Big Bug Day:
Swine Enteric Viruses

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December 6th, 2023

DEMETER
Veterinary Services Inc.

Agenda

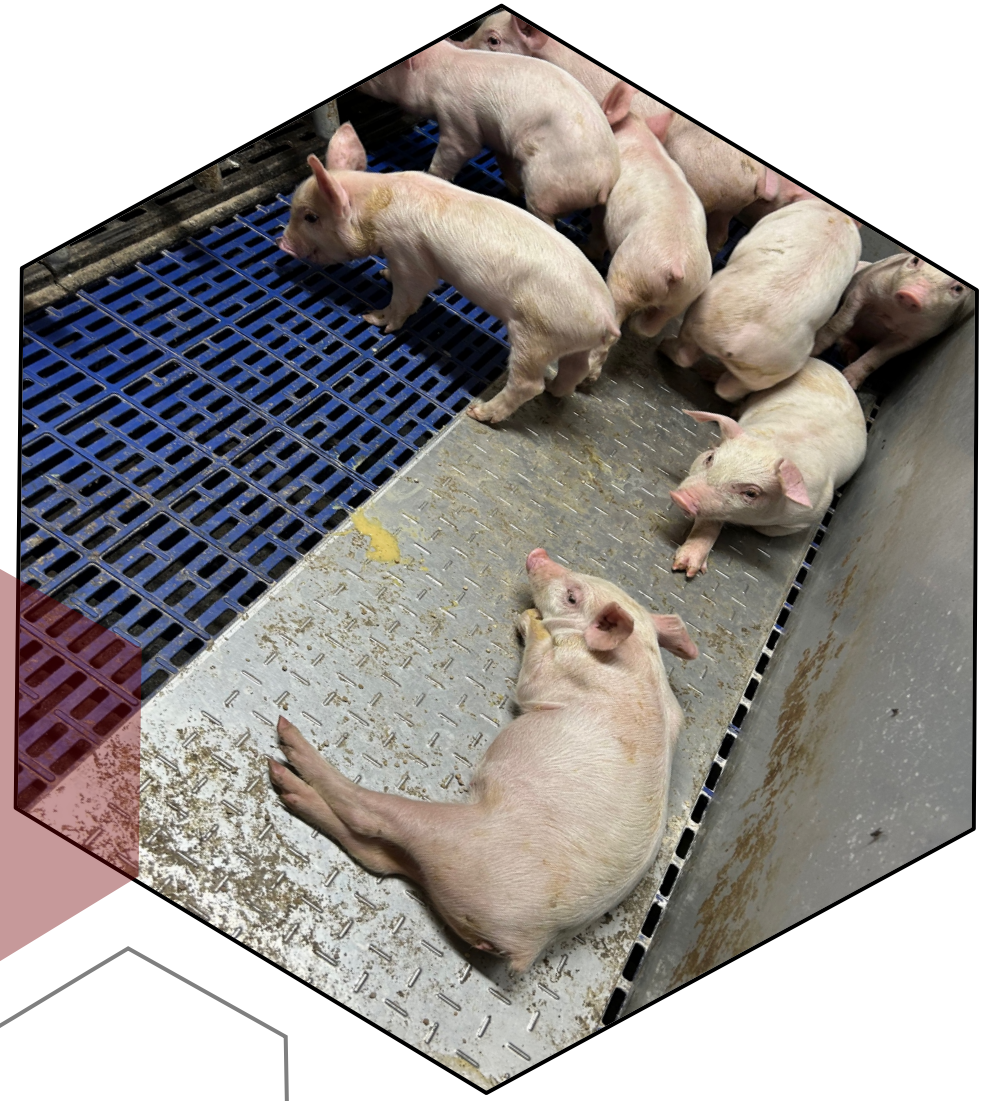
Sapovirus

- What we know
- Case study

PED

- 2023 was a bad year!
- What happened
- What we can learn

Sapovirus



About the Virus

- Family *Caliciviridae* genus *Sapovirus*
- Sapovirus first characterized in 1999; identified as a potential emerging pathogen in 2019
- Genotype 3 is pathogenic, others are not
- Virus somewhat conserved to date
  - Within subgroups, 2-3% difference in homology
  - Between subgroups, ~85% homology

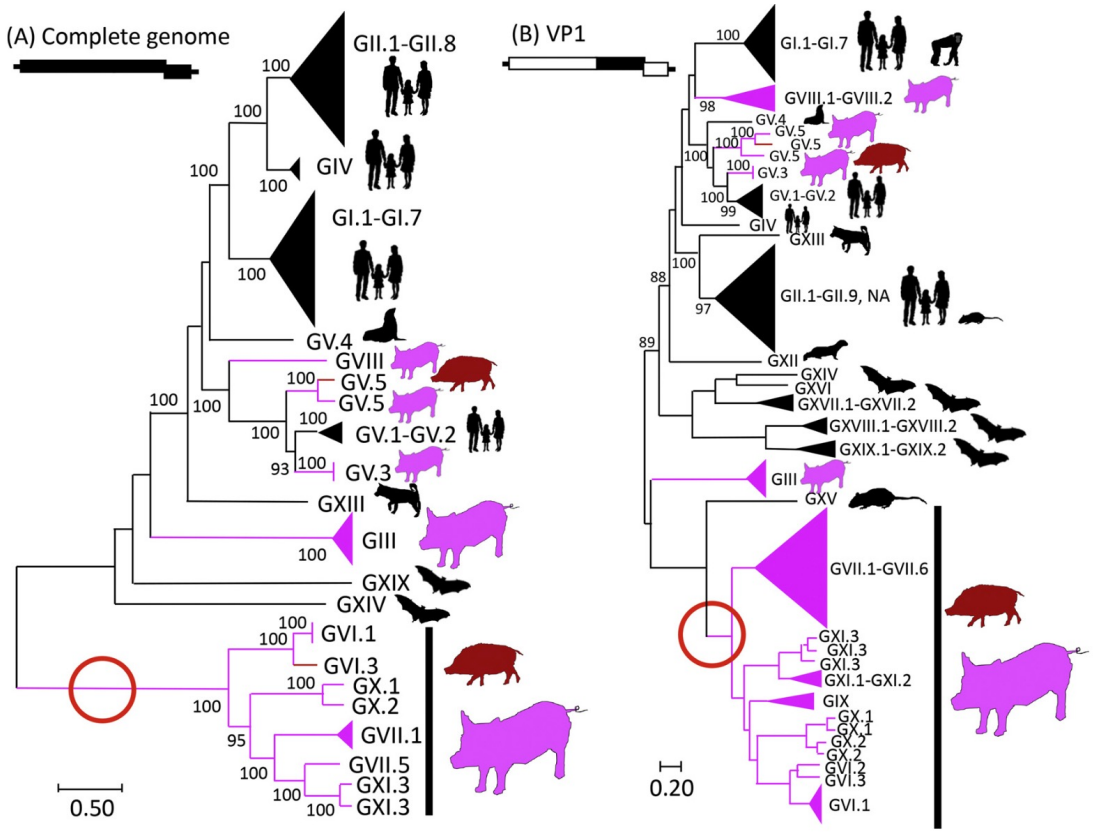
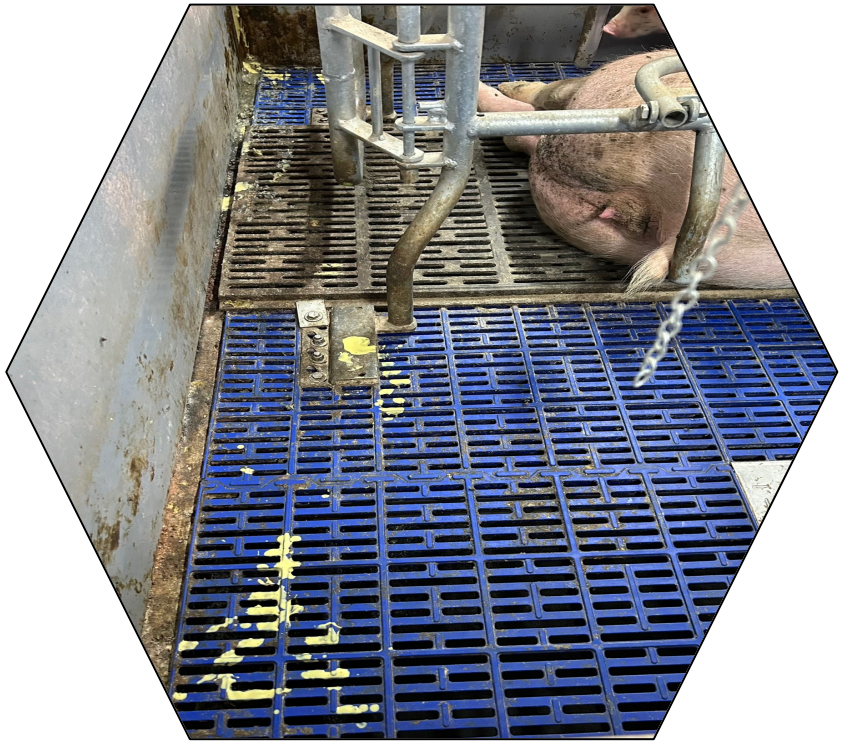


Image: Nagai et al., 2020

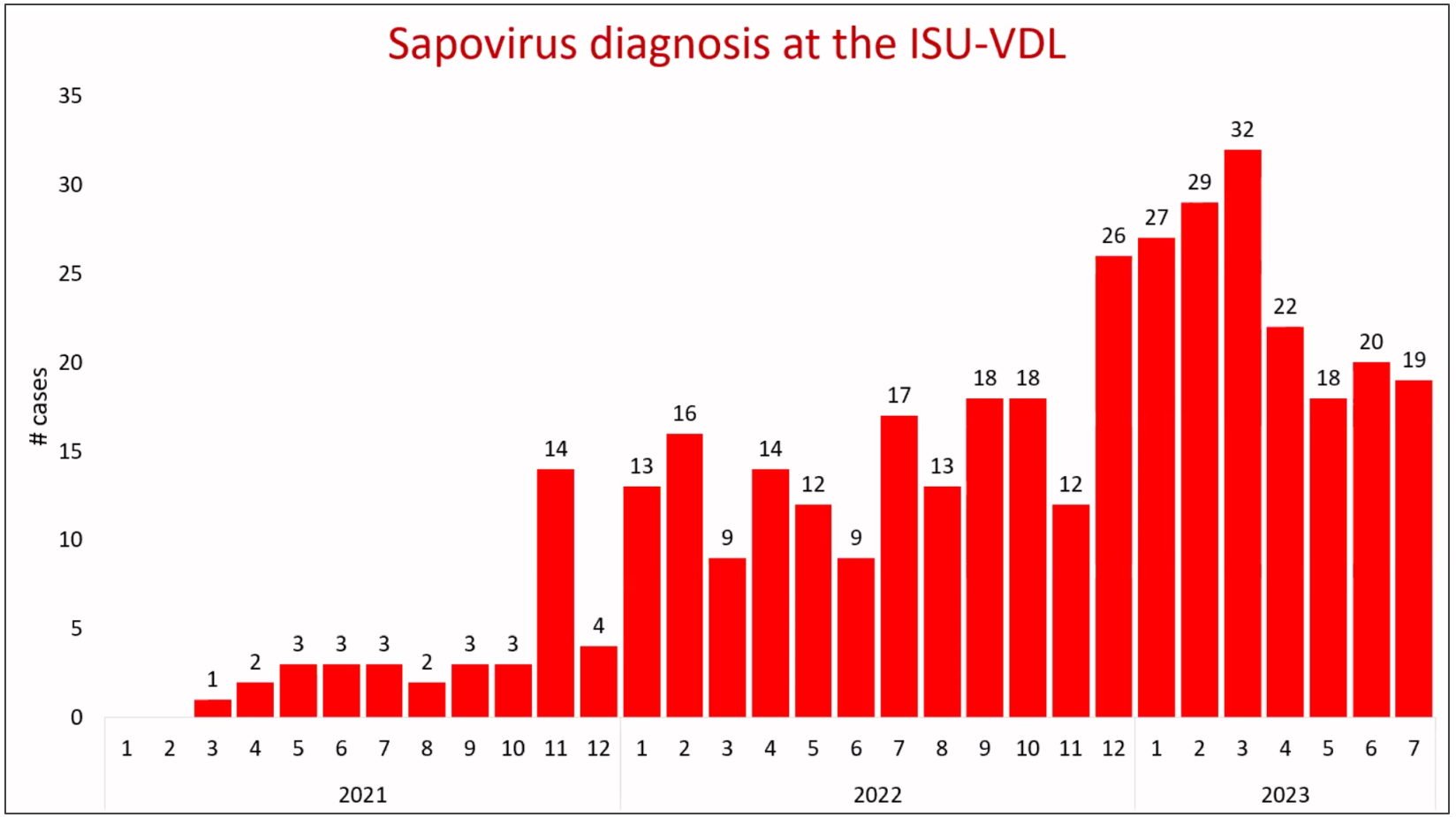
What We Know

- Causes diarrhea in suckling pigs
- Occurs in mid-lactation[1]
- Can cause 1-2 lbs of weaning weight loss[2]
- 2019 U.S. prevalence results[3]:
  - 234 fecal samples from U.S. pigs ***with diarrhea***
    - 106 samples (**45.3%**) were positive, **Ct 26.0 ± 0.5**
  - 102 fecal samples from ***clinical healthy*** U.S. pigs
    - 44 samples (**43.1%**) were positive, **Ct 33.2 ± 0.9**
- Comments from the field in 2023:
  - "7-10 day old scour that looks like coccidiosis" (Dr. Ackerman, Pork Vet Solutions)



1 Anderson et al, 2021; 2 Shen, 2021; 3 Shen et al., 2019

Sapovirus Data from Iowa State University



Source: Iowa State University; SHIC webinar August 30, 2023

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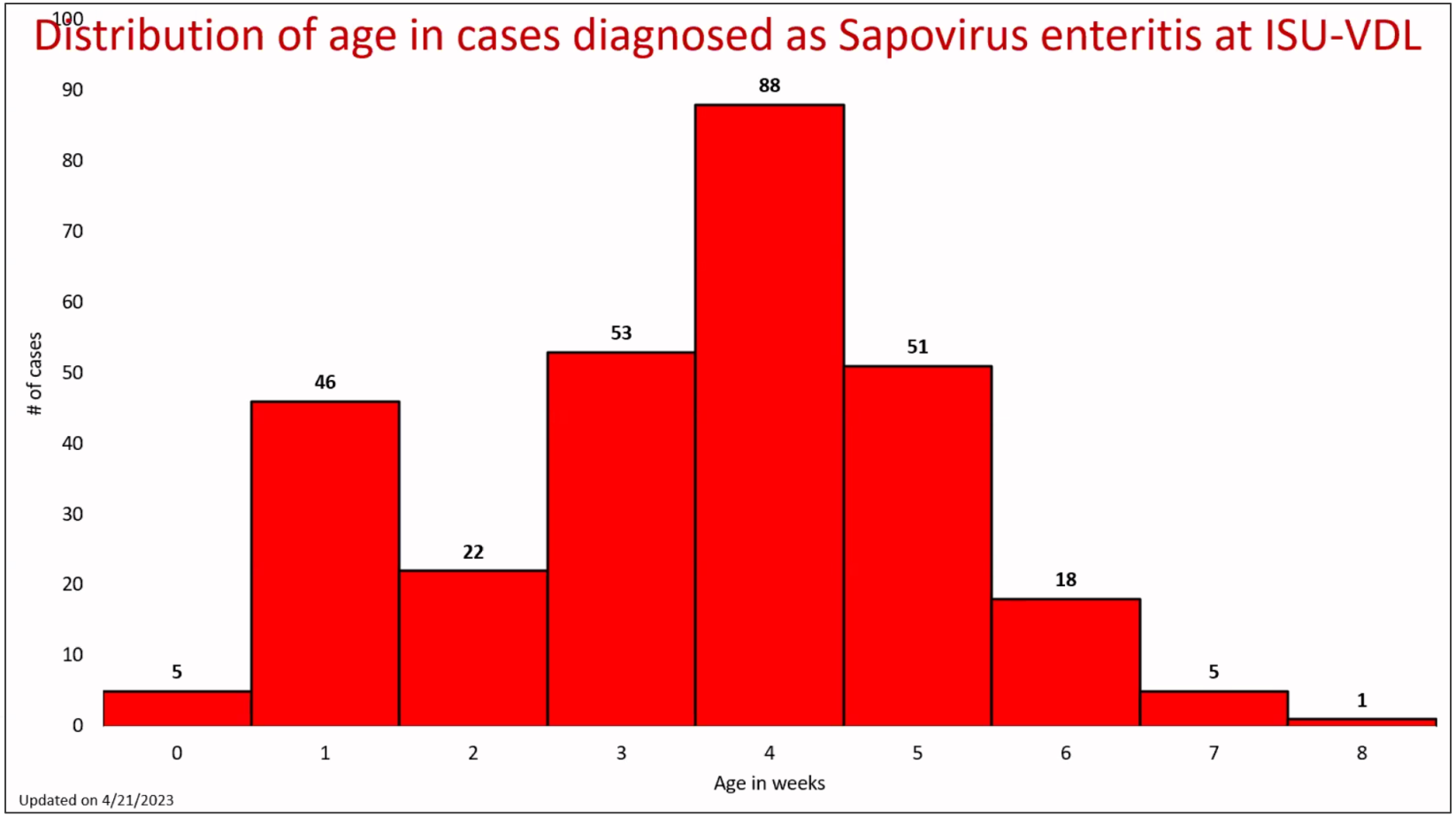

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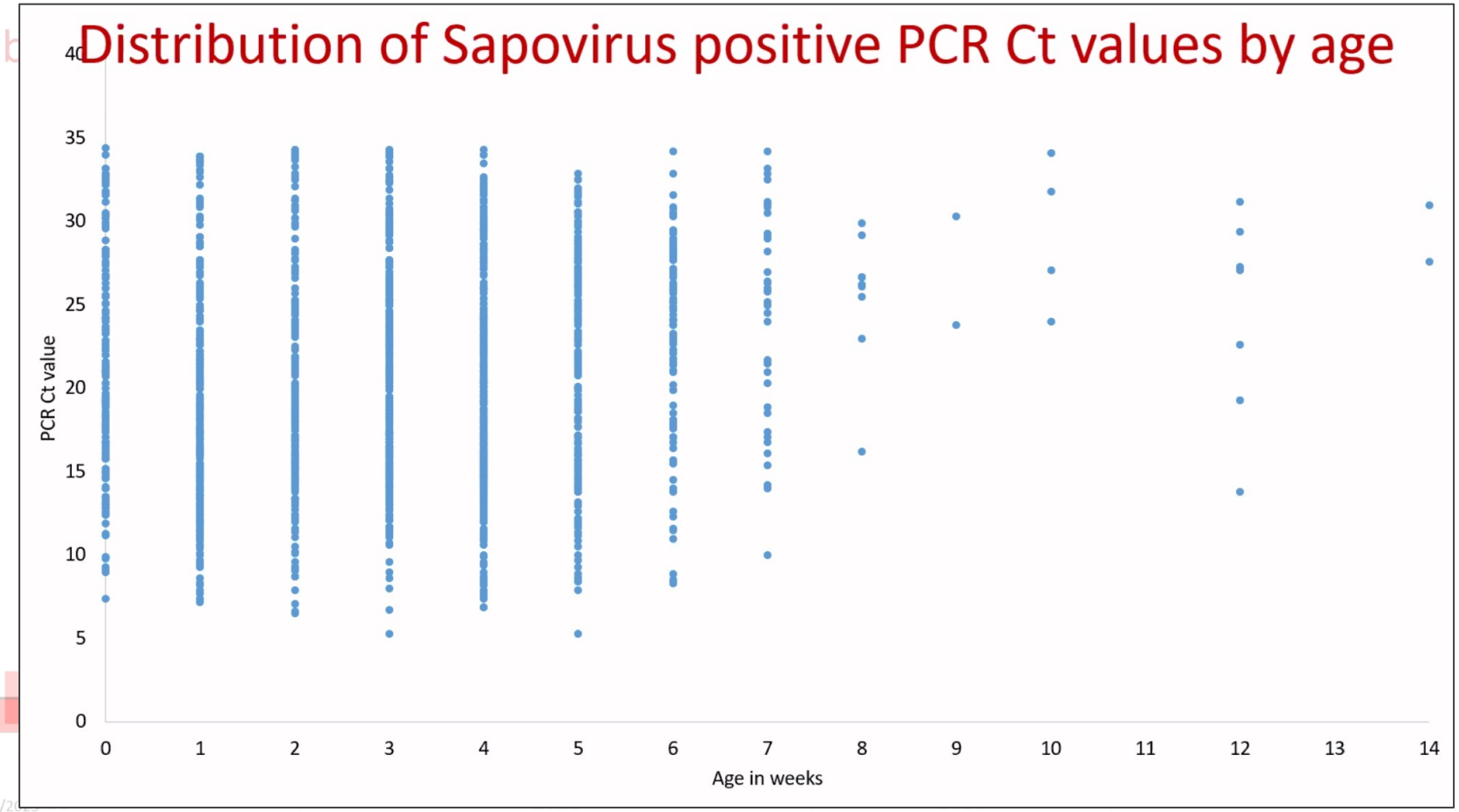

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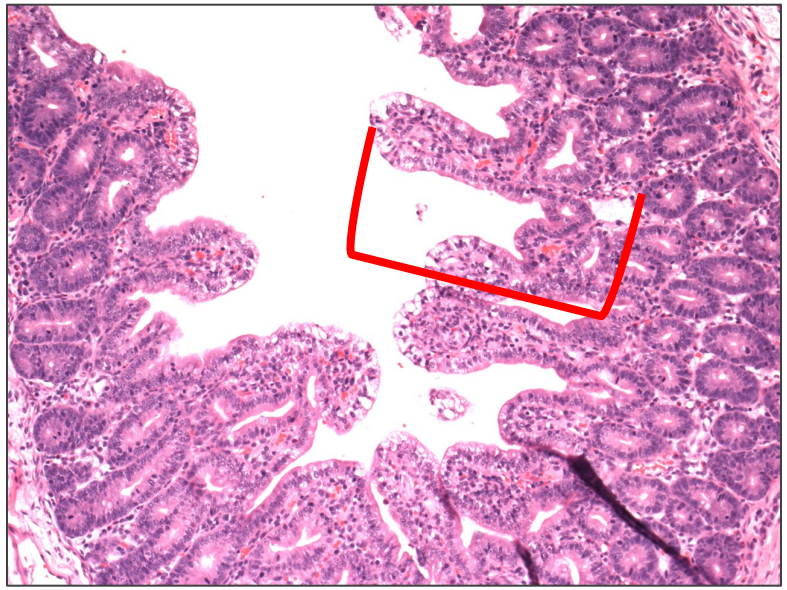
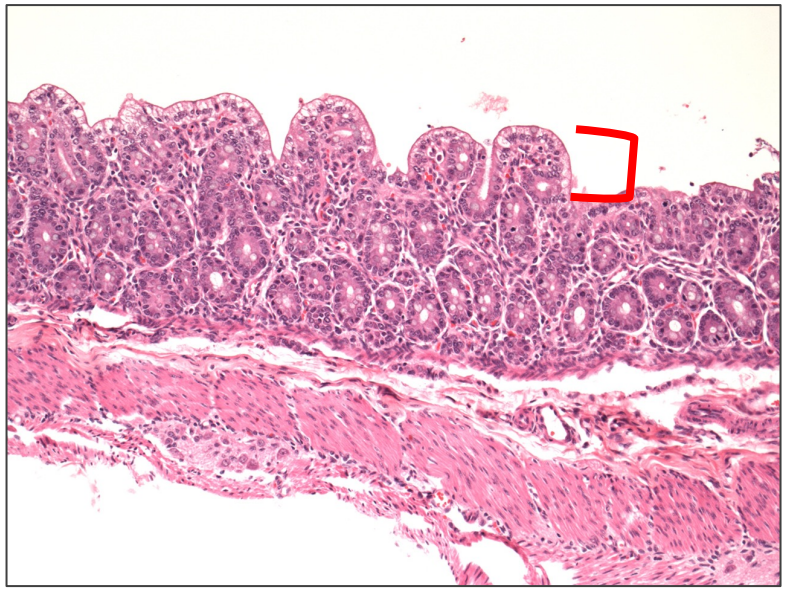
Sapovirus Diagnosis Can Be a Challenge

- **Positivity does not mean causality!**
  - Can be found in mixed infections
  - Healthy animals can be positive
- Rotavirus and Sapovirus cause the same disease
  - Atrophic enteritis – "hollow tube"
  - Segmental lesions can lead to missing diagnosis



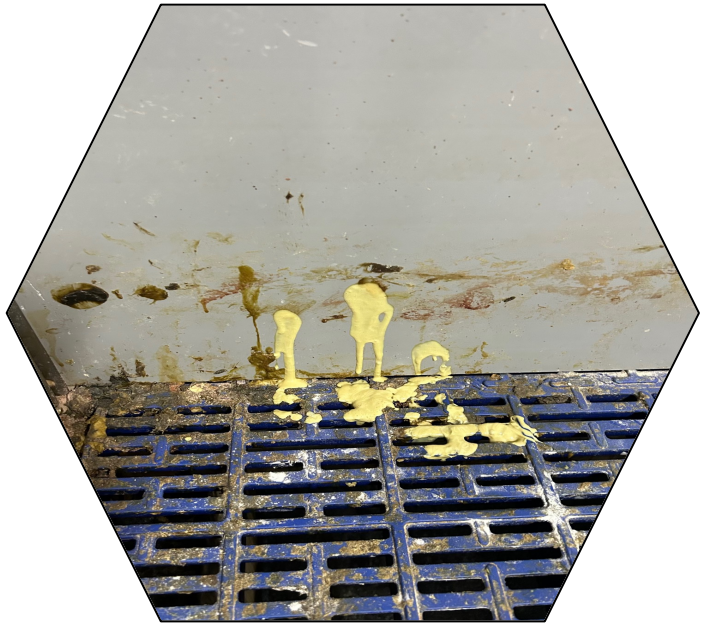


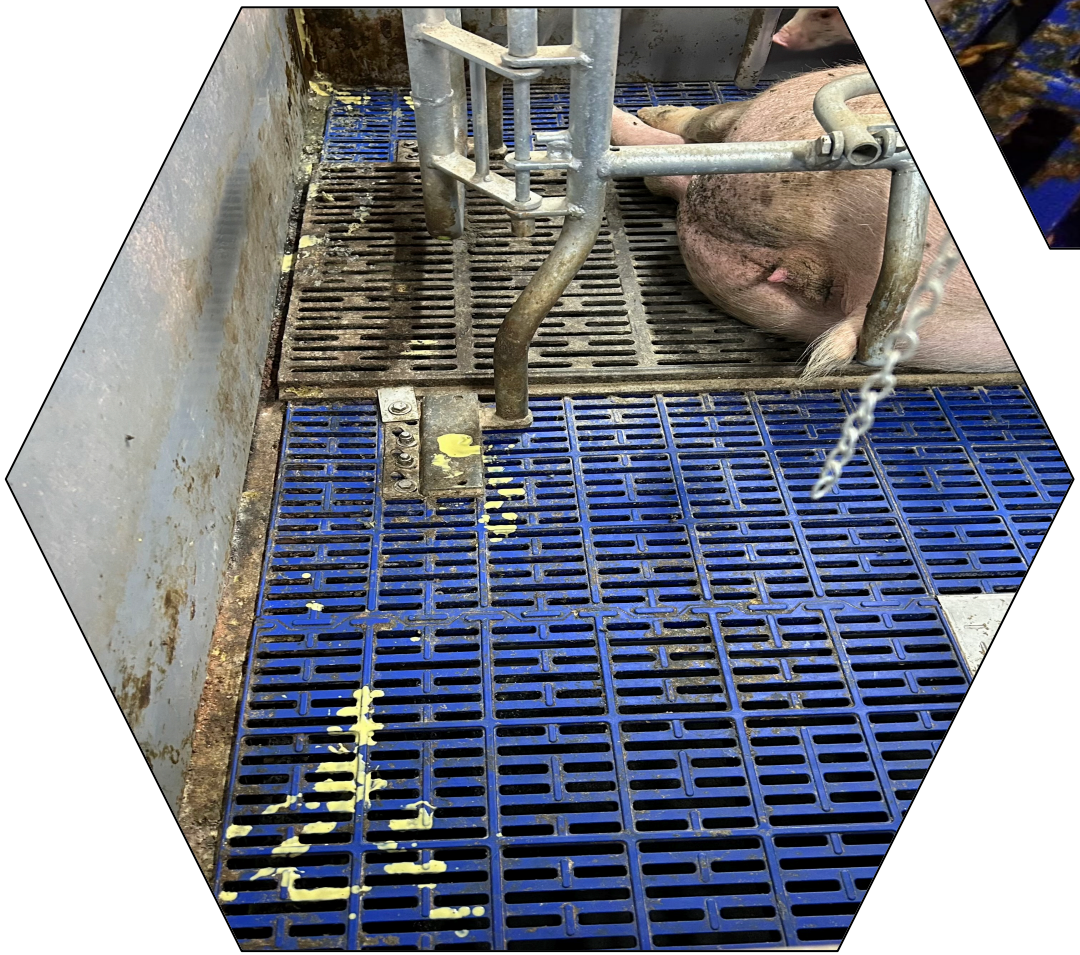
Sequivity Sapovirus Vaccine

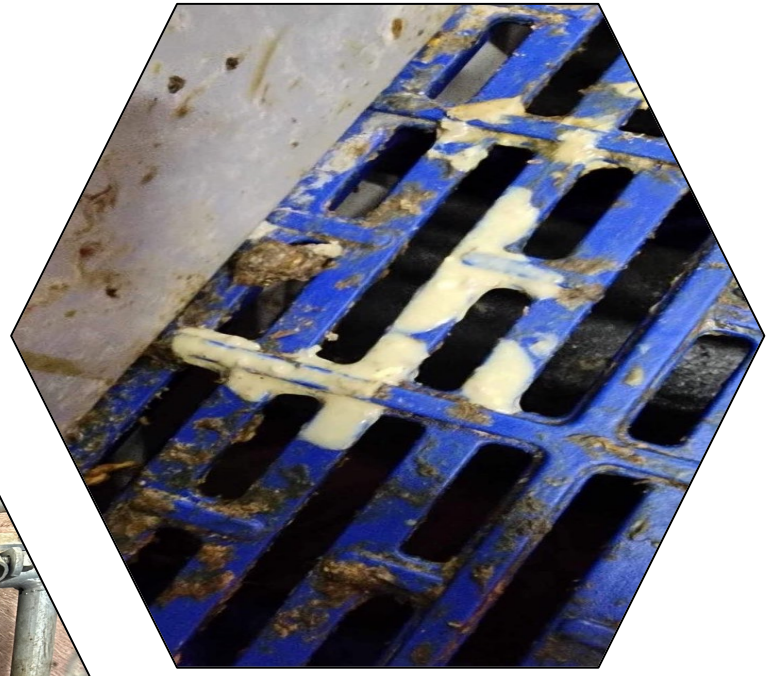
SEQUIVITY®

- First produced in 2021 for commercial use
- Use of vaccine (Merck U.S. data):
  - Less positive litters (25.6% vs 53.6%)
  - Lower PWM (2.13% reduction, more effect on gilts)
- 2.5 million doses sold in US
- "Vaccine is a game-changer; disease costs 1-2 piglets per litter"
  (Dr. Ackerman, Pork Vet Solutions)

Sapovirus Case:
Looks Like Coccidia!







Sapovirus Case: Sampling Timeline

Date	Sample Type	Result	
6 weeks after first farrowing	3 fresh manure samples	▪ *Negative* for Rotavirus ▪ *Negative* for coccidia oocysts	▪ *Negative* for pathogenic E. coli ▪ *Possible* Clostridium perfringens?

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1 month later	6 fresh manure samples	▪ *Negative* for coccidia oocysts ▪ *Negative* for pathogenic E. coli ▪ *1/6 Positive* for Rotavirus (Ct 26)	▪ *Possible* Clostridium perfringens? ▪ 1/2 *Positive for Sapovirus (Ct 21)*

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2 weeks later	Euthanized 2 piglets for tissues	▪ **Severe atrophic enteritis** for both pigs ▪ *Negative* for Rotavirus	▪ *Positive* for Sapovirus (Ct 20 and 22) ▪ Sequenced Sapovirus Genotype 3 VP1

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1 week later	Submitted 3 live pigs	▪ **Severe atrophic enteritis** for all pigs ▪ *1/3 Positive for* for Rotavirus A (Ct 30) ▪ Neutrophilic colitis (*likely dysbiosis*)	▪ *Positive* for Sapovirus (**Ct 15, 16, 19**) ▪ Sequenced Sapovirus Genotype 3 VP1

New Case – Interpretation?

- Coccidia control is not working (21-25 days)

Fecal flotation **Method ID:PARA-001**

Date Authorized: 2023-Nov-30 15:09

Sample ID	Client SampleID	Specimen type	Test	Result
23-101441-0010	FECES A	Feces	Result	No Parasites Identified
	FECES A		Level	0
23-101441-0011	FECES B		Result	No Parasites Identified
	FECES B		Level	0
23-101441-0012	FECES C		Result	No Parasites Identified
	FECES C		Level	0

Comments:

Level: 0 = none seen, 1+ = few, 2+ = moderate, 3+ = large numbers.

Rotavirus, group A, B, C **Method ID:V-005**

Date Authorized: 2023-Nov-30 16:18

Sample ID	Client Sample ID	Specimen Type	1. Rotavirus A PCR		2. Rotavirus B PCR		3. Rotavirus C PCR	
			Result (Ct)	Interpretation	Result (Ct)	Interpretation	Result (Ct)	Interpretation
23-101441-0009	**SI POOL**	Tissue	18.86	Positive	25.13	Positive	Not detected	Negative

Porcine sapovirus - PCR **Method ID:V-005**

Date Authorized: 2023-Nov-30 16:18

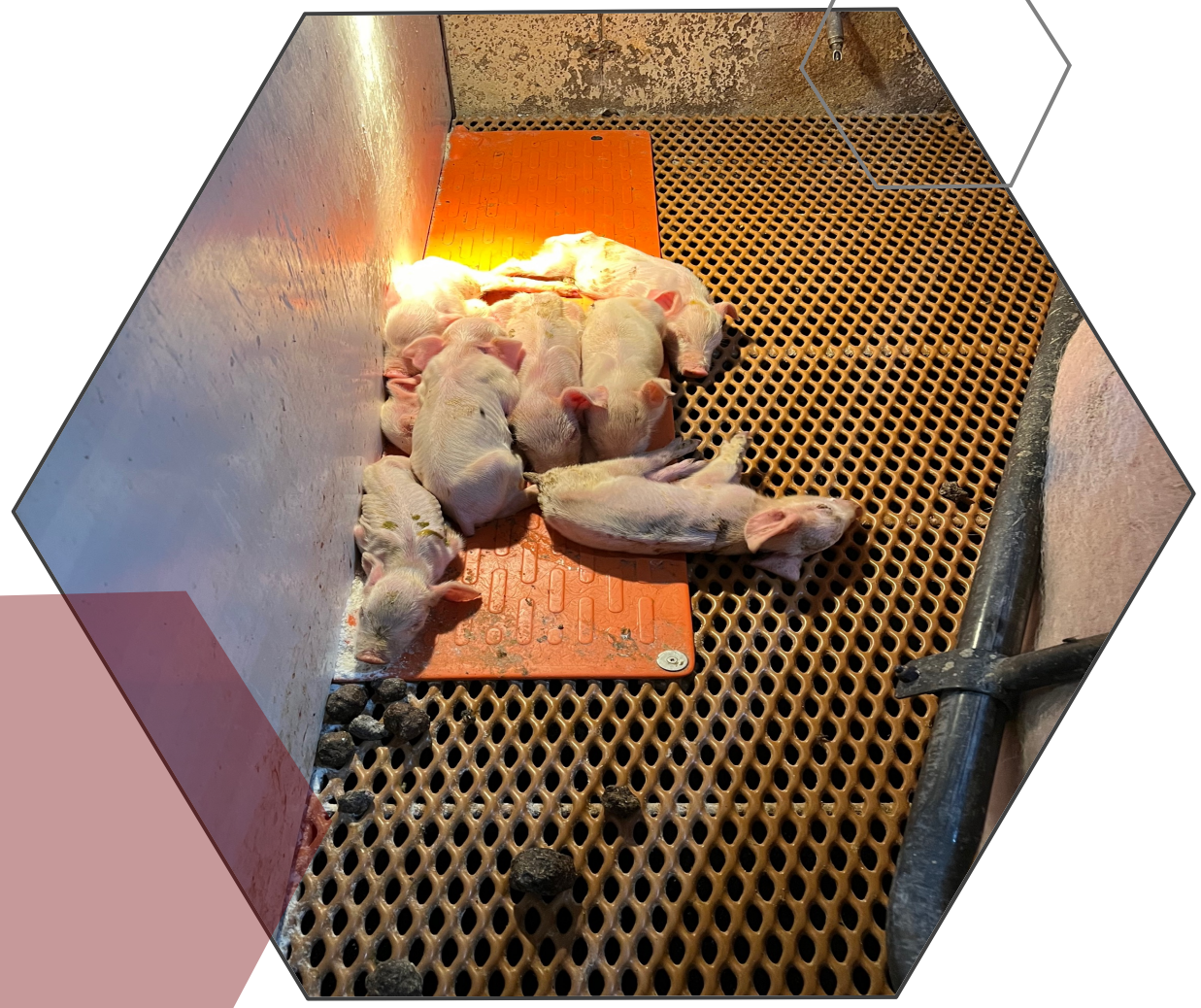
Sample ID	Client Sample ID	Specimen Type	Result (Ct)	Interpretation
23-101441-0009	**SI POOL**	Tissue	16.82	Positive

Final Thoughts on Sapovirus

- Likely missed Sapovirus disease for some time because lesions are common to other common pathogens and found in mixed infections; **not looking!**
- Diagnosis can be challenging
- Vaccination seems to be consistent in response
  - Improved PWM
  - 1-2 lbs wean weight increase

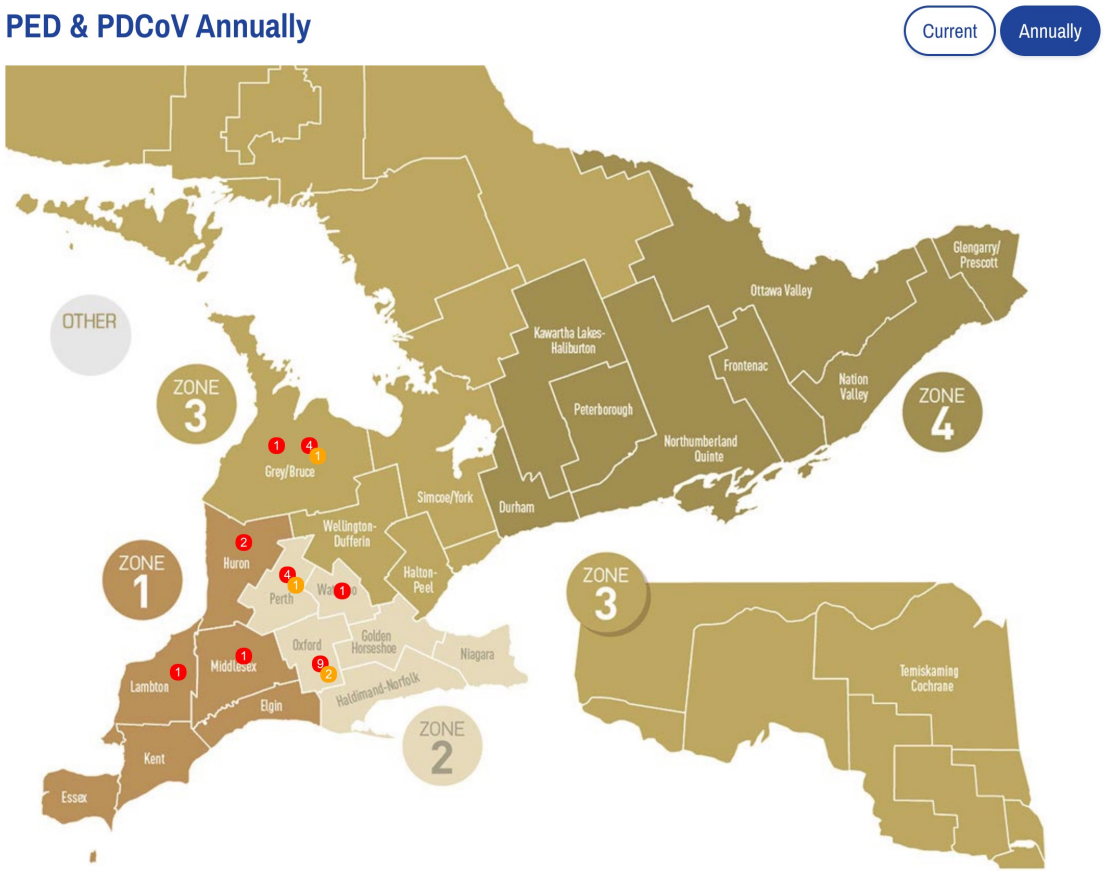
PED Cases

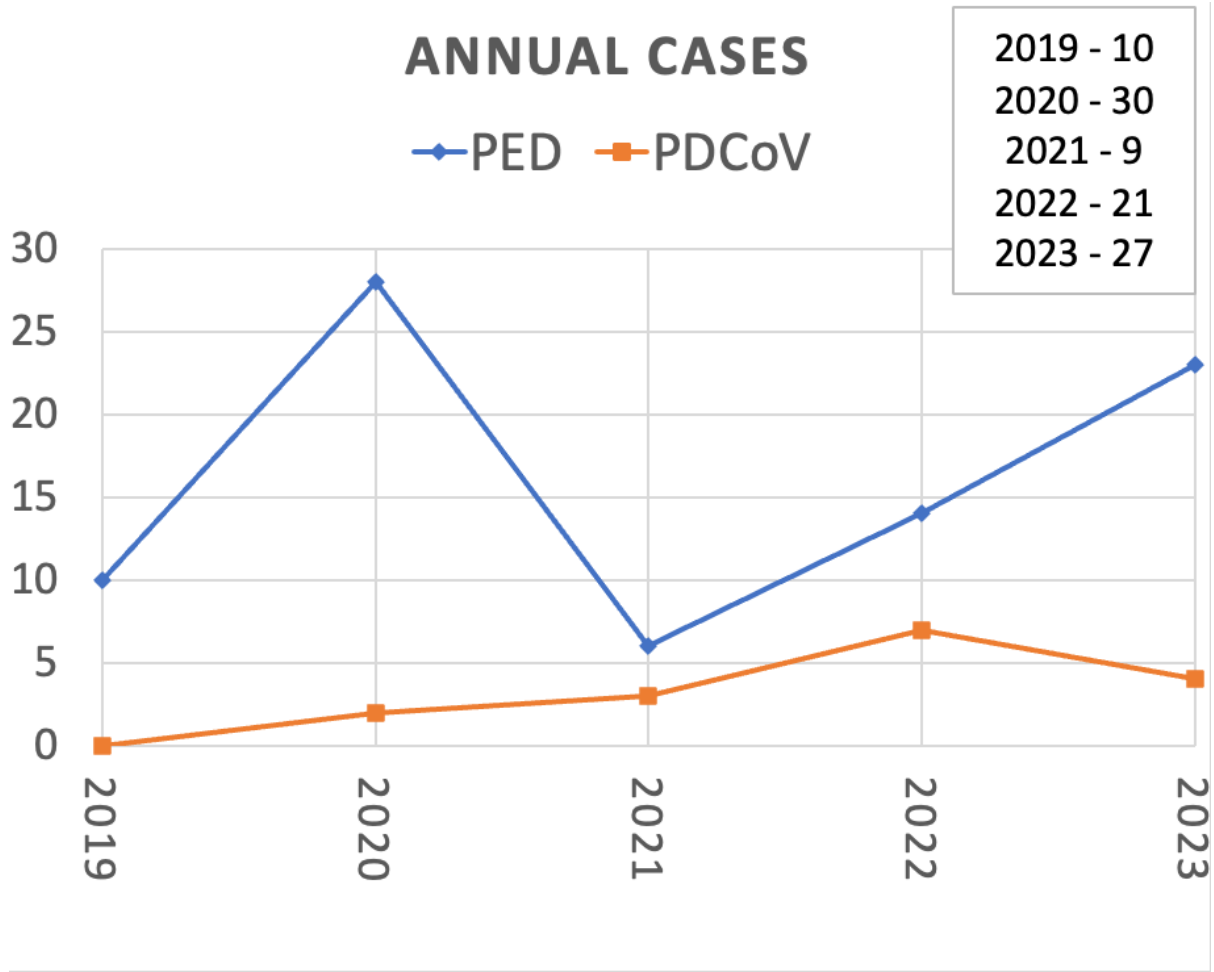
Spring 2023



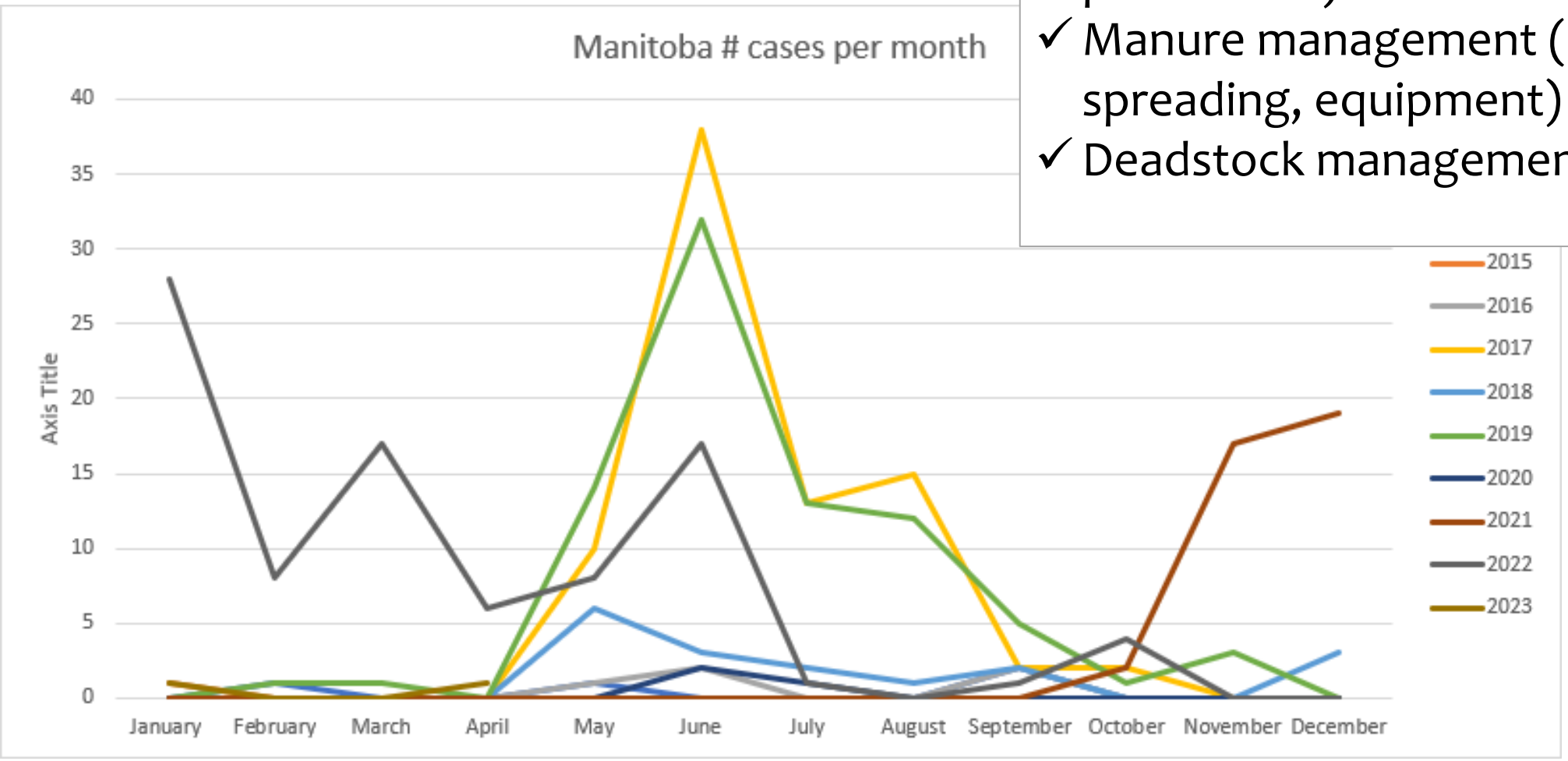
Annual PED Cases in Ontario

- OMAFRA stopped reported PED cases July 15, 2015
- Swine Heath Ontario reporting:





Manitoba PED Cases



Lessons Learned from PED in Manitoba 2017

*Continued risks associated with the following areas of activity:

- ✓ Assembly yards (location, layout, procedures)
- ✓ Manure management (handling, storage, spreading, equipment)
- ✓ Deadstock management

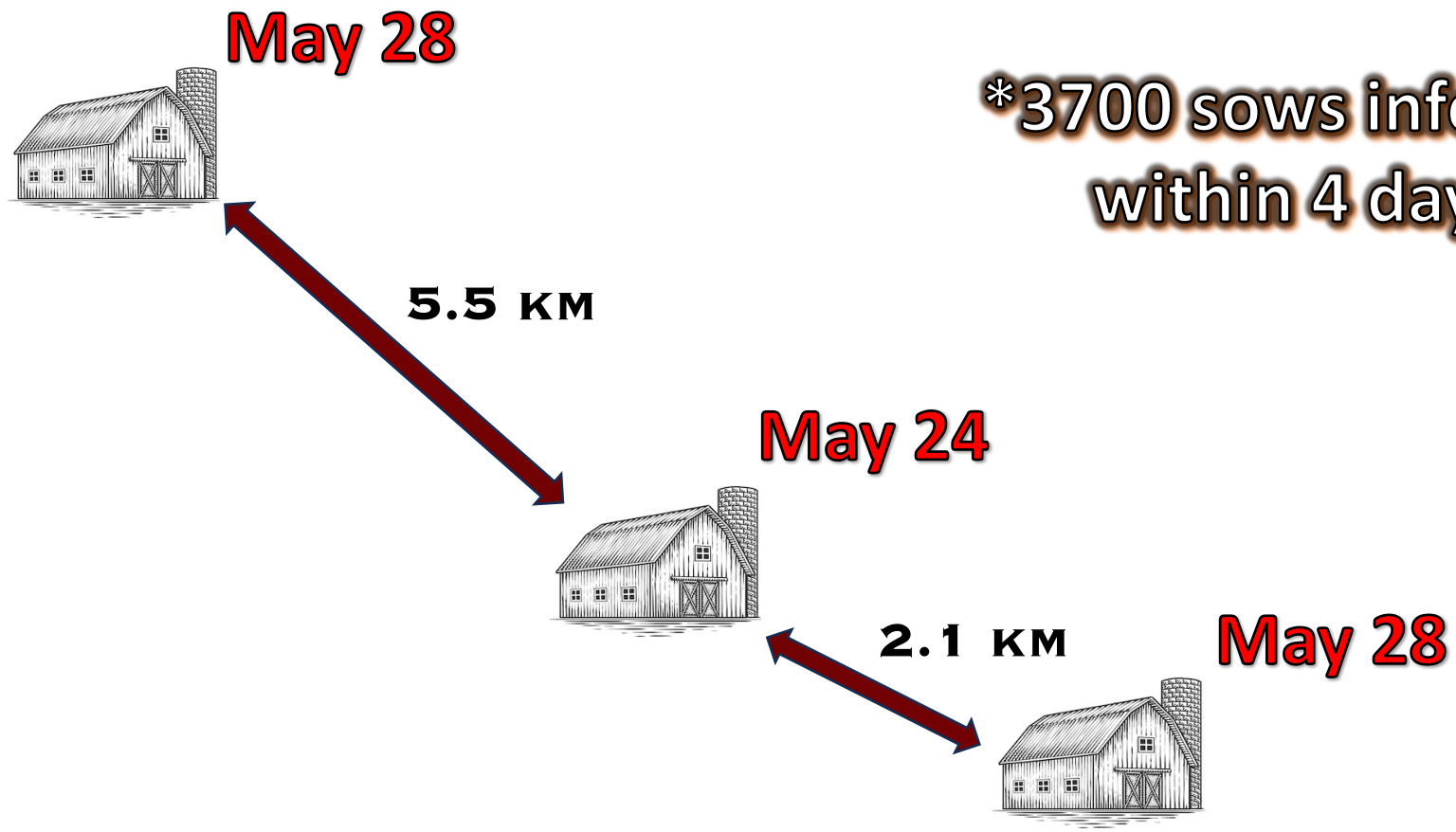
Source: Manitoba Pork

What Happened in Spring 2023?

Date	Sow	Nursery	Finisher
Jan 18	X		
Jan 18		X	
Jan 23		X	
Feb 14		X	
Mar 29			X
Mar 31			X
Apr 6			X
Apr 14	X		
Apr 25		X	

- Sudden increase in sow barn PED outbreaks in a localized area:
  - Case 1: May 24
  - Case 2: May 28
  - Case 3: May 28
  - Case 4: June 4

Proximity of PED Cases



*3700 sows infected within 4 days

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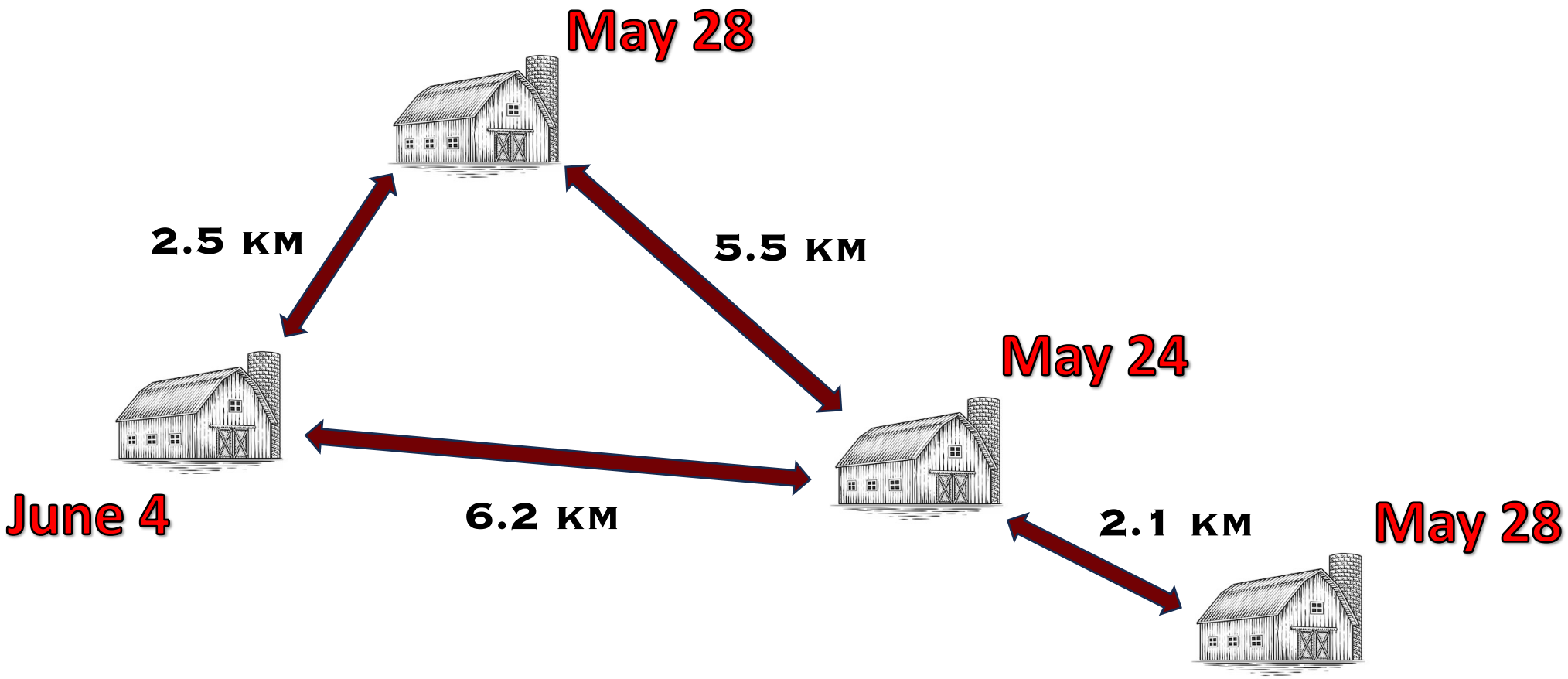

What Followed?

- Demeter was the vet-of-record for these 4 sites
- **STEP 1:** Immediately halt movement of pigs and gain a better understanding of extent of infection
- **STEP 2:** Contain the spread of virus as much as possible

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- **RESULT:** Able to contain infection by managing **pigs and people!**

Why Did This Happen?

- Common transport ***may*** link some of the early 2023 cases, *definitely not all*
- Some initial cases in 2023 Q1 went undetected
- Manure spreading was being completed in the localized area prior to 4 sow barn outbreaks late May
  - Lessons to learn from Manitoba!
  - **Confident 1st case related to cross-contamination of manure spreading equipment***
- Clear biosecurity breaks in cases 2 and 4
  - Contaminated traffic may have brought PED to site, but **people** moved it further
- These producers were all part of SHARC, but ***not aware*** of local April PED cases*

Biosecurity Procedures Compliance

- Quebec poultry farms (Racicot et al., 2012)
- Boots, logbook, controlled areas, coveralls, hand sanitation
- Short-term (first 2 weeks), medium term (6 months later)
- Assessed by video surveillance

Measure	Short-term	Medium-term
Boots		
Entrance Area		
Hand Sanitation		

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Measure	Short-term	Medium-term
Boots	93.6%	68.7%
Entrance Area	26.8%	29.1%
Hand Sanitation	57.1%	33.0%

Keys to Success

- Manage positive pigs
- 1st sow barn case of May told everyone immediately
  - Neighbours, feed company, transport, A.I. company…
- **Now everyone is more on the look-out!**
- Farms continued to call neighbours with every pig movement, some cases *even if pigs stable*
- Farms had trouble managing people movement between barns when eradicating – often shared people between multiple sites prior to break
- Farms avoided spreading manure after breaks and waited until fall
  - Communicated with neighbours, avoided certain roads

What Can We Learn?

- Communication through the entire industry is absolutely necessary
  - **Vet clinics**, feed companies, service companies, rendering companies, transport, etc.
- Communication with neighbours is key (regardless of SHARC enrollment!)
- PED and DCoV can be mild in nursery-finishing
- Biosecurity is so important – **can't take a break!**
- Quick action and good planning can reduce the spread
  - Highly infectious virus and easy to move around

DEMETER
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Thank you, questions?

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