

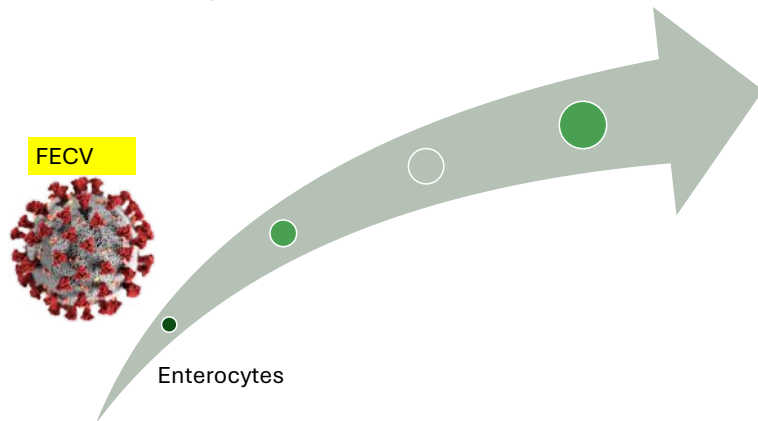
## Feline Infectious Peritonitis Embracing a new era in treatment

Maria Lyraki DVM MSc DipECVIM-CA MRCVS

EBVS and RCVS Recognised Specialist in Small Animal Internal Medicine



### FIP Pathogenesis



### Overview of the lecture

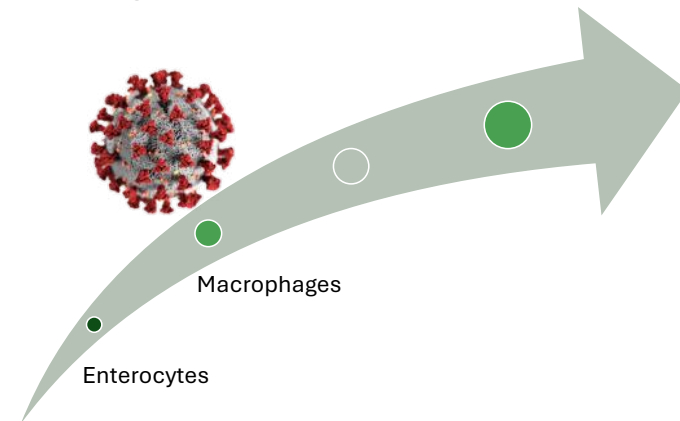


*"An Update on the existing literature"*

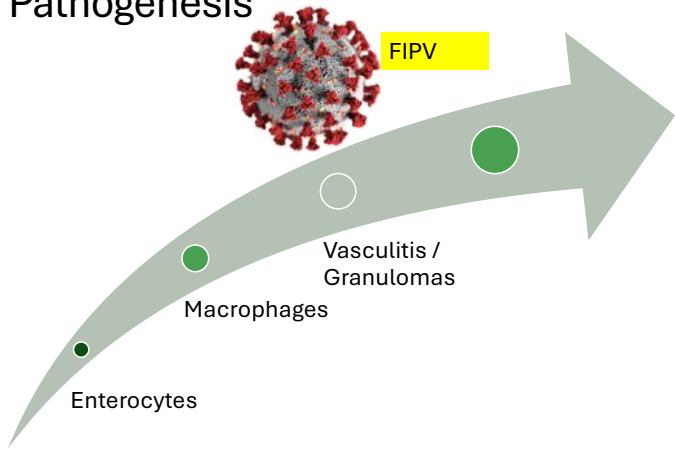


*"Applying theory in practice – exploring new concepts"*

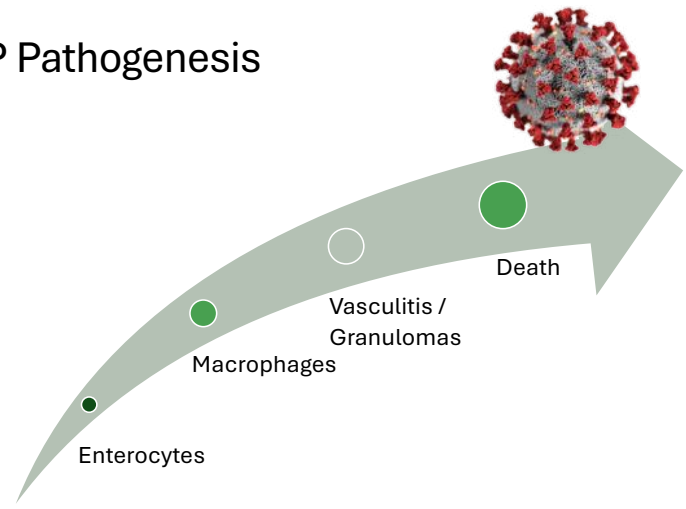
### FIP Pathogenesis



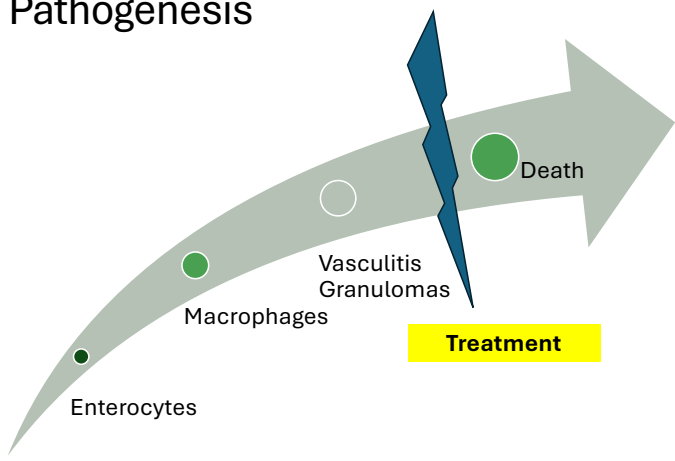
### FIP Pathogenesis



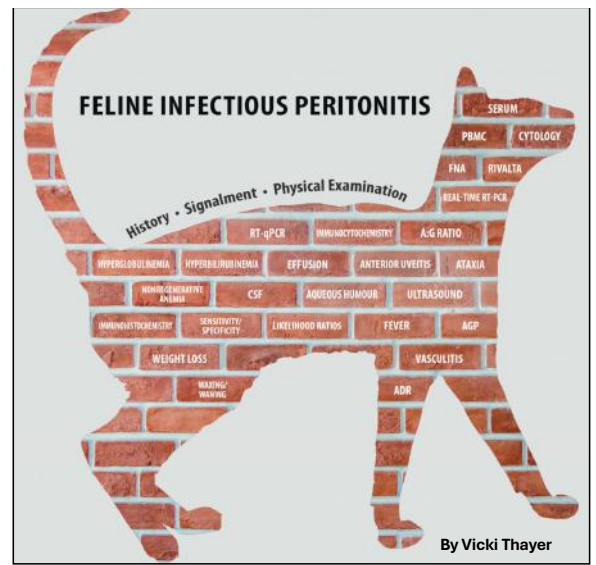
### FIP Pathogenesis



### FIP Pathogenesis



### Diagnosis



## ABCD guidelines for the diagnosis

FIP Diagnosis	Confirmed	Very likely	Highly suspicious
Consistent clinicopathological abnormalities	✓		
Cytology/Histopathology	✓		
PCR of appropriate tissue			
Immunohistochemistry OR Immunocytochemistry	✓		



## ABCD guidelines for the diagnosis

FIP Diagnosis	Confirmed	Very likely	Highly suspicious
Consistent clinicopathological abnormalities	✓	✓	
Cytology/Histopathology	✓	✓	
PCR of appropriate tissue		✓	
Immunohistochemistry OR Immunocytochemistry	✓		



## ABCD guidelines for the diagnosis

FIP Diagnosis	Confirmed	Very likely	Highly suspicious
Consistent clinicopathological abnormalities	✓	✓	✓
Cytology/Histopathology	✓	✓	
PCR of appropriate tissue		✓	
Immunohistochemistry OR Immunocytochemistry	✓		



## ABCD guidelines for the diagnosis




FIP Diagnosis	Confirmed	Very likely	Highly suspicious
Consistent clinicopathological abnormalities	✓	✓	✓
Cytology/Histopathology	✓	✓	
PCR of appropriate tissue		✓	
Immunohistochemistry OR Immunocytochemistry	✓		








## FIP TREATMENT

### Treatment options

GS-441524 Remdesivir	Nucleoside analogues, oral and injectable	
Molnupiravir EIDD-1931	Nucleoside analogues, oral only	
Nirmatrelvir Ritonavir	Protease inhibitors, oral only, not published data yet	
GC376	Protease inhibitor, preliminary studies	
Mefloquine Itraconazole IFN- omega Polyprenyl Immunostimulant Glucocorticoids	Adjunctive treatment / more limited effect	

### Treatment options

GS-441524 Remdesivir	Nucleoside analogues, oral and injectable	
Molnupiravir EIDD-1931	Nucleoside analogues, oral only	
Nirmatrelvir Ritonavir	Protease inhibitors, oral only, not published data yet	
GC376	Protease inhibitor, preliminary studies	
Mefloquine Itraconazole IFN- omega Polyprenyl Immunostimulant Glucocorticoids	Adjunctive treatment / more limited effect	

### GS-441524 / remdesivir

Clinical presentation	Remdesivir – by injection	GS-441524 – oral
Cats with effusions and without ocular or neurological signs	10 mg/kg once daily	10-12 mg/kg once daily
No effusion and without ocular or neurological signs	12 mg/kg once daily	10-12 mg/kg once daily
Ocular signs present (effusive and non-effusive)	15 mg/kg once daily	15 mg/kg once daily
Neurological signs present (effusive and non-effusive)	20 mg/kg once daily	10 mg/kg <b>twice</b> daily (i.e. 20 mg/kg given as a divided dose)

*An update on treatment of FIP using antiviral drugs in 2024: growing experience but more to learn*

# GS-441524 / remdesivir

Clinical presentation	Remdesivir – by injection	GS-441524 – oral
Cats with effusions and without ocular or neurological signs	10 mg/kg once daily	10-12 mg/kg once daily
No effusion and without ocular or neurological signs	12 mg/kg once daily	10-12 mg/kg once daily
Ocular signs present (effusive and non-effusive)	15 mg/kg once daily	15 mg/kg once daily
Neurological signs present (effusive and non-effusive)	20 mg/kg once daily	10 mg/kg twice daily (i.e. 20 mg/kg given as a divided dose)

*“Most cases have eye/brain involvement regardless of obvious clinical signs or not”*

*An update on treatment of FIP using antiviral drugs in 2024: growing experience but more to learn*

# Efficacy

- Coggins SJ, et al. **Outcomes of treatment of cats with feline infectious peritonitis using parenterally administered remdesivir, with or without transition to orally administered GS-441524.** *Viruses.* 2022
- Taylor SS, et al. **Retrospective study and outcome of 307 cats with feline infectious peritonitis treated with legally sourced veterinary compounded preparations of remdesivir and GS-441524 (2020-2022).** *J Feline Med Surg.* 2023
- Green J, et al. **Thirty-two cats with effusive or non-effusive feline infectious peritonitis treated with a combination of remdesivir and GS-441524.** *J Vet Intern Med.* 2023
- Zwicklbauer K, et al. **Long-term follow-up of cats in complete remission after treatment of feline infectious peritonitis with oral GS-441524.** *J Feline Med Surg.* 2023
- Yan Y, et al. **Better therapeutic effect of oral administration of GS441524 compared to GC376.** *Veterinary Microbiology* 2023.
- Zuzzi-Krebitz AM, et al. **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.** *Viruses* 2024.

# Efficacy

- Coggins SJ, et al. **Outcomes of treatment of cats with feline infectious peritonitis using parenterally administered remdesivir, with or without transition to orally administered GS-441524.** *Viruses.* 2022
- Taylor SS, et al. **Retrospective study and outcome of 307 cats with feline infectious peritonitis treated with legally sourced veterinary compounded preparations of remdesivir and GS-441524 (2020-2022).** *J Feline Med Surg.* 2023
- ✓ Highly efficient ~ 85 % across the studies**
- ✓ Highly Safe – no major adverse effects**
- Long-term follow-up of cats in complete remission after treatment of feline infectious peritonitis. *J Feline Med Surg.* 2023
- Yan Y, et al. **Better therapeutic effect of oral administration of GS441524 compared to GC376.** *Veterinary Microbiology* 2023.
- Zuzzi-Krebitz AM, et al. **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.** *Viruses* 2024.



# Veklury

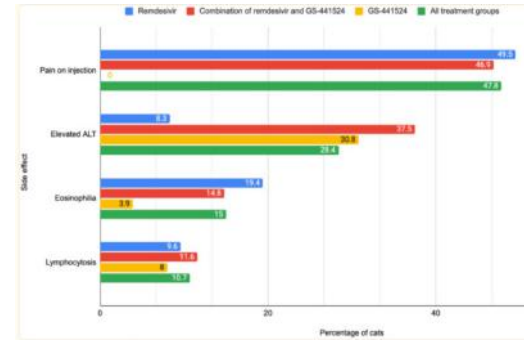
- IV use only
- Very acidic (pH 1.4!)
- Reconstitution with water for injection to 5mg/ml
- Dilute further with saline
- Slow infusion over 30-120 min
- May cause sedation/nausea for a few hours!
- Discard after 12 hours



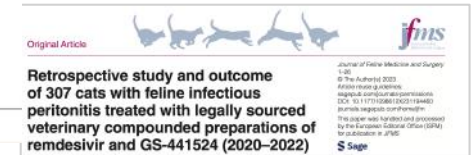
## GS-441524 / remdesivir



## Adverse effects – Part 1



- Injection reactions
- ALT increase
- Eosinophilia
- Lymphocytosis
- Nausea/Sedation (IV administration)



## Adverse effects – Part 2



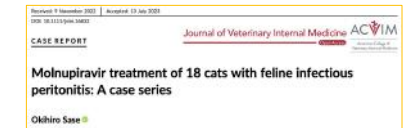
- Uroliths

*J. Vet. Intern. Med.* 2024 Jan-Feb; 38(1): 370–374. Published online 2023 Nov 30.  
doi: [10.1111/jvim.16954](https://doi.org/10.1111/jvim.16954)  
PMCID: PMC10800210 | PMID: 38032049

Uroliths composed of antiviral compound GS-441524 in 2 cats undergoing treatment for feline infectious peritonitis

## Molnupiravir / EIDD-1931

- GS is NOT available everywhere in the world
- GS is very expensive
- Drug combinations may allow treating resistant or relapsed cases
- Nucleoside analogue
- Increases the mutation rate of the virus
- EIDD-1931 is the active metabolite



GS-441524 and molnupiravir are similarly effective for the treatment of cats with feline infectious peritonitis

Okihiro Sase<sup>1\*</sup>, Tomoko Iwami<sup>1</sup>, Takeru Sasaki<sup>1</sup> and Tadashi Sano<sup>2</sup>

<sup>1</sup>Yuu-Me Animal Hospital, Sakura, Japan, <sup>2</sup>Okihiro University of Agriculture and Veterinary Medicine, Department of Clinical Veterinary Science, Hokkaido, Japan



## Doses

- Wet FIP: 10mg/kg PO BID
- Dry FIP: 12 mg/kg PO BID
- Neuro/Ocular: 15mg/kg PO BID



## Doses

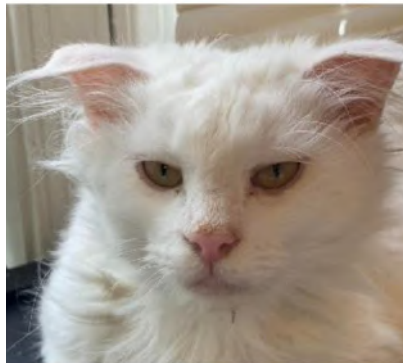
- Wet FIP: 10mg/kg PO BID
- Dry FIP: 12 mg/kg PO BID
- **Neuro/Ocular: 15mg/kg PO BID**



## Molnupiravir / EIDD-1931

### Adverse effects

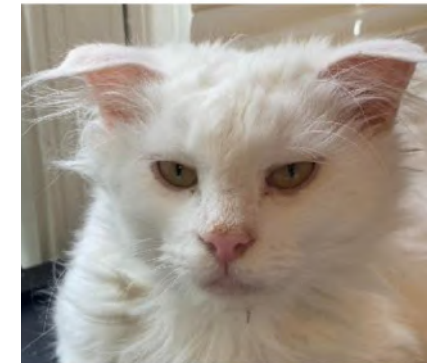
- Folded ears
- Broken whiskers
- Increased ALT



## Molnupiravir / EIDD-1931

### Adverse effects

- Folded ears
- Broken whiskers
- Increased ALT
- **Leukopenia**
- **Increase the mutation rate of the virus??**





## Authorized vs black market products

JAVMA AVMA

**Unlicensed antiviral products used for the at-home treatment of feline infectious peritonitis contain GS-441524 at significantly different amounts than advertised**

Alycia M. Kern, MPH<sup>1\*</sup>; Su Guan, PhD<sup>2</sup>; Nicole Jacques<sup>3</sup>; Wendy Movicozz, PhD<sup>4</sup>; Samantha J. M. Evans, DVM, PhD, DACVP<sup>5</sup>

<sup>1</sup>Department of Veterinary Biosciences, College of Veterinary Medicine, The Ohio State University, Columbus, OH  
<sup>2</sup>Department of Biochemistry and Molecular Medicine, School of Medicine, University of California-Davis, Davis, CA  
<sup>3</sup>San Jose, CA  
<sup>4</sup>Department of Orthopaedic Surgery, School of Medicine, University of Virginia, Charlottesville, VA  
<sup>5</sup>Department Public Health Sciences, School of Medicine, University of Virginia, Charlottesville, VA  
<sup>6</sup>Department of Microbiology, Immunology, and Pathology, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO  
\*Corresponding author: Alycia M. Kern (kern.3429@buckeye.msu.edu)

**OBJECTIVE**  
To analyze the content of unlicensed GS-441524-like products being used as a largely successful at-home treatment for cats suspected to have FIP. The remdesivir content and pH were also measured.

**SAMPLE**  
127 injectable and oral samples from 30 of the most popular brands of black market producers.

**METHODS**  
Unlicensed GS-441524-like products were procured through donations and tested for GS-441524 and remdesivir content by liquid chromatography with tandem mass spectrometry. A pH meter measured the pH of injectable samples.

**RESULTS**  
Of the 87 injectable formulations, 95% contained more (on average 39% more) GS-441524 than expected based on the producer's marketed concentrations. The average pH (7.30 [24]) was well below the physiologic pH conditions recommended for SC injections. The oral formulations were more variable, with 43% containing more GS-441524 (on average 75% more) than expected and 58% containing less (on average 39% less) than the expected content. There was minimal variability in GS-441524 content between replicate samples in the injectable formulations (measured by coefficient of variation). One injectable and 2 oral samples additionally contained remdesivir.

25/09/24

29

## Authorized vs black market products

JAVMA AVMA

**Unlicensed antiviral products used for the at-home treatment of feline infectious peritonitis contain GS-441524 at significantly different amounts than advertised**

Alycia M. Kern, MPH<sup>1\*</sup>; Su Guan, PhD<sup>2</sup>; Nicole Jacques<sup>3</sup>; Wendy Movicozz, PhD<sup>4</sup>; Samantha J. M. Evans, DVM, PhD, DACVP<sup>5</sup>

<sup>1</sup>Department of Veterinary Biosciences, College of Veterinary Medicine, The Ohio State University, Columbus, OH  
<sup>2</sup>Department of Biochemistry and Molecular Medicine, School of Medicine, University of California-Davis, Davis, CA  
<sup>3</sup>San Jose, CA  
<sup>4</sup>Department of Orthopaedic Surgery, School of Medicine, University of Virginia, Charlottesville, VA  
<sup>5</sup>Department Public Health Sciences, School of Medicine, University of Virginia, Charlottesville, VA  
<sup>6</sup>Department of Microbiology, Immunology, and Pathology, College of Veterinary Medicine and Biomedical Sciences, Colorado State University, Fort Collins, CO  
\*Corresponding author: Alycia M. Kern (kern.3429@buckeye.msu.edu)

**OBJECTIVE**  
To analyze the content of unlicensed GS-441524-like products being used as a largely successful at-home treatment for cats suspected to have FIP. The remdesivir content and pH were also measured.

**SAMPLE**  
127 injectable and oral samples from 30 of the most popular brands of black market producers.

**METHODS**  
Unlicensed GS-441524-like products were procured through donations and tested for GS-441524 and remdesivir content by liquid chromatography with tandem mass spectrometry. A pH meter measured the pH of injectable samples.

**RESULTS**  
Of the 87 injectable formulations, 95% contained more (on average 39% more) GS-441524 than expected based on the producer's marketed concentrations. The average pH (7.30 [24]) was well below the physiologic pH conditions recommended for SC injections. The oral formulations were more variable, with 43% containing more GS-441524 (on average 75% more) than expected and 58% containing less (on average 39% less) than the expected content. There was minimal variability in GS-441524 content between replicate samples in the injectable formulations (measured by coefficient of variation). One injectable and 2 oral samples additionally contained remdesivir.

25/09/24

30

## Glucocorticoids (GCs) in FIP treatment

- We tend to discontinue GCs once antivirals have been started
- But they can be useful to control neurological signs and immune-mediated consequences

**Short-term Outcome of Clinical and Laboratory Variables in Cats With Feline Infectious Peritonitis Receiving Oral Treatment With GS-441524, With and Without Additional Corticosteroids**

ECVIM-CA CONGRESS, 2024

S.M. Meunier<sup>1</sup>; S. Felten<sup>1</sup>; A.M. Spir<sup>2,3</sup>; J.M. Wenk<sup>3,4</sup>; C.C. De Witt Curtius<sup>3,4</sup>; A.B. Bouzon<sup>2,5</sup>; M.L. Meli<sup>3,4</sup>; I. Cerchiaro<sup>3,4</sup>; B. Pineroli<sup>3,4</sup>; A.K. Kipar<sup>6</sup>; K. Hartmann<sup>7</sup>; R. Hofmann-Lehmann<sup>3,4</sup>

- Viral loads did not increase
- Survival did not differ

## Glucocorticoids (GCs) in FIP treatment

- We tend to discontinue GCs once antivirals have been started
- But they can be useful to control neurological signs and immune-mediated consequences



- ✓ If necessary, they are unlikely to do harm as adjuncts
- ✓ Long-term treatment should be avoided
- ✓ Do not delay antivirals!





## FAQs

### Is GS-441524 better than molnupiravir?

- GS-441524 appears highly effective and safe
- But Not available everywhere in the world
- Expensive
- Drug combinations may allow treating resistant or relapsed cases

### Is GS-441524 better than molnupiravir?

- 59 cats treated with GS-4421524 and 59 cats with molnupiravir
- 20.3% in the GS-441524 group and 13.6% in the molnupiravir group died within the first days
- No major adverse effects in either group
- 48/48 in the GS-441524 group and 51/52 in the molnupiravir group achieved remission

GS-441524 and molnupiravir are similarly effective for the treatment of cats with feline infectious peritonitis

Okiihiro Sase<sup>1\*</sup>, Tomoko Iwami<sup>2</sup>, Takeru Sasaki<sup>1</sup> and Tadashi Sano<sup>2</sup>

<sup>1</sup>You-Me Animal Hospital, Sakara, Japan, <sup>2</sup>Cobhiro University of Agriculture and Veterinary Medicine, Department of Clinical Veterinary Science, Hokkaido, Japan

### Is GS-441524 better than molnupiravir?

- 59 cats treated with GS-4421524 and 59 cats with molnupiravir
- 20.3% in the GS-441524 group and 13.6% in the molnupiravir group died within the first days
- No major adverse effects in either group
- 48/48 in the GS-441524 group and 51/52 in the molnupiravir group achieved remission

GS-441524 and molnupiravir are similarly effective for the treatment of cats with feline infectious peritonitis

Okiihiro Sase<sup>1\*</sup>, Tomoko Iwami<sup>2</sup>, Takeru Sasaki<sup>1</sup> and Tadashi Sano<sup>2</sup>

<sup>1</sup>You-Me Animal Hospital, Sakara, Japan, <sup>2</sup>Cobhiro University of Agriculture and Veterinary Medicine, Department of Clinical Veterinary Science, Hokkaido, Japan



**“GS and molnupiravir have SO FAR similar efficacy and safety at standard doses”**

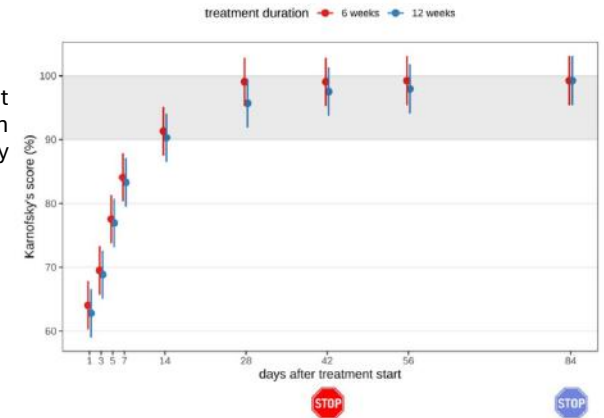
## Do I have to treat for 82 days?

- 40 cats FIP were randomized to receive 42 or 82 days of GS-441524
- Effusive cases predominantly
- Dose was 15mg/kg/day
- The cats were followed for 168 days



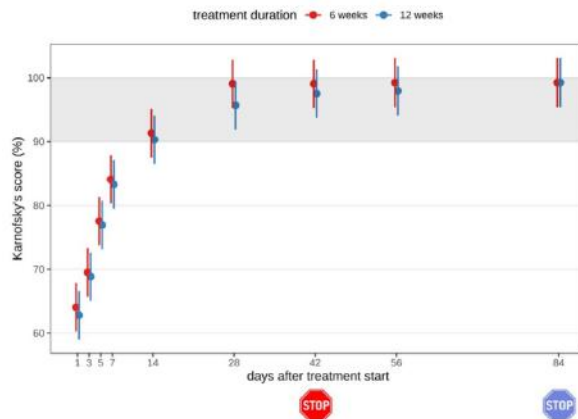
## Do I have to treat for 82 days?

A shorter treatment duration of 42 days can be considered equally effective to 82 days



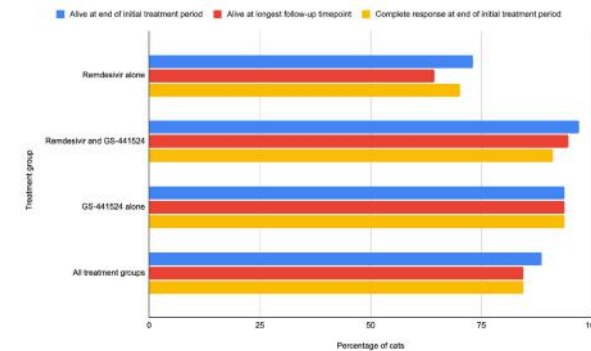
## Do I have to treat for 82 days?

- A shorter treatment duration of 42 days can be considered equally effective to 82 days



- Very few neuro/ocular cases – care with extrapolating data to other forms of FIP

## Is injectable treatment better than oral?



Journal of Feline Medicine and Surgery  
 Volume 33, Issue 9, September 2021  
 © The Author(s) 2021. Article reuse guidelines: <http://www.tandf.co.uk/journals>  
 https://doi.org/10.1080/10989191.2021.1946888

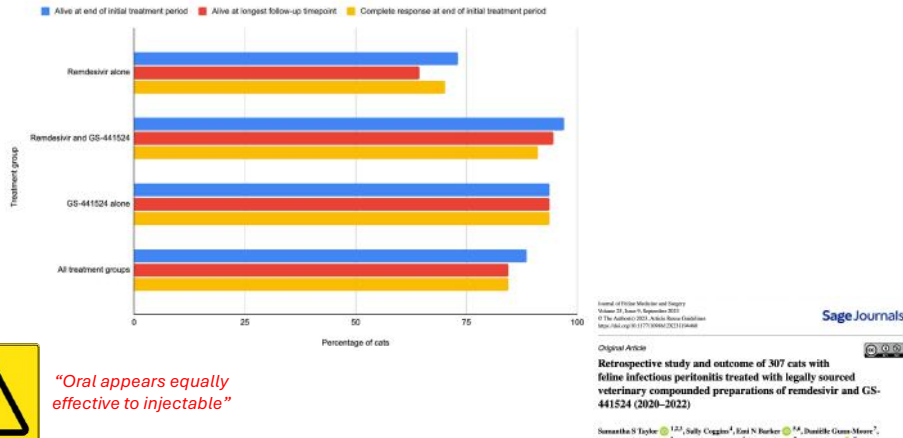
Sage Journals

Original Article

**Retrospective study and outcome of 307 cats with feline infectious peritonitis treated with legally sourced veterinary compounded preparations of remdesivir and GS-441524 (2020–2022)**

Samantha S Taylor <sup>1,2,3</sup>, Sally Cuggins <sup>4</sup>, Eyal N Parker <sup>5,6</sup>, Denise Ginn-Morris <sup>7</sup>

## Is injectable treatment better than oral?



“Oral appears equally effective to injectable”

## Can FIP be ever cured completely?

- 18 cats followed for up to 1 year after treatment
- Laboratory parameters remained stable
- Blood viral loads remained negative
- 12 cats showed abdominal lymphadenomegaly
- Two cats developed mild neurological signs, compatible with feline hyperaesthesia syndrome

Zwicklbauer K, Krentz D, et al. Long-term follow-up of cats in complete remission after treatment of feline infectious peritonitis with oral GS-441524. *J Feline Med Surg.* 2023

## Can FIP be ever cured completely?

- Oral treatment can cause sustained remission



Zwicklbauer K, Krentz D, et al. Long-term follow-up of cats in complete remission after treatment of feline infectious peritonitis with oral GS-441524. *J Feline Med Surg.* 2023

## Can FIP be ever cured completely?



Case Report

### Clinical Follow-Up and Postmortem Findings in a Cat That Was Cured of Feline Infectious Peritonitis with an Oral Antiviral Drug Containing GS-441524

Daniela Krentz<sup>1,\*,†</sup>, Katharina Zwicklbauer<sup>1,†</sup>, Sandra Felten<sup>1</sup>, Michèle Bergmann<sup>1</sup>, Roswitha Dorsch<sup>1</sup>, Regina Hofmann-Lehmann<sup>2</sup>, Marina L. Meli<sup>2</sup>, Andrea M. Spiri<sup>2</sup>, Ulrich von Both<sup>3</sup>, Martin Alberer<sup>3</sup>, Anne Hönl<sup>1,4</sup>, Kaspar Matiassek<sup>4,†</sup> and Katrin Hartmann<sup>1,†</sup>



## Can FIP be ever cured completely?

Tissue	IHC for FCoV Antigen	FCoV RT-qPCR <sup>1</sup> (Viral Load)	18S rRNA RT-qPCR <sup>1</sup> (RNA Quality Control) CT <sup>2</sup> -Value
mandibular lymph node	negative	negative	15.09
jejunum	negative	negative	15.86
duodenum	negative	negative	14.08
spleen	negative	negative	14.18
colon	negative	negative	16.02
mesenterial lymph node	negative	negative	15.57
kidney	negative	negative	20.62
caecum	negative	negative	14.28
rectum	negative	negative	15.21
liver	negative	negative	20.54
brain	negative	negative	20.82

<sup>1</sup> RNA diluted 1:5; <sup>2</sup> cycle threshold values.

## Can FIP be ever cured completely?

Tissue	IHC for FCoV Antigen	FCoV RT-qPCR <sup>1</sup> (Viral Load)	18S rRNA RT-qPCR <sup>1</sup> (RNA Quality Control) CT <sup>2</sup> -Value
mandibular lymph node	negative	negative	15.09
jejunum	negative	negative	15.86
duodenum	negative	negative	14.08
spleen	neg		
colon	neg		
mesenterial lymph node	neg		
kidney	neg		
caecum	neg		
rectum	neg		
liver	neg		
brain	neg		

<sup>1</sup> RNA diluted 1:5; <sup>2</sup> cycle threshold values.



FIP can be completely cured!!



## Monitoring

### Monitoring

- Clinical response
- Weight gain
- Blood work / repeat imaging
  - Normalization of initial abnormalities
  - Drug adverse effects
- Acute phase proteins

## Acute phase proteins

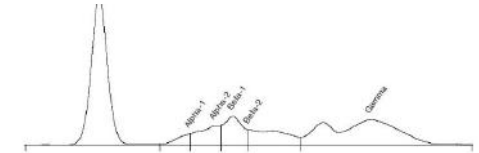
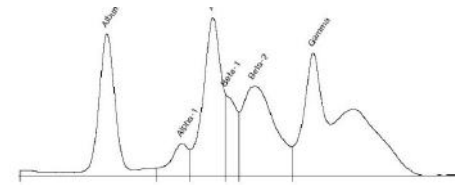
- Markers of inflammation
- Supporting diagnosis among other findings – **DO NOT BASE DIAGNOSIS SOLELY ON THEM**
- Monitoring tools

A1 – glycoprotein (AGP)		
It can support the diagnosis		
Useful tool to guide treatment duration - 2-4 weeks to normalize		
Not available everywhere		

A1 – glycoprotein (AGP)	Serum electrophoresis	
It can support the diagnosis	<ul style="list-style-type: none"> <li>• Abnormal even when total globulins are normal – can support diagnosis</li> <li>• Polyclonal/biclonal/monoclonal</li> </ul>	
Useful tool to guide treatment duration - 2-4 weeks to normalize	Takes longer than the others to normalize (4-8 weeks) - <b>TOO LONG FOR TREATMENT DURATION</b>	
Not available everywhere	Available worldwide	

A1 – glycoprotein (AGP)	Serum electrophoresis	Serum amyloid A (SAA)
It can support the diagnosis	<ul style="list-style-type: none"> <li>• Abnormal even when total globulins are normal – can support diagnosis</li> <li>• Polyclonal/biclonal/monoclonal</li> </ul>	Easily affected by comorbidities Rapid changes in serum levels
Useful tool to guide treatment duration - 2-4 weeks to normalize	Takes longer than the others to normalize (4-8 weeks) - <b>TOO LONG FOR TREATMENT DURATION</b>	Normalizes within days
Not available everywhere	Available worldwide	Not available everywhere

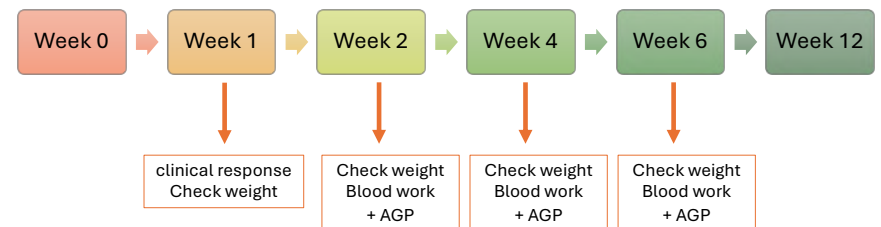
A1-glycoprotein (AGP)	Serum electrophoresis	Serum amyloid A (SAA)
It can support the diagnosis	<ul style="list-style-type: none"> <li>Abnormal even when total globulins are normal – can support diagnosis</li> <li>Polyclonal or monoclonal</li> </ul>	Easily affected by comorbidities Rapid changes in serum levels
Useful tool to guide treatment duration - 2-4 weeks to normalize	Takes longer than the others to normalize (4-8 weeks) - <b>TOO LONG FOR TREATMENT DURATION</b>	Normalizes within days
Not available everywhere	Available worldwide	Not available everywhere



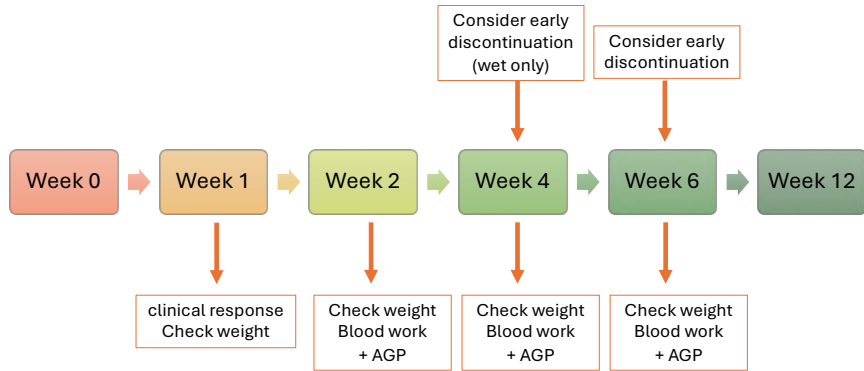
## Monitoring



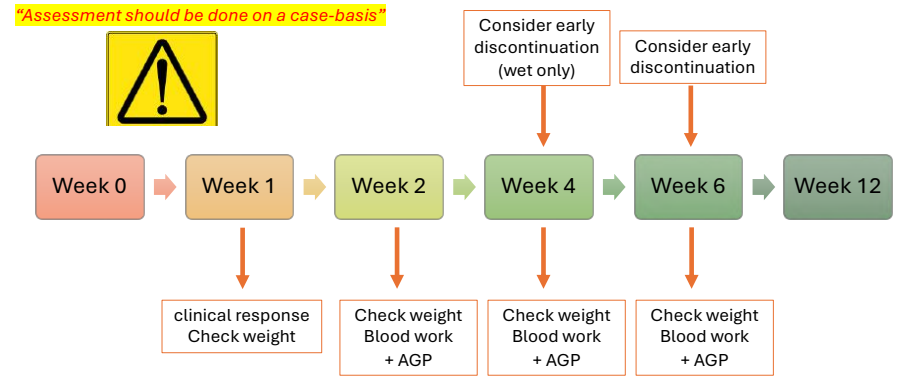
## Monitoring



# Monitoring

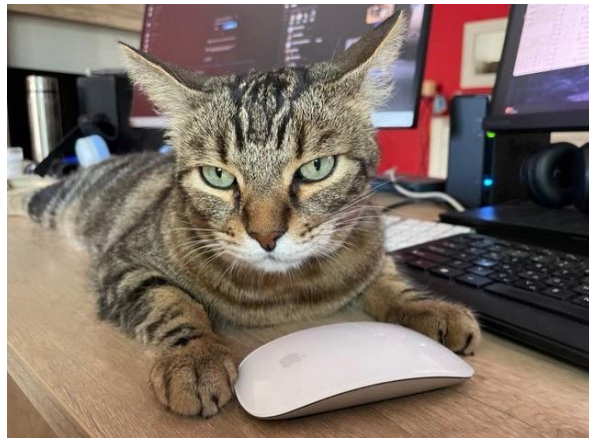


# Monitoring



## Taz's story...

A 8 y Male Neutered Domestic Short Hair



## Clinical presentation

- 3 weeks progressive history
  - Weight loss
  - Hyporexia
  - Depression
- Physical examination
  - Pyrexia
  - Palpable mesenteric lymph nodes



## Initial work-up

- Marked leukocytosis, left shift
- Mild non-regenerative anaemia
- Mild hyperglobulinaemia
- Ultrasound revealed enlarged mesenteric lymph nodes
- FeLV / FIV negative



25/09/24

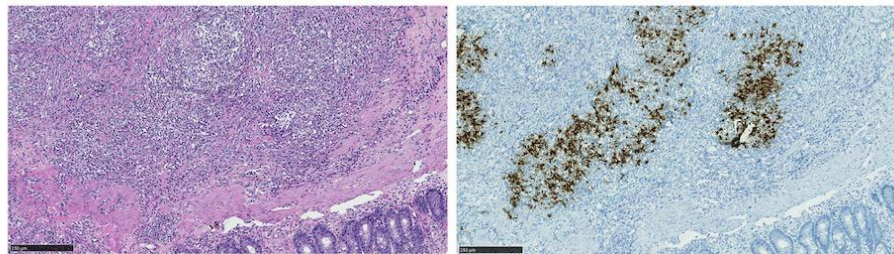
61

## Diagnosis

- Cytology was not diagnostic – PCR was negative
- Exploratory laparotomy
  - Lymph node excisional biopsy
- Histopathology showed pyogranulomatous inflammation
- Negative bacterial culture



25/09/24



## Immunohistochemistry

## Week 2 treatment

- 15mg/kg SID GS-441524
- Partial clinical improvement
- No weight gain yet
- Skin reaction



γ- globulins (abs.) 23 g/L (RI 3.6-16.9)

Neutrophils 35 K/μL (RI 2.87-17.02)

Baseline

---

γ- globulins (abs.) 25 g/L (RI 3.6-16.9)

Neutrophils 28 K/μL (RI 2.87-17.02)

Week 2

γ- globulins (abs.) 23 g/L (RI 3.6-16.9)

Neutrophils 35 K/μL (RI 2.87-17.02)

Baseline



γ- globulins (abs.)

Neutrophils 28 K/μL (RI 2.87-17.02)

Week 2

What have I done wrong?

## Possible explanations

- Wrong diagnosis?
- Other concurrent diseases going on?
- Owner compliance?
- Underdosing due to weight gain?
- Has the drug the concentration I think it has? – Illegal drugs
- Poor absorber?
- Quick excreter?
- Drug resistance

## Possible explanations

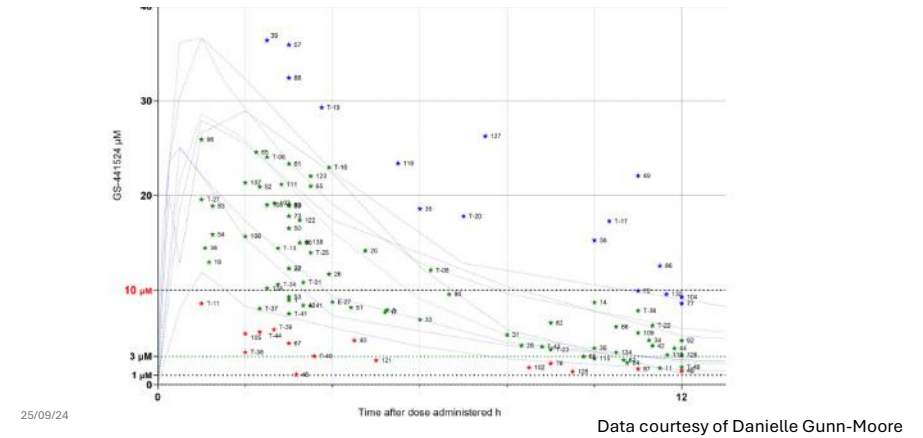
- ~~Wrong diagnosis?~~
- ~~Other concurrent diseases going on?~~
- ~~Owner compliance?~~
- ~~Underdosing due to weight gain?~~
- ~~Has the drug the concentration I think it has? – Illegal drugs~~
- Poor absorber?
- Quick excreter?
- Drug resistance

## Possible explanations

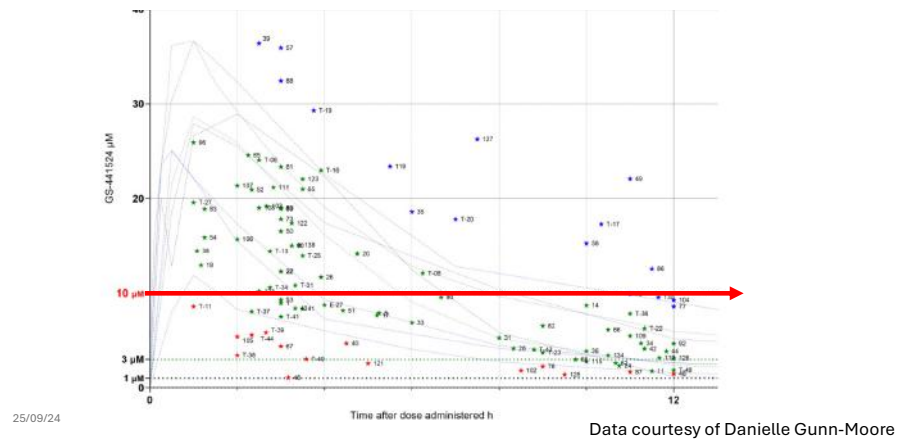
- Wrong diagnosis?
- Other concurrent diseases going on?
- Owner compliance?
- Underdosing due to weight gain?
- Has the drug the concentration I think it has? – Illegal drugs
- Poor absorber?
- Quick excreter?
- Drug resistance

} Therapeutic drug monitoring

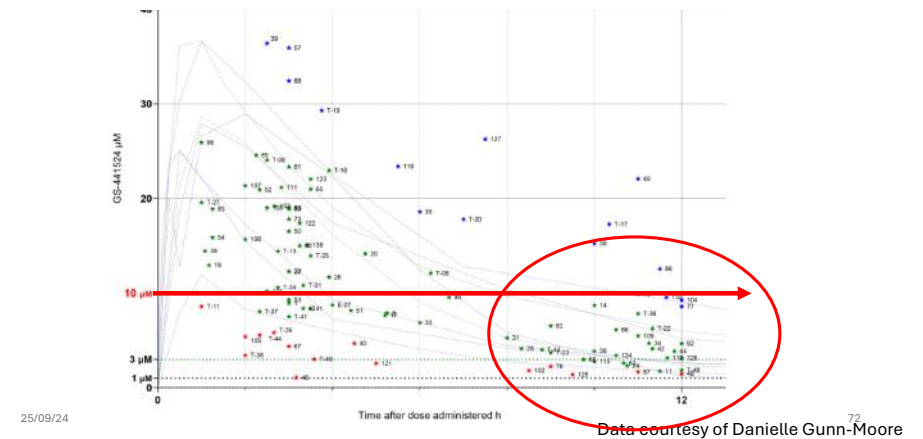
## Therapeutic Drug Monitoring



## Therapeutic Drug Monitoring



## Therapeutic Drug Monitoring



## Week 4 - treatment

- The dose was doubled
  - 15mg/kg BID PO GS-441524
- Complete clinical improvement
- Weight gain
- A-1 glycoprotein normal
- Serum electrophoresis improved



## What have we learnt so far from TDM?

- Twice daily dosing appears optimal to maintain GS serum levels
- Some cats may have poor absorption / quick excretion
- High doses are needed to overcome blood and eye brain barrier
- Dosage may need adjustments based on response
- Not all cats respond / absorb the same way!

## What have we learnt so far from TDM?

- Twice daily dosing appears optimal to maintain GS serum levels
- Some cats may have poor absorption
- High doses can overcome blood and eye brain barrier
- Dosage may need adjustments based on response
- Not all cats respond / absorb the same way!



How TDM relates to clinical response?  
Is this clinically relevant?  
Most cats will respond to once daily!  
More research is needed

## Going forward...

---

Legal / authorized treatment available worldwide

---

Is one drug superior to other?

---

Is 42 days (or less...) enough for all types of FIP?

---

Ideal dosing scheme

---

Is Therapeutic drug monitoring clinically relevant?

---

How to diagnose relapses

---

Drug combinations?

25/09/24



Photo taken at the Malcolm's Cat Protection Society, Cyprus



## Going forward...

Legal / authorized treatment available worldwide

Is one drug superior to other?

Is 42 days (or less) enough for all types of FIP?

Ideal dosing

Is Therapeutic drug monitoring clinically relevant?

How to diagnose relapses

Drug combinations?

25/09/24



Photo taken at the Malcolm's Cat Protection Society, Cyprus

**There is still a lot to learn!**

77

## A big thank you



## A big thank you to

- **Charalampos Attipa**, University of Edinburgh
- **Danielle Gunn-Moore**, University of Edinburgh
- **Demetris Epaminondas**, Aristotle University of Thessaloniki
- **Petra Cerna**, Colorado State University, Brno University
- **Maria-Eleni Filippitzi**, Aristotle University of Thessaloniki
- **Stella Mazeri**, University of Edinburgh
- **Christine Tait-Burkard**, Roslin Institute
- **The Pancyprian Veterinary Association**
- **Steve Cooke**, Micro sampling Ltd – Oxford Nanopore
- **Everyone at FCoV-23 Centre of Excellence**



Thank you!

Questions?

[fipresearch.greececyprus@gmail.com](mailto:fipresearch.greececyprus@gmail.com)

