

A New Era for Cats: Groundbreaking FIP Treatments Explained

Best Friends Network Webinar

November 14, 2024

BFNetwork@bestfriends.org



In loving memory of Judo, and the many other cats we honor with this work.





RACE Credit

- Available to live attendees
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Housekeeping

- Feedback:
 - One-question short survey at the end
 - Email bfnetwork@bestfriends.org
- We will make the webinar recording and presentation deck available in ~3 business days
- Please submit your questions for the panelists through the Q&A
- Please use the chat to share reactions, ideas, and resources





Welcome to Q&A

Questions you ask will show up here. Only host and panelists will be able to see all questions.

Who can see your questions?

To: Everyone

Hello

Chat

Raise hand

Q&A

Hide captions

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Today's Topics and Speakers

Diagnosis, Treatment, and Follow-ups *(25 minutes)*

- Dr. Colleen Guilfoyle, Veterinarian, National Shelter Medicine, Best Friends Animal Society (she/her/hers)
- Dr. Jennifer Bledsoe-Nix, Veterinarian, Best Friends Animal Society (she/her/hers)

The Future of FIP Treatment and Next Steps *(20 minutes)*

- Dr. Samantha Evans, Assistant Professor of Clinical Pathology, College of Veterinary Medicine and Biomedical Sciences Colorado State University (she/her/hers)
- Nicole Jacque, FIP Researcher, co-founder FIP Global CATS (she/her/hers)

Q&A

- Moderator: Katelyn Durkin, Manager, Network Partner Relationships, Best Friends Animal Society, bfnetwork@bestfriends.org (she/her/hers)

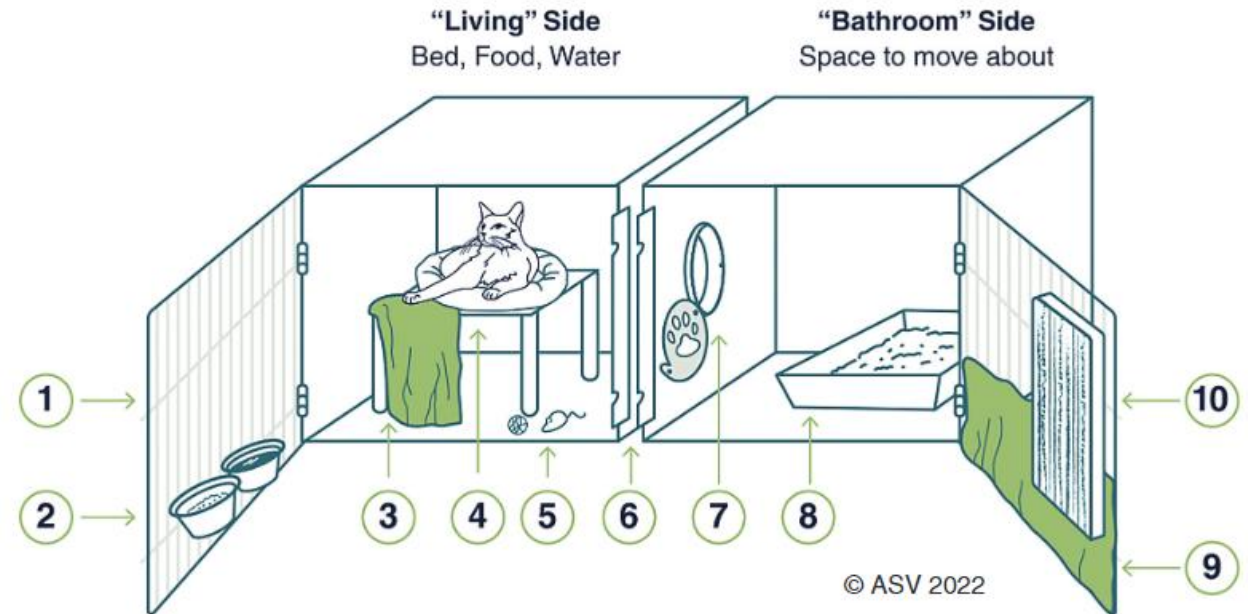
Prevention, Diagnosis, Treatments, and Follow-ups

with Dr. Colleen Guilfoyle and Dr. Jennifer Bledsoe-Nix



Prevention

- Stress can be a key factor in the onset of FIP.
- **Population management is key!**
 - Overcrowding
 - Length of stay
 - Stress mitigation



- | | | | |
|-------------------|----------------------|-------------------------------|-------------------------|
| 1. Open Bars | 3. Draped Towel | 6. Quiet latches and hinges | 8. Litter box |
| • Interaction | • Hiding place | | • Full size |
| • Ventilation | • Interaction choice | | • No shelf above |
| 2. Food and water | 4. Raised Bed | 7. Portal | 9. Partial Cage Cover |
| | • Soft resting place | • Ease of daily care | • Retreat space |
| | • Retreat space | • Separation of spaces | • Interaction choice |
| | 5. Toys | • Open except during cleaning | 10. Scratching Material |





Diagnosis

1. FeLV/FIV testing
2. FIP in littermates
3. Effusion
4. Neuro/Ocular
5. Non-specific clinical signs



"Bindi" - Survived neurologic FIP and adopted!



Diagnosis

(Reasonably) Definitive Diagnosis

- Effusion with positive FIP RT-PCR (with specific mutation) or positive Rivalta's in a young cat.
 - Low to moderate cellularity
 - High protein concentration, low A:G ratio
- Therapeutic trial
 - A therapeutic trial of 24-72 hours can be considered when diagnosis is suspected.
 - Fever/clinical condition should improve within 24-72 hours of initiating therapy.



"Sonny" - Survived effusive FIP and adopted!



Diagnosis



"Rihanna" - Survived effusive FIP (pleural) and available for adoption!

Presumptive Diagnosis

- Characteristic effusion
 - High viscosity/high protein, low cellularity
- Littermates with FIP
- Kitten/young cat with neurological disease or characteristic ocular changes (uveitis), other more common causes deemed less likely or ruled out via empirical treatment or testing.
- Kitten/young cat with non-specific clinical picture (fever, failure to gain weight (or weight loss), unthrifty, diarrhea) and non-specific bloodwork abnormalities (anemia, increased total bilirubin, increased globulins).



Diagnosis

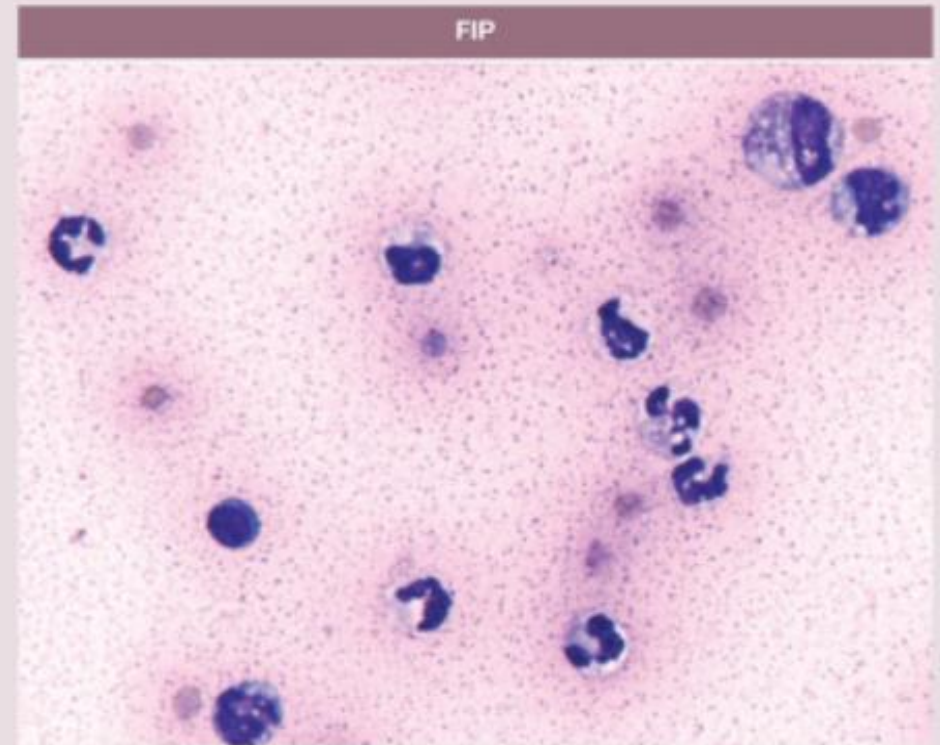
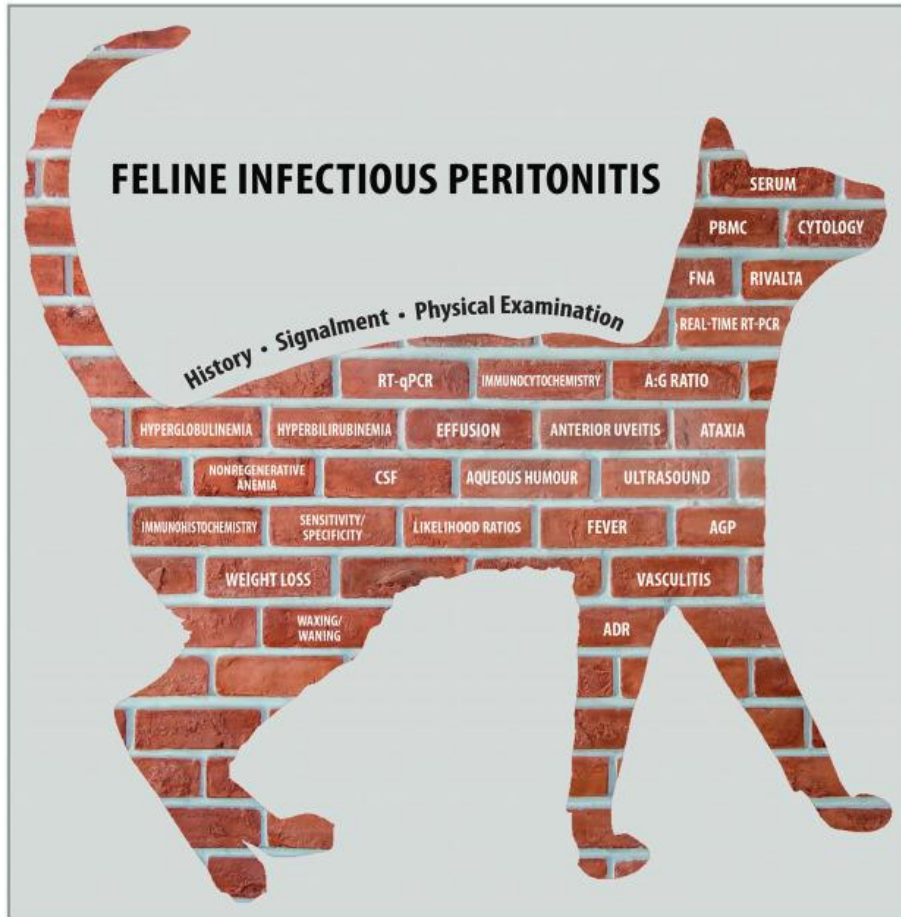


Figure 16a FIP (effusion): mixed cell population (non-degenerate neutrophils, macrophages and one lymphocyte) dispersed with a few erythrocytes in a granular eosinophilic proteinaceous background commonly observed in FIP effusions. Modified Wright stain, x 100



Treatment - Dosing

GS-441524 Oral Dosing

These doses represent the minimum dose. Dose escalation may often be necessary.

Clinical Presentation	GS-441524 PO Dosage
Effusion(s) and without ocular or neurological signs	15mg/kg q24hrs or split q12hrs
No effusion and without ocular or neurological signs	15mg/kg q24hrs or split q12hrs
Ocular signs present +/- effusion	15-20mg/kg q24hrs or split q12hrs
Neurologic signs present +/- effusion	10mg/kg (minimum) q12hrs



Treatment - Dosing

Molnupiravir (EIDD 2801) Oral Dosing

Clinical Presentation	EIDD 2801 PO Dosage
Effusion(s) and without ocular or neurological signs	10-15mg/kg q12hrs
Ocular signs present +/- effusion	15mg/kg q12hrs
Neurologic signs present +/- effusion	10-20mg/kg (minimum) q12hrs



Treatment



US Pharmacies Offering Compounded FIP Treatment

Pharmacy Name	Formulations offered	Sample 12 Week Treatment Cost*
Stokes	GS: Tablets, liquid oral suspension EIDD-1931: Tablets	\$1146.60 (Tablets)
	Available in all 50 states. Uses the BOVA compounded GS-441524 formulation which has several years of clinical use in the UK and AUS, and has been used in multiple studies https://www.stokespharmacy.com	
Wedgewood	Molnupiravir: Capsules, liquid oral suspension	\$148.50 (Oral Suspension)
	Available in all 50 states. https://www.wedgewood.com	
Mixlab	GS: Tablets, liquid oral suspension	\$755.16 (Tablets)
	Available in all 50 states. Offers 50% discount to rescues/shelters. https://mixlab.com	
Specialty Vet Pharmacy	GS: Capsules, chewable, liquid oral suspension	\$186.73 (oral suspension)
	Available in all states EXCEPT: AL, AR, KY, LA, MD, NC, NE, OR and TN. https://www.svpmeds.com	
Avrio	GS: Tablets	\$756
	Available in all states EXCEPT: AL, AR, CA, LA, MA, MD, MS, NH, NJ, OK, TN, WV https://avriorx.com	
Wood Dale	GS: Capsules, liquid oral suspension	\$732 (oral suspension)
	Available in AK, AZ, CO, CT, DE, FL, GA, ID, IL, IN, MA, MD, MI, MS, MT, NC, NH, NJ, NY, OH, OR, PA, RI, SD, TN, TX, WV, WI, WY https://wooddalepharmacy.com	
Ethos	GS: Troche, tablets, liquid oral suspension	\$746.55 (oral suspension)
	Available in MA, NH, VT, ME, CO, NY, WI, IL and HI. https://ethospetrx.com	
Pet Pharmacy NW	GS: Capsules, liquid oral suspension	Not available
	Available in OR and WA only. https://petpharmacynw.com	
Las Colinas	GS: Capsules	\$840
	Available in TX only. https://www.lascalinaspharmacy.com	



For more info visit: fipglobalcats.com and fipvetguide.com

*Sample 12 Week Treatment cost is based on expected base cost for a 3 kg (6.6 lb) cat with wet/dry (no ocular or neurological involvement) at the recommended dosages for treatment. This does not include adjustment for weight gain during treatment, and is meant to give a general comparison of treatment costs. Actual treatment cost will vary depending on cat's response to treatment, weight gain, and other factors.

Updated: 10/31/2024



Treatment and Observation Follow-up

Treatment Follow-Up – based on clinical severity of FIP

- If clinically stable:
 - Recheck exam or telemedicine recheck 2-4 weeks after starting treatment
 - Recheck CBC and chemistry at 6-8 weeks and 10-11 weeks of treatment
 - Monitoring improvement in previously abnormal values
 - Albumin, total protein and globulin abnormalities
 - Anemia, neutrophilia, total bilirubin and other abnormalities if present
 - If values are not improving, dose may need adjustment
- If ocular or mild neurologic FIP, recommend photos and/or videos to monitor improvements
- If not clinically stable, follow recommendation from veterinarian

NAME: Rhubarb **Age:** 4 Months / **Sex:** Female, S

Type of FIP: Ocular

Symptoms: Hypphema, no blepharospasm or ocular discharge. Mild normocytic, normochromic anemia (29%)

Other: Sibling to Carrot Top FIP+ with Abdominal Effusion. Cedar City

Diagnosis	4 Weeks GS	8 Weeks GS	12 Weeks GS	4 Weeks Post GS
Date: 8/17/23	Date: 9/12/23	Date: 10/9/23	Date: 11/8/23	Date: 12/6/23

	Test	Test Name	Normal low	Normal high	units*	Value	Value	Value	Value	Value
FIPRed cells	RBC	Red blood cells	6.54	12.2	M/uL	7.17	9.02	9.06		8.37
	HCT	Hematocrit	30.3	52.3	%	29.6	39.2	42.6		36.6
	HGB	Hemoglobin	9.8	16.2	g/dl	8.4	12.5	12.6		12.7

FIPWhite cells	WBC	White blood cells	2.87	17.02	K/uL	9.52	17.34	9.51		14.38
	%LYM	% Lymphocytes	20	45	%	21.6	35.2	40.4		25.0
	%NEU	% Neutrophils	35	75	%	71.5	57.9	51.1		66.3
	LYM	Absolute Lymphocyte Count	0.92	6.88	K/uL	2.05	6.10	3.84		3.60
	NEU	Absolute Neutrophil Count	2.3	10.29	K/uL	6.80	10.03	4.86		9.54

FIP Chemistry	TP	Total protein	5.2	8.2	g/dl	10.5	7.4	7.0	7.4	8.3
	ALB	Albumin	2.5	3.9	g/dl	2.9	3.2	3.0	3.4	2.9
	GLOB	Globulin	2.8	4.8	g/dl	7.6	4.2	4.0	4.0	5.4
	A/G	ALB to GLOB ratio	0.35	1.5	n/a	0.38	0.76	0.75	0.85	0.54
	TBIL	Total Bilirubin	0.0	0.9	mH/dL	0.3	0.3	0.3	0.3	0.3

Kidney	CREA	Creatinine	0.6	2.4	mg/dl	1.1	1.2	0.8	1.0	1.2
	BUN	Blood urea nitrogen	14	36	mg/dl	19	26	22	29	21

Liver	ALT	Alanine Aminotransferase	12	115	U/L	42	47	49	51	52
	ALP	Alk Phos	6	102	U/L	30	71	85	70	38

Weight	KG	1.72	2.40			
Temperature	F	103.5	Normal	Normal	Normal	Normal
GS Brand		Diagnosis	Aura Blue 20	Aura Blue 20	Aura Blue 20	Observation
Dose MG/KG		Diagnosis	12 mg/kg	12 mg/kg	12 mg/kg	Observation
Dose ML	ml	Diagnosis	1.44			Observation





Treatment and Observation Follow-Up

Observation Follow-Up

- Observation period begins after treatment completed
- We follow an 84-day observation phase
- During that time, CBC and chemistry is checked every 4 weeks
 - Monitor for signs of relapse
 - Relapse uncommon in otherwise healthy animals in low stress environment
- Vaccinations can be performed as recommended based on environment and risk
- Spay/Neuter can be performed if at least 1 month remaining in treatment (and clinically stable) or any time during observation

Case Review – Rhubarb



Ocular FIP – rubeosis iridis

- 4-month-old FS DSH
- No abnormalities in activity or appetite noted by caregivers
- During morning feeding, caregiver noted red eyes and requested doctor evaluation
- Bilateral neovascularization of iris
- CBC – mild anemia with HCT 29.6%
- Chemistry – elevated total protein and globulin with A:G ratio 0.38
- Mildly febrile at 103.5 F
- Started on ocular doses GS

Survived FIP and adopted!

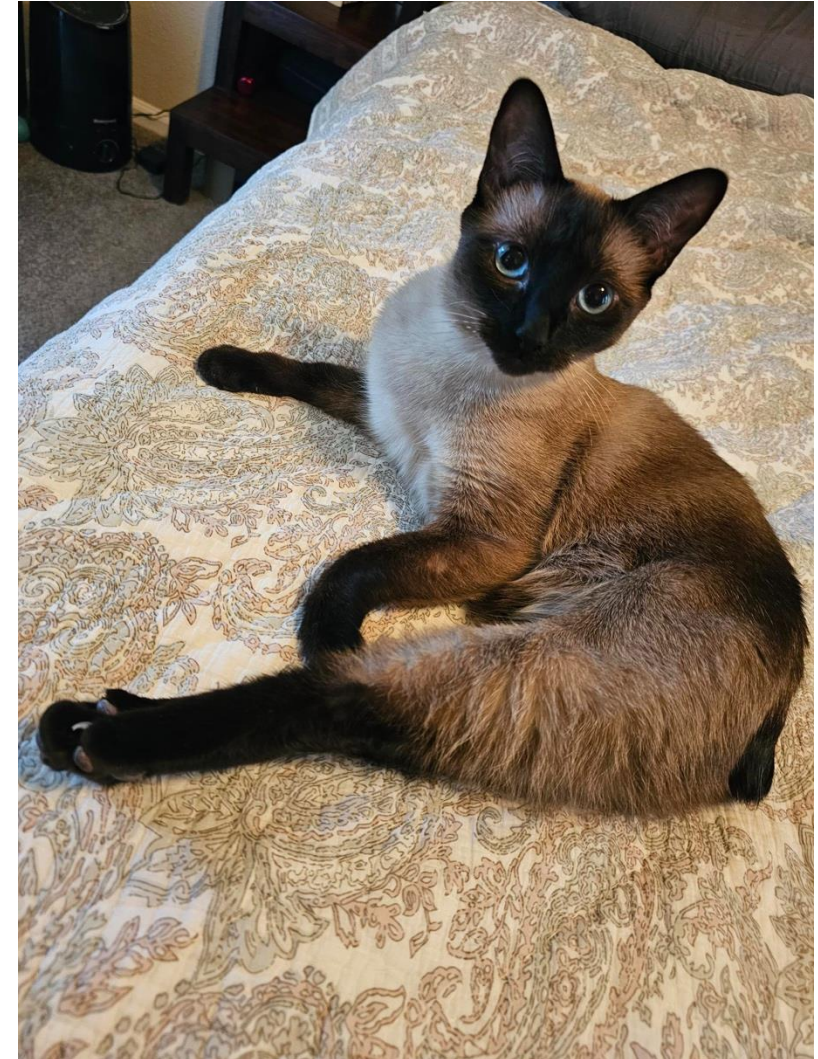


Case Review - Freyja

2-year-old FS Siamese Manx cross

Symptoms: decreased activity, poor appetite, weight loss and overall lower activity

- No effusion on exam; not febrile
- CBC – all normal values
- Chemistry – mildly elevated amylase with very elevated total protein and globulin
- Albumin:Globulin ratio of 0.3
 - Confirmatory protein electrophoresis submitted – gamma, alpha-2 and beta globulins all elevated supporting FIP diagnosis
- Started treatment with GS injections (before lab results)
 - Within 2 days, appetite improved
 - Within 1 week, normal activity



The Future of FIP Treatment and Next Steps

with Dr. Samantha Evans and Nicole Jacque





The Future of FIP Treatment

- FIP Treatment
 - New treatment options
 - Combined antiviral therapy
 - Shorter treatment duration
- Better understanding of FIP pathogenesis
 - Transmission
- Improved diagnostics
- Effects of heredity on susceptibility to FIP
- FIP Prevention



Compounded GS Around the Globe



Compounded GS-441524 &/or RDV

Graphic created by Dr. Sally Coggins (Univ Sydney)



The Future of FIP Treatment

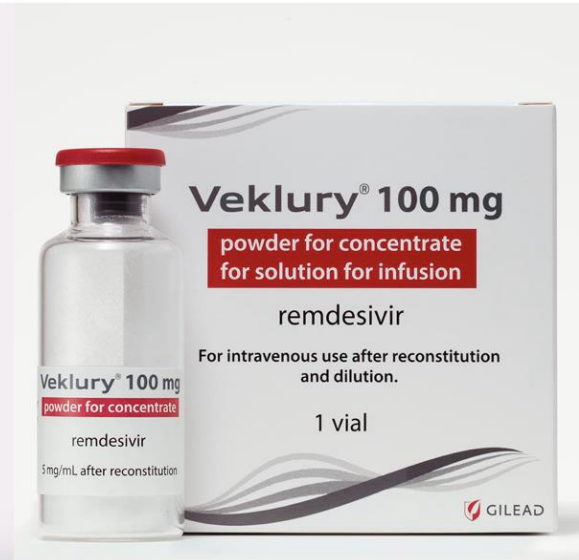
Current treatment options in the US



GS-441524
Compounded



Molnupiravir
Compounded



Remdesivir
Off-label



Paxlovid
Off-label



The Future of FIP Treatment

- Future new treatment option: GC376
 - First antiviral to successfully treat FIP
 - 3CLPro protease inhibitor
 - Anivive is working towards FDA approval
 - Submitted Reasonable Expectation of Effectiveness section to the FDA-CVM

Original Article



Efficacy of a 3C-like protease inhibitor in treating various forms of acquired feline infectious peritonitis

Niels C Pedersen¹, Yunjeong Kim², Hongwei Liu¹, Anushka C Galasiti Kankanamalage³, Chrissy Eckstrand⁴, William C Groutas³, Michael Bannasch¹, Juliana M Meadows⁵ and Kyeong-Ok Chang²

Journal of Feline Medicine and Surgery
2018, Vol. 20(4) 378–392
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The Future of FIP Treatment

- Combination Therapy
 - Common strategy for human viral diseases
 - Synergistic combinations increase effectiveness
 - Combination therapy prevents viral resistance



[Front Vet Sci.](#) 2022; 9: 1002488.

PMCID: PMC9650422

Published online 2022 Oct 28. doi: [10.3389/fvets.2022.1002488](https://doi.org/10.3389/fvets.2022.1002488)

PMID: [36387398](https://pubmed.ncbi.nlm.nih.gov/36387398/)

Effect of GS-441524 in combination with the 3C-like protease inhibitor GC376 on the treatment of naturally transmitted feline infectious peritonitis

[Jinbao Lv](#), [Yang Bai](#), [Yingyun Wang](#), [Liu Yang](#), [Yipeng Jin](#)[✉] and [Jun Dong](#)[✉]

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The Future of FIP Treatment

- Shorter Treatment Duration
 - Some cats may be able to have a shorter treatment duration with current protocols – as little as 6 weeks has shown non-inferiority in some cases
 - New protocols may enable even shorter treatment duration

Open Access Article

Short Treatment of 42 Days with Oral GS-441524 Results in Equal Efficacy as the Recommended 84-Day Treatment in Cats Suffering from Feline Infectious Peritonitis with Effusion—A Prospective Randomized Controlled Study

by Anna-M. Zuzzi-Krebitz ^{1,*}  , Katharina Buchta ¹  , Michèle Bergmann ¹ , Daniela Krentz ¹  ,
Katharina Zwicklbauer ¹  , Roswitha Dorsch ¹  , Gerhard Wess ¹ , Andrea Fischer ¹ ,
Kaspar Matiasek ² , Anne Hönl ^{1,2}  , Sonja Fiedler ² , Laura Kolberg ³  ,
Regina Hofmann-Lehmann ⁴  , Marina L. Meli ⁴  , Andrea M. Spiri ⁴  ,
A. Katrin Helfer-Hungerbuehler ⁴ , Sandra Felten ⁵ , Yury Zablotski ¹  , Martin Alberer ³ ,
Ulrich von Both ^{3,6}   and + Show full author list



Combined Antiviral Therapy for FIP

CSU/Best Friends Animal Society/MedVet Columbus:

Ongoing clinical trial with combined **oral** GS-441524 and GC376
(all FIP phenotypes)

"GS-441524 combined with GC376 can be safely and effectively used to treat FIP and reduces the treatment period to **4 weeks**, with an excellent cure rate." - Lv et al, 2022



Best
Friends
Animal
Society





The Future of FIP Treatment

- Virus sequencing and surveillance
 - Identification
 - Transmission
 - Virulence



Microbiology
Spectrum



📄 | Virology | Research Article

Molecular detection using hybridization capture and next-generation sequencing reveals cross-species transmission of feline coronavirus type-1 between a domestic cat and a captive wild felid

Ximena A. Olarte-Castillo,^{1,2} Laura B. Goodman,^{2,3} Gary R. Whittaker^{1,3,4}








The Future of FIP Treatment

- Investigating genetic susceptibility to FIP
 - polygenic



Article

Evaluation of Interferon-Gamma Polymorphisms as a Risk Factor in Feline Infectious Peritonitis Development in Non-Pedigree Cats—A Large Cohort Study

Emi N. Barker ^{1,2,*}, Philippa Lait ^{1,2}, Lorenzo Ressel ³, Emily-Jayne Blackwell ², Séverine Tasker ^{2,4}, Helen Kedward-Dixon ⁵, Anja Kipar ^{6,7} and Christopher R. Helps ^{1,2}



Strawberry
Diagnosed 9/22

Peaches
Diagnosed 10/24

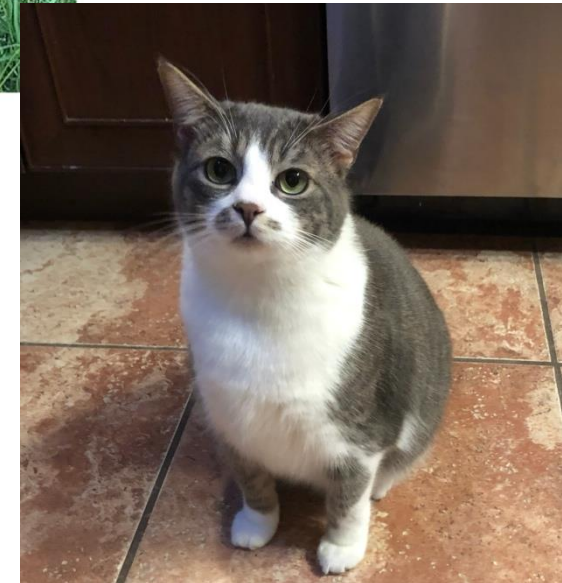
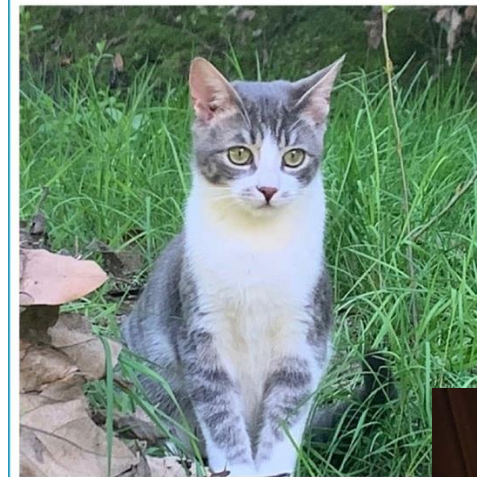


The Future of FIP Treatment

- Wouldn't it be great if we could prevent FIP in the first place?
 - Previous vaccine efforts
 - Not effective
 - May have increased chance of developing FIP!
 - **DO NOT USE!**



Peanut
(Diagnosed 12/2019)





The Future of FIP Treatment

- New mRNA vaccine development is in progress at UC Davis





The Future of FIP Diagnosis

Response to therapy (**supportive**)

Multiplex Fluorescent Immunocytochemistry (MF-ICC) and flow cytometry

Plasma proteomics and serum biomarkers

Machine learning algorithms using clinicopathologic data

Non-S gene mutations or whole genome sequencing

CRISPR-based point-of-care diagnostics?

Raman spectroscopy?

---> **Watch this space!**





FIP Friendly Vet

Find and Nominate
FIP Friendly Vets!



Find an FIP Friendly Practice near you

Vets: to be added, email the name and location of your practice to: info@fipfriendlyvet.com

Owners: Please remember that the vet must be able to physically see/examine your cat -- they cannot give advice over the phone!

Do you know an FIP Friendly Vet? [Nominate them!](#)

HOME Nominate an FIP Friendly Vet For Vets Find a Vet

Find a location near you

Enter your address or zip code

All locations (212)

Rockville Road Animal Hospital

7351 Rockville Rd
Indianapolis, IN 46214, USA

[View details](#)

Exceptional Pets Mesa

1928 S Gilbert Rd
Mesa, AZ 85204, USA

[View details](#)

Cat Clinic of Lawrence

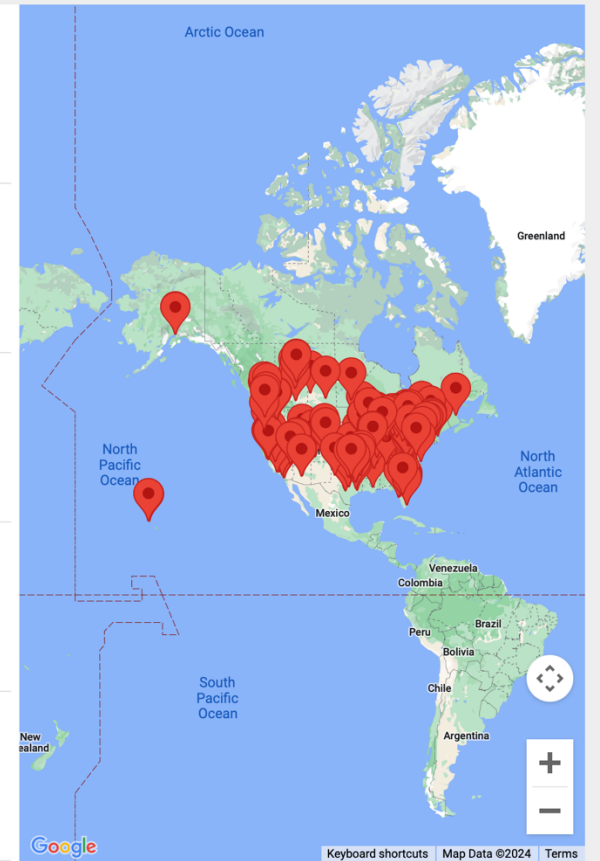
1701 Massachusetts St
Lawrence, KS 66044, USA

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Shelter Island Veterinary Hospital

3625 Midway Dr Suite T
San Diego, CA 92110, USA

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