIP Treatment

Including dosing and guidelines, to answer all veterinarian and client questions, and a separate French-speaking pharmacist available for GS-441524, Molnupiravir & general FIP inquiries



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Veterinary Portal
Scan the QR code or visit the link:
<https://vets.clearpointpharmacy.com>

Register now to gain access to the following range of valuable tools and resources:

- Order easily compounded medications directly from our pharmacy
- Explore clinical references and guidelines for veterinary practice
- Discover real-world treatment success stories
- Subscribe and stay informed with latest updates, tools, and educational content

PIMOBENDAN CAPSULES

Strengths (mg/capsule):
0.5mg to 20mg/Capsule

Quantity:
10 Capsules/Pack
to 300 Capsules/Pack

Available in multiples
of 10 Capsules



GABAPENTIN ORAL SUSPENSION

Strengths (mg/ml):
100mg/ml

Volume:
100ml

Flavour:
Tuna, Chicken
or Unflavoured



METHIMAZOLE ORAL SUSPENSION

Strengths (mg/ml):
25mg/ml and 50mg/ml

Volume:
10ml to 300ml,
in multiples of 10 ml

Flavour:
Chicken or Fish



Scan the QR code or visit the link to create your account and get started today!

Alternatively, you are welcome to email or fax us directly with your orders, and we will process them as prescriptions on file.

AVAILABILITY & ACCESS



Available in Multiple
Dosage Forms



24-hour overnight
shipping anywhere
in Canada



Same-day GTA
delivery for orders
before 2PM



Free shipping on
all orders

GS-441524 Formulations

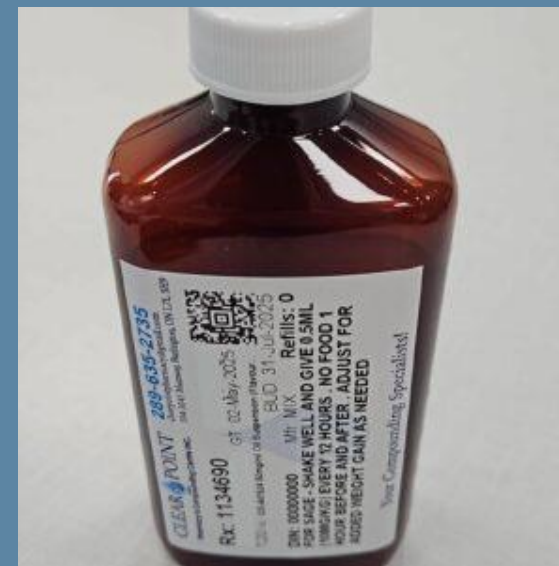
(All with 6-Month Expiry, Likely Longer)

- Oil Suspension (50 mg/mL)
 - Chicken or fish flavour
 - Available in multiples of 10 mL
- Capsules (25 mg, 50 mg, 75 mg, 100 mg)
- Tablets (25 mg, 50 mg, 75 mg, 100 mg)
- Injection (10–20 mg/mL) – Used mainly in hospital settings for cats unable to take oral medication.
 - Typical course: 5–7 days. Shelf life: ~14 days

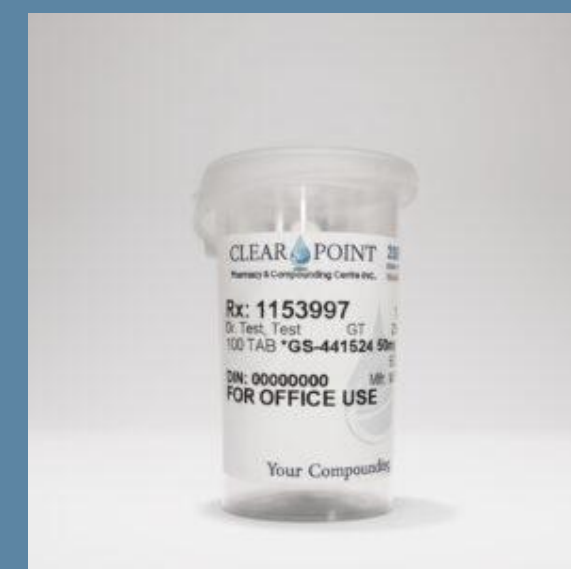
We also have Molnupiravir available as a second-line option for resistant FIP cases. Same expiry and shipping terms apply.

Molnupiravir Formulations

- Oil Suspension (50 mg/mL or 100 mg/mL)
 - Chicken or fish flavour
 - Orderable in multiples of 10mL
- Capsules (25mg, 50mg, 75mg, 100mg)



Reduced cost on smaller GS pack sizes to lower the barrier for diagnostic treatment



NEXT WEBINAR

Péritonite Infectieuse Féline - Protocoles Actuels et Présentation de Cas Cliniques

(Feline Infectious Peritonitis – Treatment and Clinical Presentation)



Wednesday, April 29

7:00 PM ET



Dr. Lilia Wang, DVM

RACE Pending



QUESTIONS OR COMMENTS?

Get in touch!



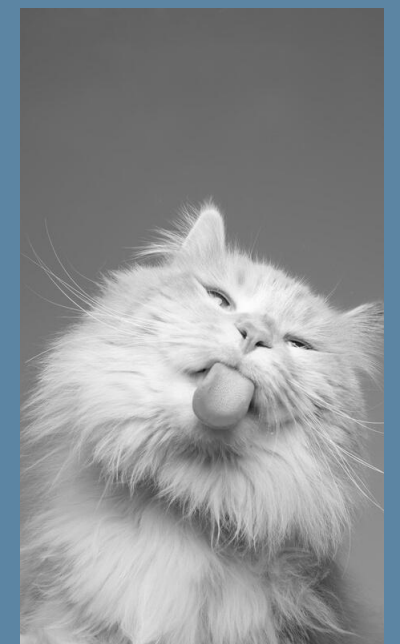
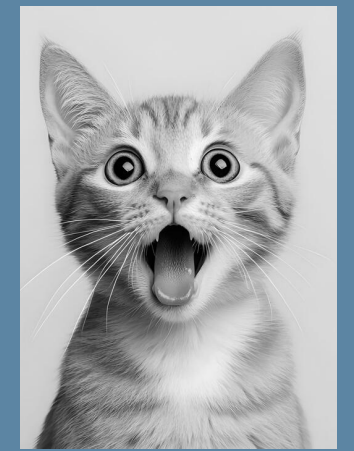
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THANK YOU

Thank you to our speaker and all participants.

Reminder: CE certificates will be emailed within 7-10 business days.

Recording and slides will be shared with registered attendees.

Stay connected: +289-635-2735 | www.clearpointpharmacy.com [For Veterinarians]

Next Webinar – April 29th, 2026 @ 7PM EST

Péritonite Infectieuse Féline - Protocoles Actuels et Présentation de Cas Cliniques

Dr Lilia Wang, DVM