

# Your Chat Moderator



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# Your Presenter



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# Panleukopenia 101



# Feline Panleukopenia

- Panleukopenia
- Infectious enteritis
- Feline distemper
- “Cat plague”
- Feline parvo
- Cat Typhoid



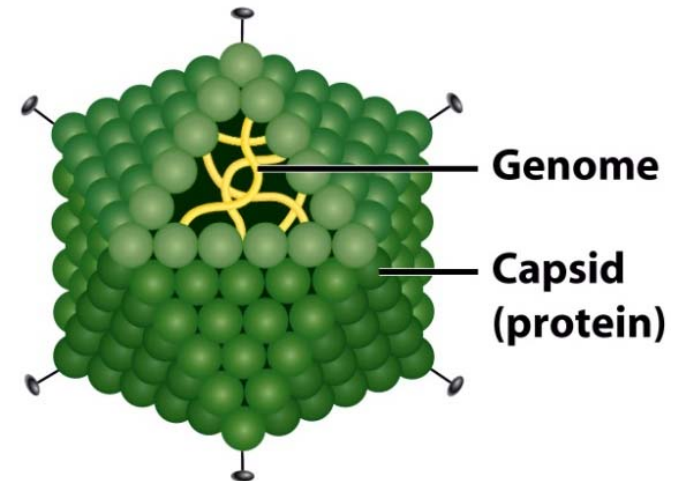
# Feline Panleukopenia

## Caused by a feline parvovirus (FPV):

- Non-enveloped DNA virus
- Closely related to canine parvo (CPV)

## Important features:

- Highly contagious, easily spread
- Stable, single strain virus
- Very durable – long-term persistence in the environment
- Can cause severe, potentially fatal disease



# Who gets panleuk?

- **ANY unvaccinated cat of any age**
  - Kittens, co-infected cats most susceptible to disease
  - Cases occur all year long with some seasonality
    - Higher rates in spring/summer → more susceptible animals



# FPV Transmission

Virus spread primarily through feces and vomit but present in nearly all bodily excretions

- Cat-cat direct contact
- Fomite transmission
- Environmental contamination
- Mechanical, vector transmission

Highly resistant in the environment – persists for up to a year

- Cleaning and disinfection using parvocidal products is critical!



# FPV Transmission

Incubation period:

- Reported from 2-14 days
- 5-7 days most common

Viral shedding (contagious to other cats):

- Up to 2-3 days before clinical signs
- Weeks following recovery



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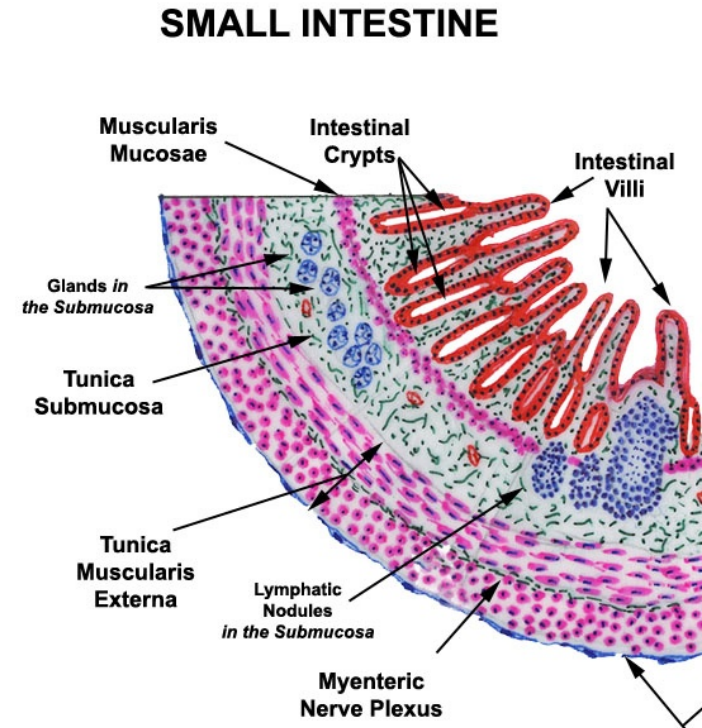
- Up to 2-3 days before clinical signs
- Weeks following recovery

## Management challenge:

May be contagious before symptoms start and for a period of time after they resolve

# What happens when they get sick?

- Severe, potentially fatal disease
- Virus attacks rapidly dividing cells
  - Destroys the lining of the intestines
    - Vomiting, diarrhea, dehydration, electrolyte problems
- Wipes out bone marrow
  - Decreases in white blood cells hamper immune system's ability to fight infection



# What about cerebellar hypoplasia?

- FPV replicates in many tissues in the fetus



# What about cerebellar hypoplasia?

- Early pregnancy:
  - Abortion
  - Birth defects
  - Infertility but queen otherwise seems fine

# What about cerebellar hypoplasia?

- Late pregnancy to 1 week old:
  - Destroys Purkinje and granule precursor cells → cerebellar hypoplasia
    - Non-progressive ataxia noticed at 2-3 wks of age
- Other neuro or ocular signs less commonly reported



# Clinical Signs of FPV Infection

**Symptoms** usually develop 5-7 days after exposure, but range is 2-14 days:

- Vomiting
- Depression
- Diarrhea
- Inappetance
- Dehydration
- Lethargy, weakness
- Sudden death
- Subclinical – no outward signs of illness



# Clinical Signs of FPV Infection

## Subclinical disease???

- Probably relatively common
- Adult immunocompetent cats
- Partial immunity

## Severity influenced by:

- Age
- Immune status
- Concurrent infections



# Diagnosis

## Consistent symptoms and history

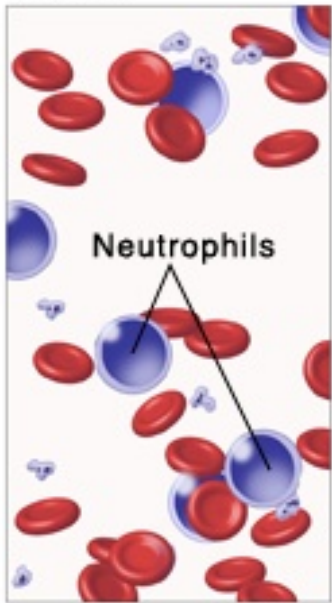
### In-house parvo tests

- Developed for dogs but works for cats
- Looks for viral antigen in the feces
- False negative results possible
- May cross-react with recent MLV vaccination
  - Anecdotally weak positives within a week
  - Not common (1/64) – safest is to assume infection



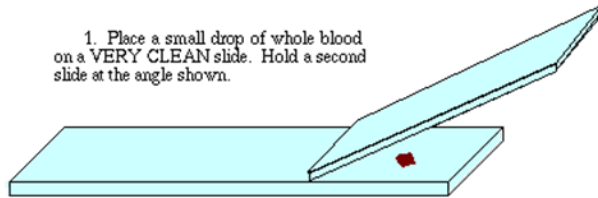


## Normal

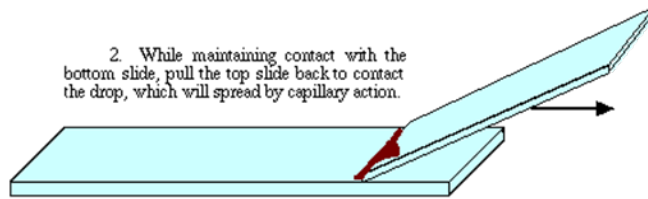


- Complete blood count (CBC) or smear
  - At 10X → 4-6 WBC per field or less
  - At 40X → 1-3 WBC per field or less

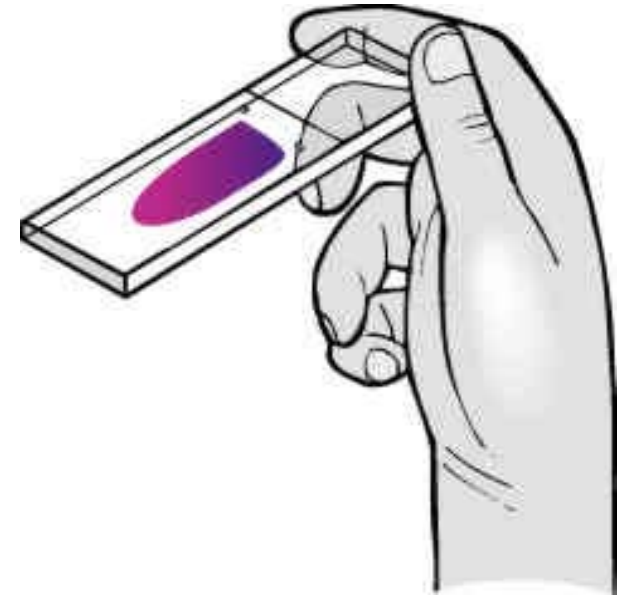
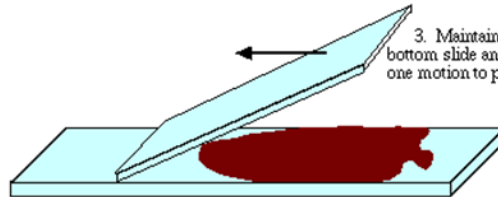
1. Place a small drop of whole blood on a VERY CLEAN slide. Hold a second slide at the angle shown.



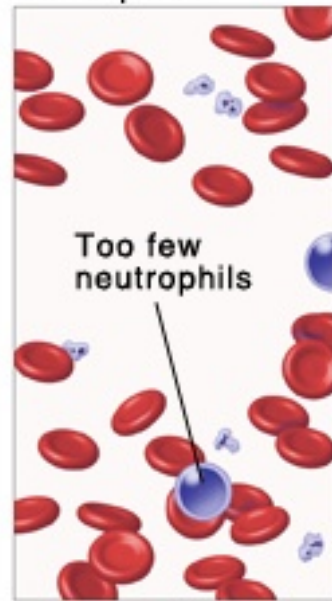
2. While maintaining contact with the bottom slide, pull the top slide back to contact the drop, which will spread by capillary action.



3. Maintain firm contact with the bottom slide and push the top slide in one motion to produce the smear.



## Neutropenia

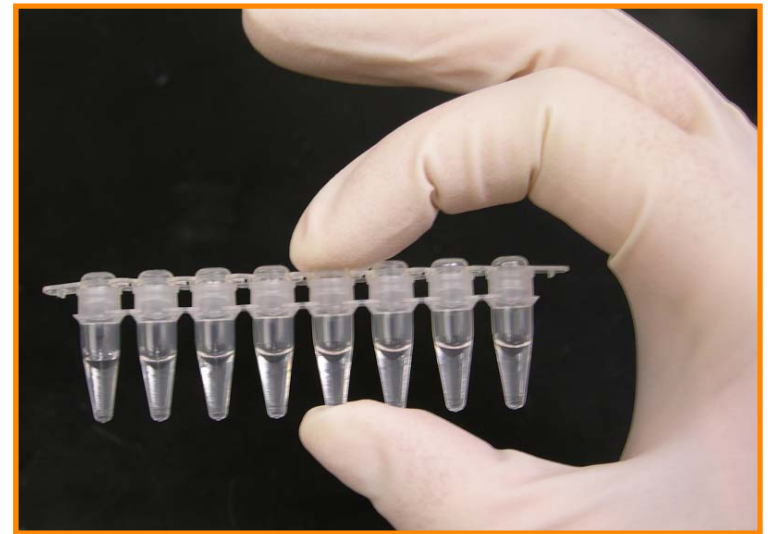


Caveat: not every cat will develop leukopenia

# Diagnosis

PCR testing is also available

- Need to distinguish recent vaccination vs. natural infection
- Look for quantitative levels
- Available in “diarrhea panels”



# Diagnosis

Post-mortem diagnosis:

- Always necropsy cats that die in the cage
- Segmental enteritis is classic finding on gross exam
- Parvo test can still be used
- Samples for PCR or IFA, IHC tests and histopath
  - Tongue is an excellent sample to collect – very sensitive



*Image from Greene's Infectious Diseases of the Dog and Cat*

# Diagnosis: Necropsy

- Identify pathogens and their role in disease
- Often the most efficient way to get an accurate diagnosis
- Document initial findings
- Non-fixed samples for bacterial culture, viral isolation, parasitology testing
  - Obtain first
  - Refrigerated for bacteria, frozen for viruses
  - Small and large intestine



# Diagnosis: Necropsy

- Tissue samples for histopathology
  - Preserve samples (9:1 ratio formalin: tissue)



# Diagnosis: Necropsy

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# Preventive Strategies

- **Plan A: Prevent exposure**
- If exposure can't be zero, limit the dose to as little as possible:
  - Avoid overcrowding
  - Reduce length of stay
  - Excellent sanitation
  - Fomite control
  - Adequate isolation +/- quarantine

# Preventive Strategies

- **Plan B: Strengthen host defenses**
  - Good husbandry, nutrition
  - Treat concurrent infections
  - Vaccination
  - Reduce stress





# Preventing Exposure

**Avoid overcrowding – stay within your capacity for care**

Crowding = major stressor and risk factor for disease outbreaks

- Exacerbates challenges shelters already struggle to manage
- Not inevitable!



# Capacity for Care

- Housing capacity
  - Not just an open cage, but an appropriate enclosure for that particular animal
  - Ideally below your max capacity
- Staffing capacity
  - Staff and/or volunteers to meet the physical and behavioral needs of that animal
- Additional sufficient resources as needed for that animal
  - Medications, vet care, training



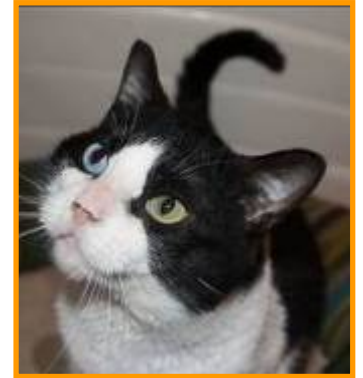
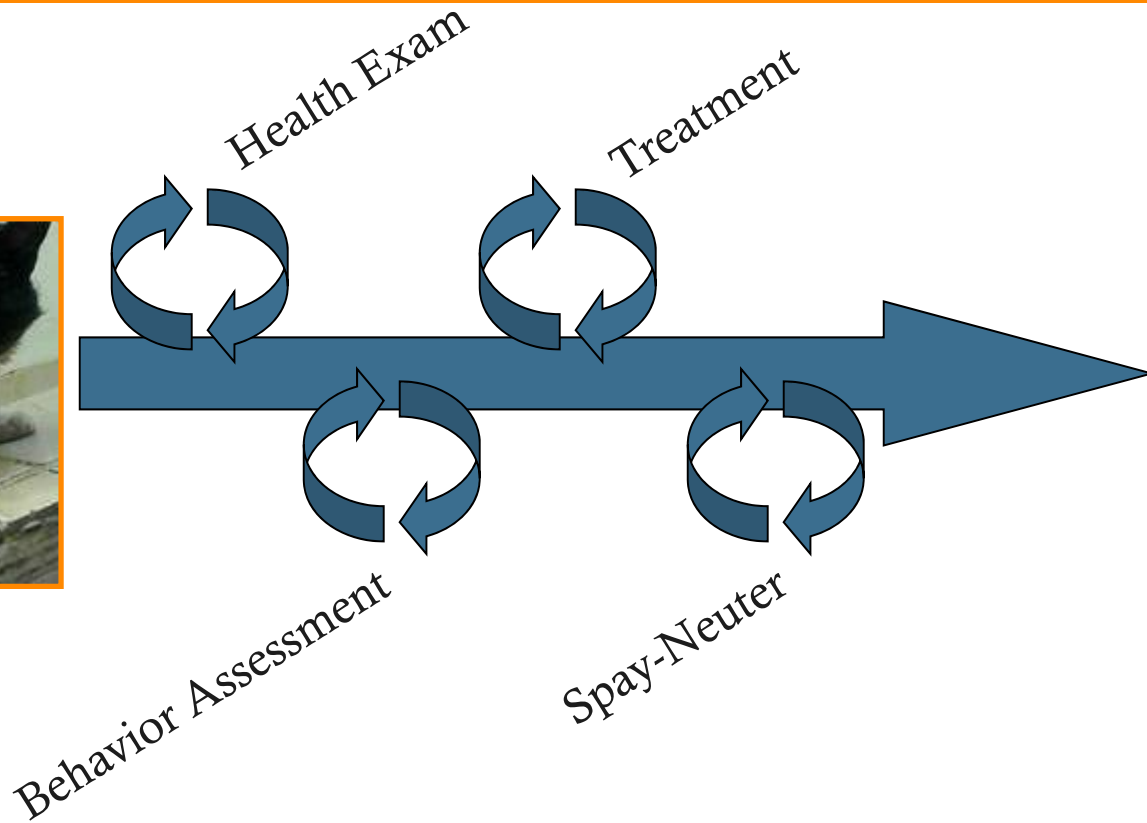
# Why Length of Stay (LOS) Matters

- Calculate holding capacity, adoption driven capacity, and amount of time available for animal care
- Knowing capacity for care, LOS, and average shelter populations helps with decision-making
  - Resource allocation
  - Staffing
  - Intake and adoption decisions
  - Cage space
- **Moving animals efficiently through the system is a win-win-win!**





**INTAKE**



**OUTCOME**

## What can we do **TODAY** to move that animal closer to their final outcome?

- Written SOP and criteria for behavior, medical to determine adoption, transfer, etc
- Eliminate holds and bottle necks – extra staffing, resources, fast track/slow track program, etc.

# Daily Rounds

The idea:

- Performed DAILY 😊
- Look at each animal in the building
- Decide where they are going
- Determine what they need to get there
- Figure out how to make happen!



# Daily Rounds

## Requires:

- Someone with training, knowledge, and authority
- A commitment by all staff and management to make it a priority



- Accurate data collection and entry
- Process +/- equipment to make it work
- Ideally, a rounds leader or task master with a team

# Preventing Exposure

Excellent sanitation procedures and fomite control



# Cleaning & Sanitation Protocols

- Cleaning & disinfection are actually two different things!
- Step 1 – Clean
  - Remove organic material
    - Detergent and scrubbing
- Step 2 – Disinfect
  - Inactivate pathogens
    - Start with a clean surface
    - Leave on required contact time





# Sanitation Basics

- Sanitation is critical – we can't rely on pathogens going away on their own
- CPV is resistant to many disinfectants
  - Cannot use quats – despite the label ☹️
  - Bleach, trisectant, Accel all good choices
- Porous, organic materials are harder or impossible to sanitize
  - Limit contact of animals with surfaces that can't be disinfected or disposed of



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# The sad facts about quats...

1. Scott, FW. Virucidal disinfectants and feline viruses. *Am J Vet Res*, 1980. 41(3): p. 410-4.
2. Kennedy, MA et al., Virucidal efficacy of the newer quaternary ammonium compounds. *J Am Anim Hosp Assoc*, 1995. 31(3): p. 254-8.
3. Eleraky NZ, Potgieter LN, Kennedy MA. Virucidal efficacy of four new disinfectants. *J Am Anim Hosp Assoc*, 2002. 38(3): p. 231-4.
4. Eterpi M, McDonnell G, Thomas V. Disinfection efficacy against parvoviruses compared with reference viruses. *J Hosp Infect*, 2009. 73(1): p. 64-70.

# Disinfection Resources

The screenshot shows the ASPCA Professional website's search interface. At the top, the ASPCA logo is followed by the word 'Professional' and the tagline 'WE ARE THEIR VOICE.'. Navigation links include 'About', 'Resource Library', 'Training', 'ASPCA Programs', and 'Blog'. A menu bar contains 'Grants', 'Spay/Neuter', 'Disaster & Cruelty', 'Shelter Management', 'Saving Lives', and 'Shelter Health', along with a search input field. The main content area features a 'Search' heading, a 'Filter' section with a 'By Topic' button, and a search results section. The search query 'disinfection' is entered, and the results show 34 items. Three results are visible: 'Shelter disinfectant quick reference' (Tools), 'Test Your Sanitation Smarts' (Tips), and 'Preventing and Managing Canine Parvovirus' (Tips).

**ASPCA Professional**  
WE ARE THEIR VOICE.®

About Resource Library Training ASPCA Programs Blog

Grants Spay/Neuter Disaster & Cruelty Shelter Management Saving Lives Shelter Health Search...

## Search

**Filter**

By Topic

Enter your keywords  
disinfection Search

The search found 34 results.

### Search results

#### Shelter disinfectant quick reference

TOOLS | Facebook Twitter Email

A guide to the use of disinfectants in the shelter.

#### Test Your Sanitation Smarts

TIPS | Facebook Twitter Email

Take a quiz to find out how well you know shelter cleaning and disinfecting products.

#### Preventing and Managing Canine Parvovirus

TIPS | Facebook Twitter Email

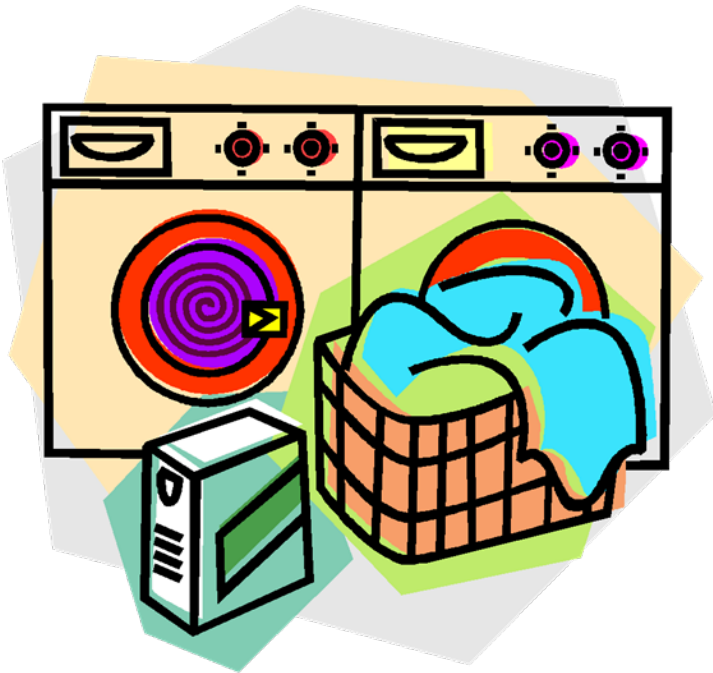
<http://www.aspcapro.org/search/index/disinfection>

# What does it mean to be clean?

- Kennels
- Cages
- Transport carriers
- Windows and walls
- Lobbies and halls
- Doors and doorknobs
- Play yards
- Vehicles
- Exam tables
- Bedding
- Toys
- Food and water bowls
- Collars and leashes
- Scoops, brushes, mops
- Clothing and footwear
- Ventilation ducts
- Phones, keyboards, etc.
- HANDS!!!

# Sanitation Basics

## Laundry:



- Hot water, detergent, bleach
- Dry thoroughly!
- Discard if heavily soiled
- Caution in and moving to laundry areas

# A Simple, Yet Critical Fix

**Wash your hands, change your gloves, wear PPE!!!**

- We can be our own worst enemies – minimize fomite spread!



# Preventing Exposure

Excellent sanitation procedures and fomite control

- Appropriate use of housing
- Labeled, dedicated equipment
- Dedicated staff
- Appropriate order of cleaning
- Diligent hand sanitation





# Preventing Exposure

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Invest your time where  
you'll get the most bang  
for your buck!



# What is “adequate” PPE?



- Hint: It's not just your hands and scrub top...

# How about footbaths?



Stockton, K. A., P. S. Morley, et al. (2006). "Evaluation of the effects of footwear hygiene protocols on nonspecific bacterial contamination of floor surfaces in an equine hospital." *J Am Vet Med Assoc* 228(7): 1068-1073.

# How about footbaths?



- *Not* reliably effective
- Can actually help spread disease

Stockton, K. A., P. S. Morley, et al. (2006). "Evaluation of the effects of footwear hygiene protocols on nonspecific bacterial contamination of floor surfaces in an equine hospital." *J Am Vet Med Assoc* 228(7): 1068-1073.

# How about footbaths?

Dedicated footwear and/or shoe covers are better choices



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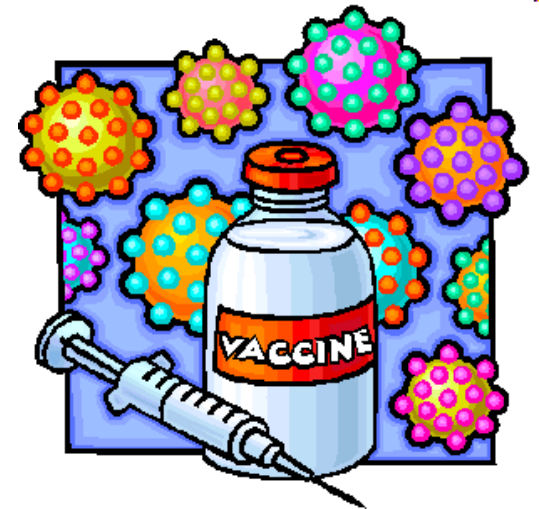
# Shouldn't we just leave the cage open for a while?



- 1, 3, 5, or even 30 days won't help if sanitation was inadequate
- Multiple thorough episodes of cleaning and disinfection can help but are not time dependent

# Panleuk Vaccination

- Panleuk is considered to be a vaccine-preventable disease – “sterile immunity”
- Vaccination reminders:
  - Biologic products that stimulate the immune system
  - Given before exposure
  - Functioning immune system with time to respond



# Panleuk Vaccination

- Vaccination reminders: MLV vaccines
  - Give as close to time of intake as possible, or before if at all possible
  - Must be kept refrigerated from time of arrival until time of administration
  - Must be mixed up fresh – do not mix and keep in the fridge for later use





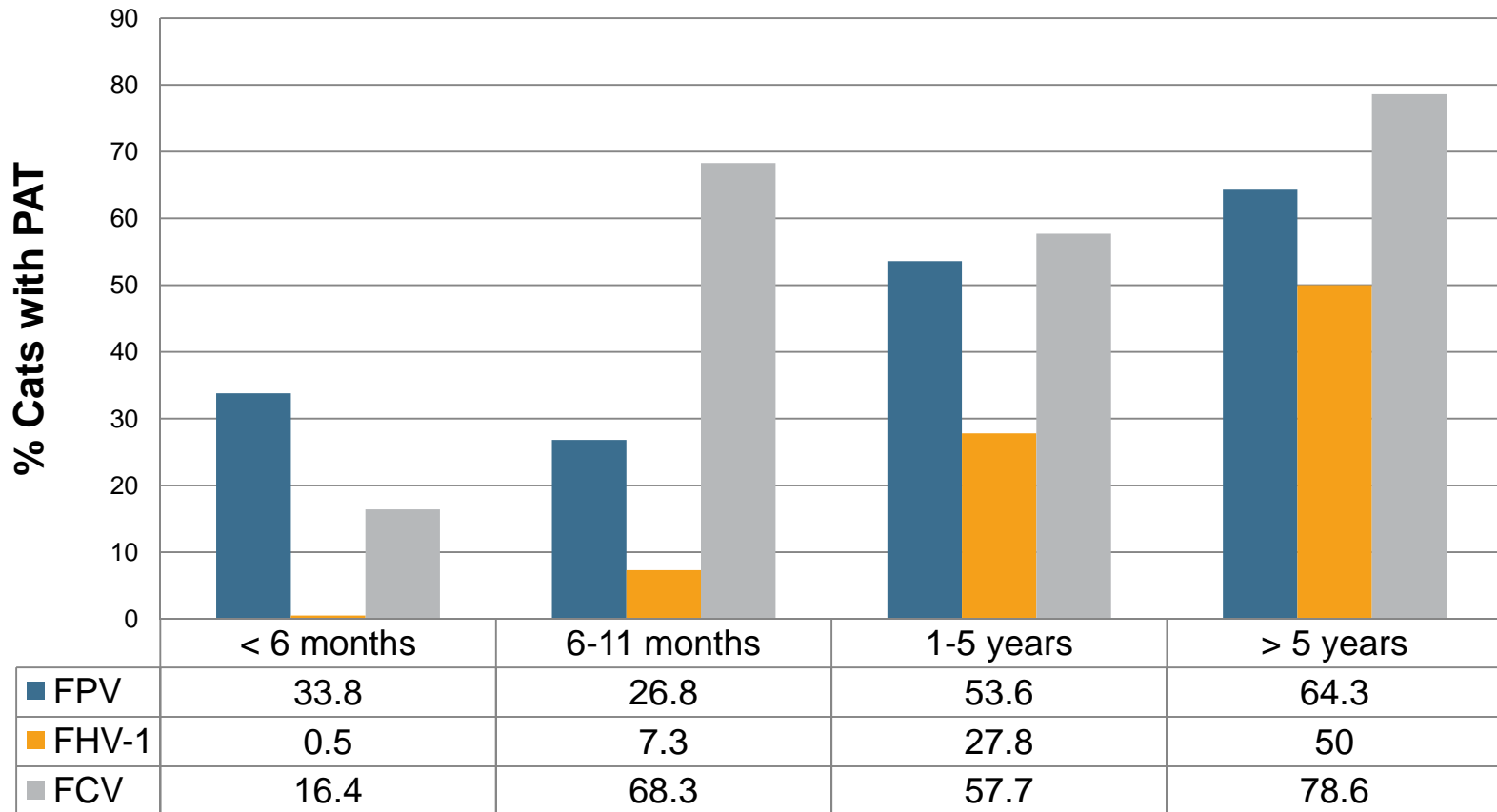
# Core Vaccination

- FVRCP given at intake for cats 4-6+ weeks old
  - Repeat q 14 days while in the shelter, stop after 16 weeks old
- Vaccination is highly effective for FPV:
  - Clinically relevant protection within hours
  - Immunity within 72 hours of administration
- Weigh exposure risk vs. vaccination risk
  - Rule of thumb: too sick to vaccinate = too sick to stay in the shelter



# Panleuk Vaccination

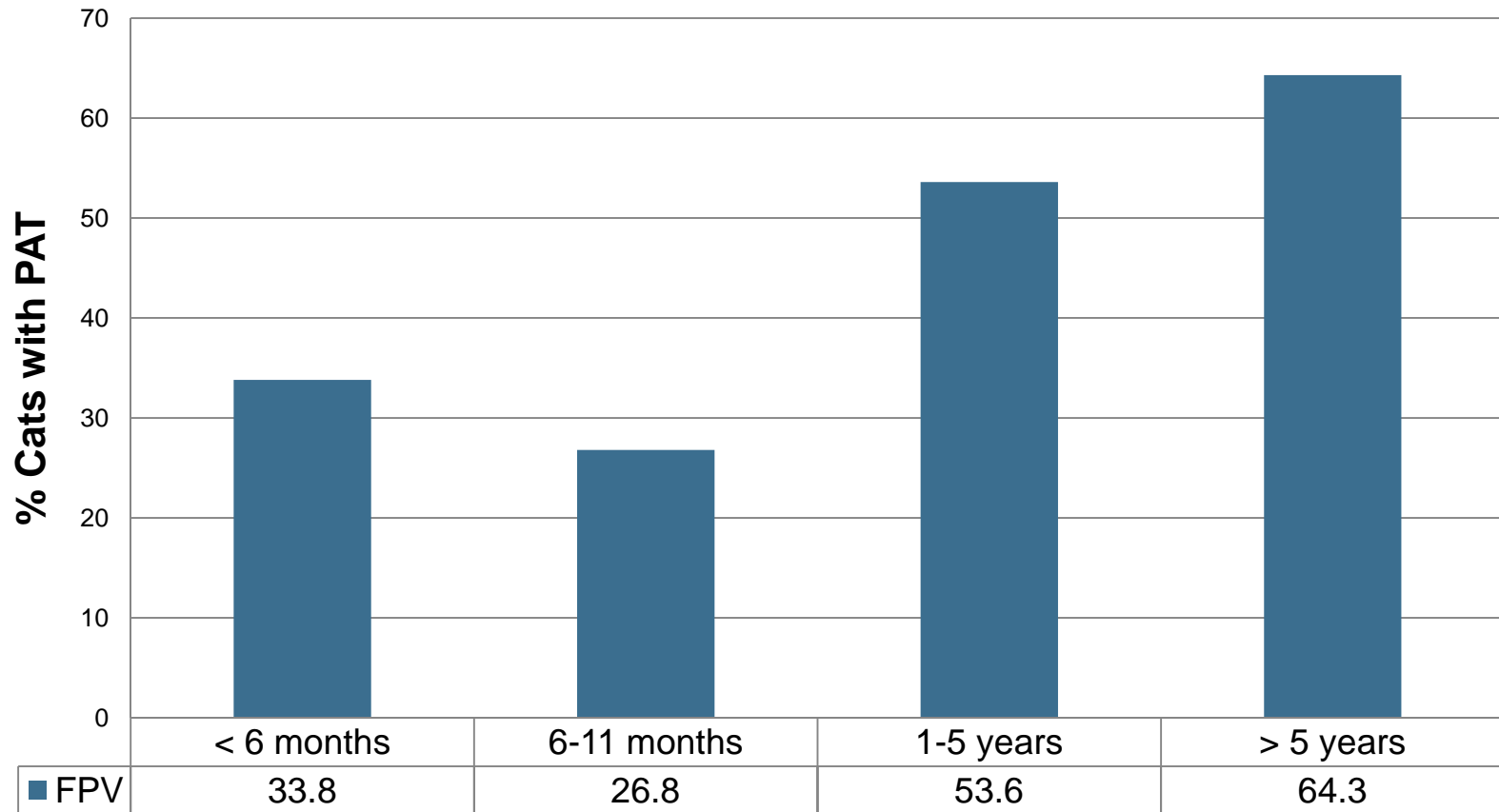
This is a core vaccine – don't assume they are protected!



DiGangi BA et al. Prevalence of serum antibody titers against feline panleukopenia virus, feline herpesvirus 1, and feline calicivirus in cats entering a Florida animal shelter. J Am Vet Med Assoc. 2012 Nov 15;241(10):1320-1325.

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# Panleuk Vaccination

Variable	Category	No. tested	No. seropositive	Prevalence (%)	OR	95% CI	P value
Age	< 6 m	195	66	33.8	Referent	NA	NA
	6–11 m	41	11	26.8	0.7	0.3–1.6	0.38
	1–5 y	97	52	53.6	2.3	1.3–3.8	< 0.01
	> 5 y	14	9	64.3	3.5	1.0–12.7	0.02
Neuter status	Sexually intact	291	99	34.0	Referent	NA	NA
	Neutered	56	39	69.6	4.5	2.3–8.7	< 0.01
Source	Stray	234	81	34.6	Referent	NA	NA
	Owned	95	47	49.5	1.9	1.1–3.1	0.01
	Other	18	10	55.6	2.4	0.8–6.9	0.07
Environment	Rural	259	92	35.5	Referent	NA	NA
	Urban	88	46	52.3	2.0	1.2–3.3	< 0.01
Health status at admission	Healthy	282	112	39.7	Referent	NA	NA
	Not healthy	65	26	40.0	1.0	0.6–1.8	0.97
Signs of caregiving	No	213	68	31.9	Referent	NA	NA
	Yes	134	70	52.2	2.3	1.5–3.7	< 0.01
BCS	1–3	37	15	40.5	Referent	NA	NA
	4–6	297	113	38.0	0.9	0.4–1.9	0.77
	7–9	13	10	76.9	4.9	1.0–27.3	0.02
Vaccinated < 24 h after admission	No	82	41	50.0	Referent	NA	NA
	Yes	265	97	36.6	0.6	0.3–1.0	0.03
Outcome	Adopted	93	28	30.1	Referent	NA	NA
	Transferred	46	16	34.8	1.2	0.6–2.8	0.58
	Reclaimed by owner	6	6	100.0	—	—	< 0.01
	Euthanized	202	88	43.6	1.8	1.0–3.1	0.03

NA = Not applicable. — = Not determined.

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Housing	4–6	297	113	38.0	0.9	0.4–1.9	0.77
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**Protect all cats – don't try to predict who may or may not have previously been vaccinated!**

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# Good News!

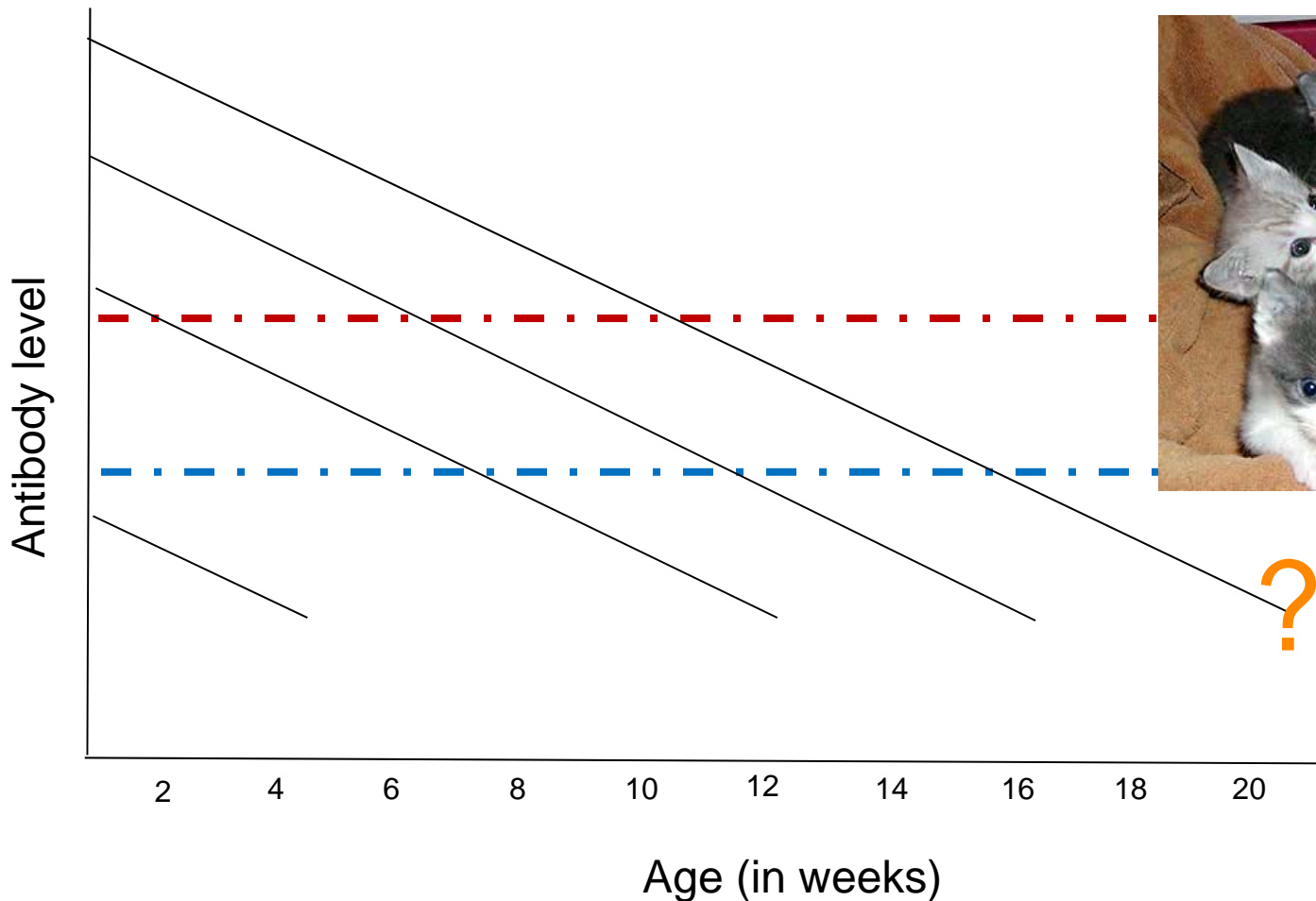


“The time necessary to obtain the immunity of cats against Panleukopenia has been studied by means of a modified live vaccine. This vaccine makes it possible to obtain a very early post-vaccinal immunity: the full immunity is reached 72 hr after the inoculation of the vaccine by the subcutaneous route. Furthermore, we have demonstrated that a sensitive kitten can be admitted in a contaminated environment immediately after vaccination without showing any clinical evidence of the disease.”

Brun, A., G. Chappuis, et al. (1979). "Immunisation against panleukopenia: early development of immunity." *Comp Immunol Microbiol Infect Dis* 1 (4): 335-9.

# Maternally-derived Antibody Interference

AKA – why kittens need so many vaccines!



# Feline Parvo Titters

- **The idea:**
  - Antibody levels for FPV correlated with protection from disease
  - Levels can help clarify susceptibility and risk in outwardly healthy cats
- **In-house test kits less helpful for identifying low risk cats than similar use in dogs**
  - Positive results fairly reliable
  - Negative results less so – may remove or quarantine inappropriately



# Treatment

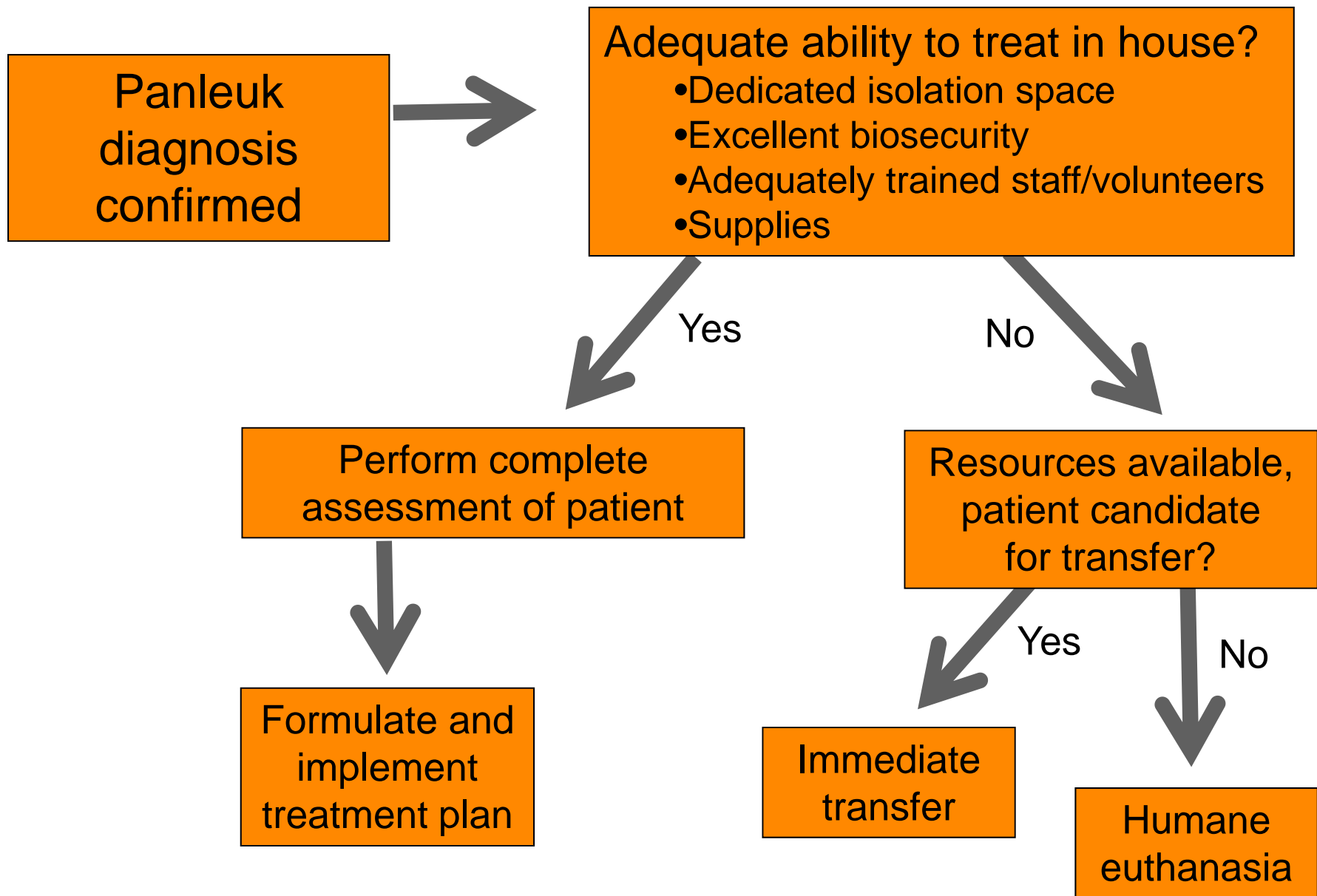
Careful consideration necessary when deciding to treat:

- Ability to provide humane level of care
  - Supplies, space/housing, staffing
- Ability to protect the remaining population – strict isolation is mandatory
- Retain focus on prevention
- Use of limited resources – prognosis can be poor even with aggressive treatment



# Treatment Considerations





# Treatment Considerations

## Prompt identification of infected cats is key:

- Remove from general population early to reduce spread
- Timely treatment helps improve outcome

## Written SOPs:

- Description and case definition
- Treatment
  - Do you treat? If so, who?
  - Initiating and administering
    - who, what, where, when, how
- Containment and management steps
- Intervention points and next steps



# Do you have an appropriate isolation space?

- Ideally, physically separate building
- Minimally, separate, easily disinfected area
- Adequate monitoring and sufficient staffing mandatory
- Full body protection, double gloves, footwear, equipment
- No crossover with kittens/new intakes



# Prognosis

- Higher mortality rates earlier in the course of treatment
- Tends to be a more protracted course of disease than canine parvo patients

# Prognosis

- Typically considered to have higher mortality rates for kittens < 6 months of age vs. adults

**Table 1** Signalment and source for cats in the in-contact, FPV-survivors and FPV-non-survivors groups

	In-contact group (n = 66)	FPV-survivors group (n = 27)	FPV-non-survivors group (n = 52)
Age at intake, median, range	6.5 weeks, 3 weeks–3 years	12 weeks, 3 weeks–1 year	8 weeks, 3 weeks–2 years
Number of cats ≥6 months old at intake	14/66 (21%)	7/27 (26%)	7/52 (13%)
Breed	DSH n = 65	DSH n = 26	DSH n = 50
	Siamese mix n = 1	DLH n = 1	DLH n = 2
Gender	Female n = 41	Female n = 15	Female n = 30
	Male n = 25	Female spayed n = 1	Female spayed n = 1
		Male n = 10	Male n = 20
		Male neutered n = 1	Male neuter n = 1
Source, n (%)	33 (50%) OR	9 (33%) OR	25/48 (52%) OR
*OR or S	33 (50%) S	18 (67%) S	23/48 (48%) S

OR = owner-relinquished; S = stray; DSH = domestic shorthair; DLH = domestic longhair

**Case series of feline panleukopenia virus in an animal shelter**

Annette Litster and Chutamas Benjanirut

*Journal of Feline Medicine and Surgery* published online 19 July 2013

# Prognosis

Published mortality rates range significantly:

- Peracute disease: 100%
- Acute disease: 25-90%

Prognostic factors:

- WBC < 1000
- Low platelet counts
- Low albumin or potassium levels
- Survival: 51.1% with aggressive therapy



# Treatment

Treatment is supportive:

- Correct dehydration, hypoglycemia, electrolyte imbalances
- Prevent sepsis
- Address hypoproteinemia
- Stop vomiting, start feeding
- Alleviate pain and discomfort



# Antimicrobial Therapy

- Antibiotics indicated due to neutropenia
- Variety of factors to consider in selection:
  - Time dependent vs. concentration dependent
  - Efficacy against pathogens likely to be of concern
  - Severity and progression of symptoms
  - Route of administration and absorption
- Common protocol:
  - Injectable penicillin with fluoroquinolone or aminoglycoside
  - Convenia for out-patient tx in dogs – efficacy in cats ???
- Remember: will not help with primary viral infection



# Parasite Control

## Co-infections exacerbate clinical illness from FPV

- Increases GI cell turnover, viral replication

## Treat orally as soon as possible

- Panacur, fenbendazole, ponazuril



# Tamiflu for Panleuk?



- Tamiflu - Osetamivir phosphate – neuraminidase inhibitor
- Described anecdotally for use in dogs, less commonly in cats
- One dog study failed to show response:
  - Weight gain, normal WBC but clinical signs and survival the same
- Not recommended for treatment of panleuk cats

Savigny, M. R. and D. K. Macintire (2010). "Use of oseltamivir in the treatment of canine parvoviral enteritis." J Vet Emerg Crit Care (San Antonio) **20**(1): 132-142.

# Treatment Parameters

- Must retain ability to provide humane care
- Regular monitoring is key – status can change rapidly

What requires revision of the plan?

- Options for further treatment
  - Changing meds
  - More aggressive therapy care
  - Transfer for care?
- 
- What are “stopping points” for your shelter?



# After Treatment...

- Time to recovery depends on severity of clinical signs and form of disease – generally longer than CPV
- Viral shedding usually stops within 2-3 weeks (but can extend to 6 weeks)
- Can SNAP or PCR before returning to general population
- Bathe and dry thoroughly!!!
- Vaccinate as usual
- Rehome ASAP



# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis

*Assess the risk, make a plan, and act on it – but do not panic.*



# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases
- **Determine animal movement**

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases
- Determine animal movement
- **Create a timeline**
  - Clinical signs vs. onset of shedding

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases
- Determine animal movement
- Create a timeline
  - Clinical signs vs. onset of shedding
- **Review individual animal risk**
  - Location, age, vaccination

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases
- Determine animal movement
- Create a timeline
  - Clinical signs vs. onset of shedding
- Review individual animal risk
  - Location, age, vaccination
- Evaluate shelter practices
  - Review sanitation, vaccination SOPs and procedures
  - Risks: crowding, co-mingling, etc.

*Assess the risk, make a plan, and act on it – but do not panic.*

# Help! We have Panleuk!

- Act promptly to limit spread
  - Stop movement – people, animals, equipment
- Establish/confirm diagnosis
- Map the cases
- Determine animal movement
- Create a timeline
  - Clinical signs vs. onset of shedding
- Review individual animal risk
  - Location, age, vaccination
- Evaluate shelter practices
  - Review sanitation, vaccination SOPs and procedures
  - Risks: crowding, co-mingling, etc.
- **Make decisions for individual animals:**
  - Treatment, quarantine, adoption, euthanasia

*Assess the risk, make a plan, and act on it – but do not panic.*



**What two things heard  
in this webinar  
will you try in the  
next month?**

Type your answers into chat please!



# New Question and Answer Session

## Let's Talk Panleuk

Wednesday, May 7, 3-4pm ET

[www.ASPCApro.org/webinar/2014-05-07/lets-talk-feline-panleuk](http://www.ASPCApro.org/webinar/2014-05-07/lets-talk-feline-panleuk)