

PEDV: Diagnosing, Monitoring and Managing Infection



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Porcine Epidemic Diarrhea Virus

- Enveloped, single-stranded RNA virus
- 7 open reading frames encode 4 structural proteins
 - Spike protein (S gene)
 - Membrane (M)
 - Envelope (E)
 - Nucleoprotein (N gene)



Porcine Epidemic Diarrhea Virus

- Pathogenesis
 - Viral attack of mature villous enterocytes
- Diffusely through the small intestine
- Cytoplasmic replication
- Incubation time = 12-18 hrs
- Severe diarrhea at 24-36 hrs (maximum effect)
 - Post infection
- Rare detection in colonocytes
 - No destruction though



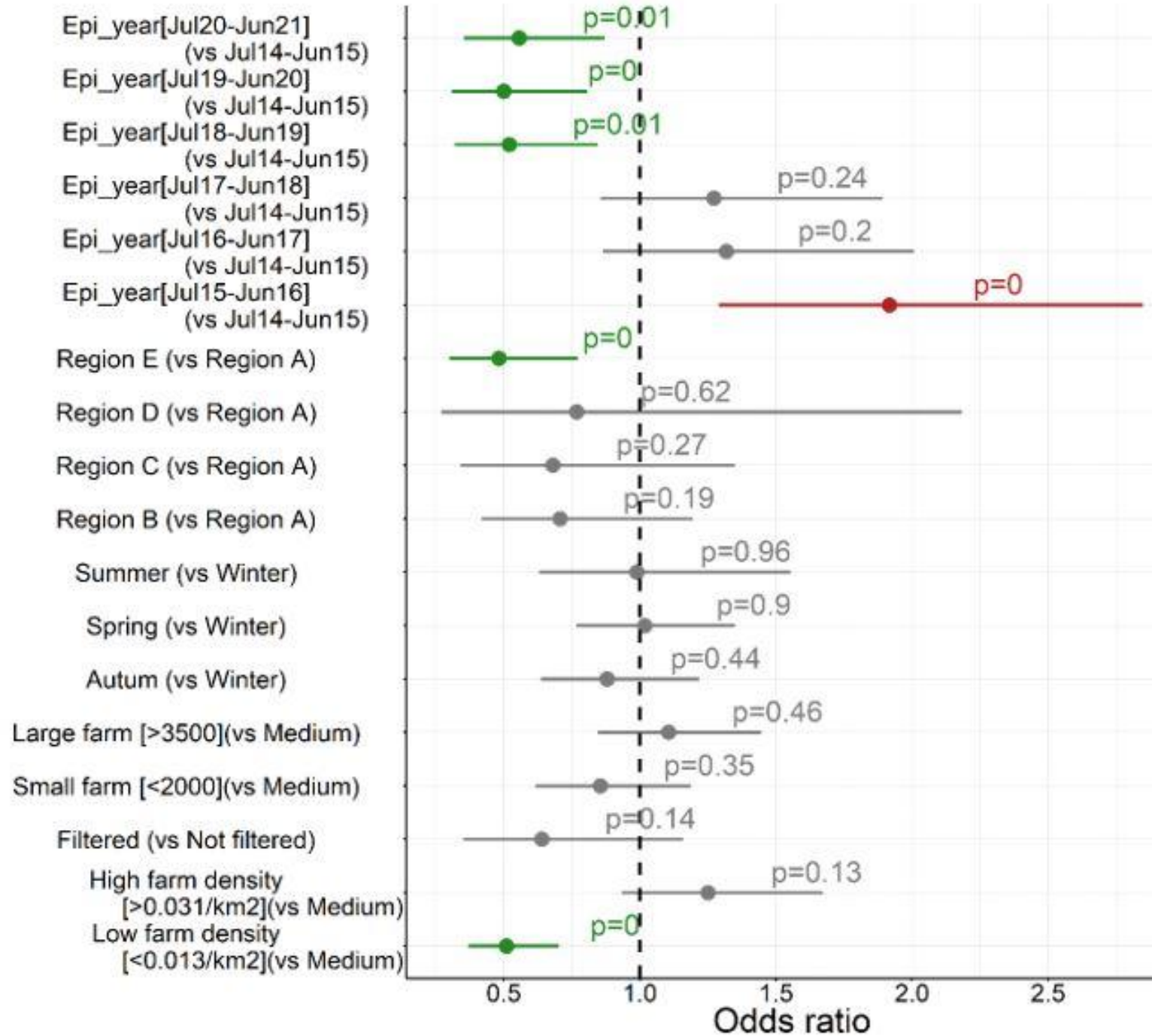
The challenge

- *High mortality in piglets under 2 weeks of age*
- PEDV first described in Europe in the 70s
- PED currently not a problem in Europe
- Fighting it in the US, test of biosecurity
- PED is an important problem in Asia

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Variable

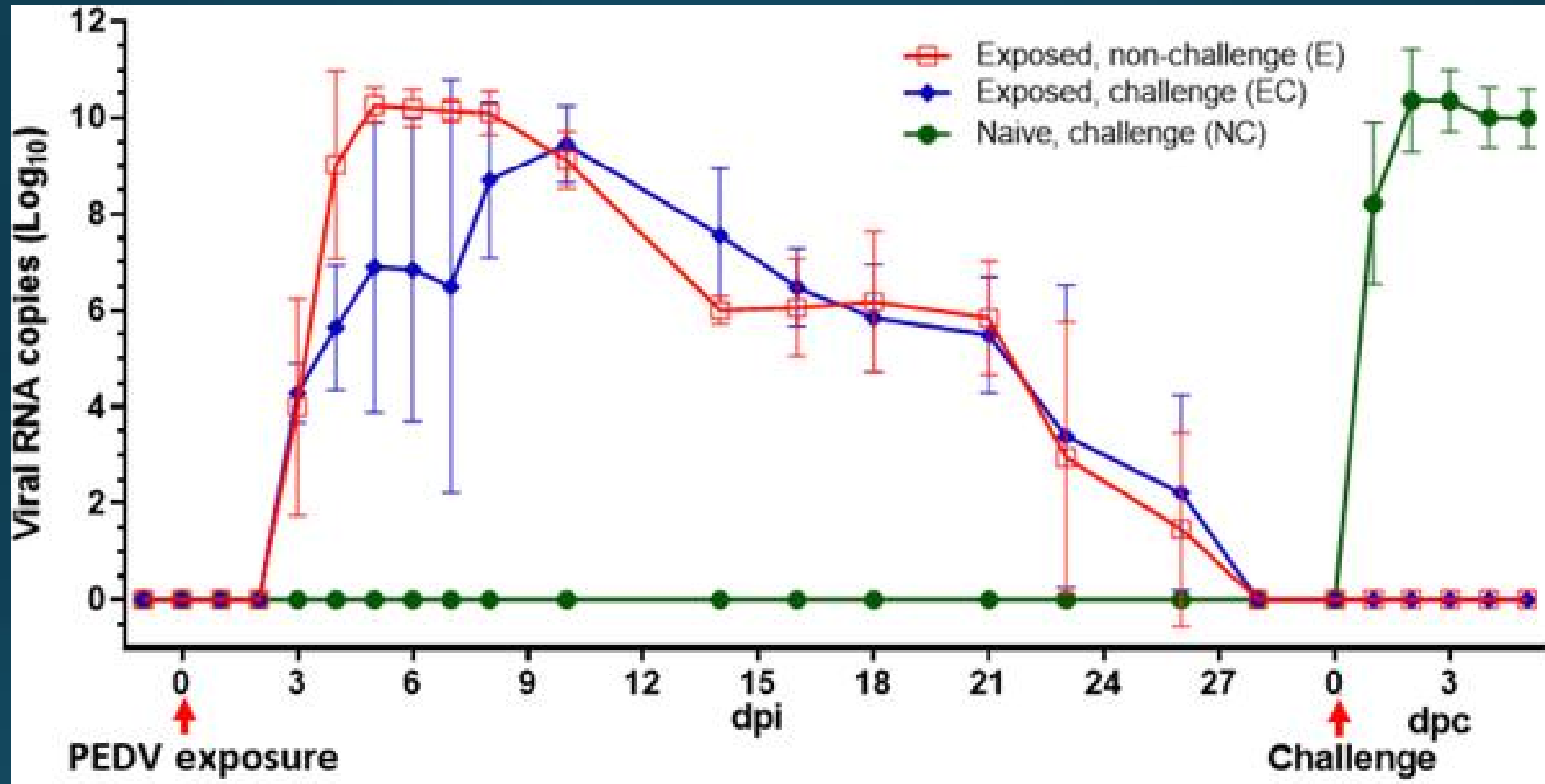


The problem

- Easily becomes endemic in sow herds and systems
- Can be eliminated from sow herds
- A strong test for biosecurity
- Current vaccines provide less protection than natural infection
- Reliant on lactogenic immunity for control
 - Colostral intake variable

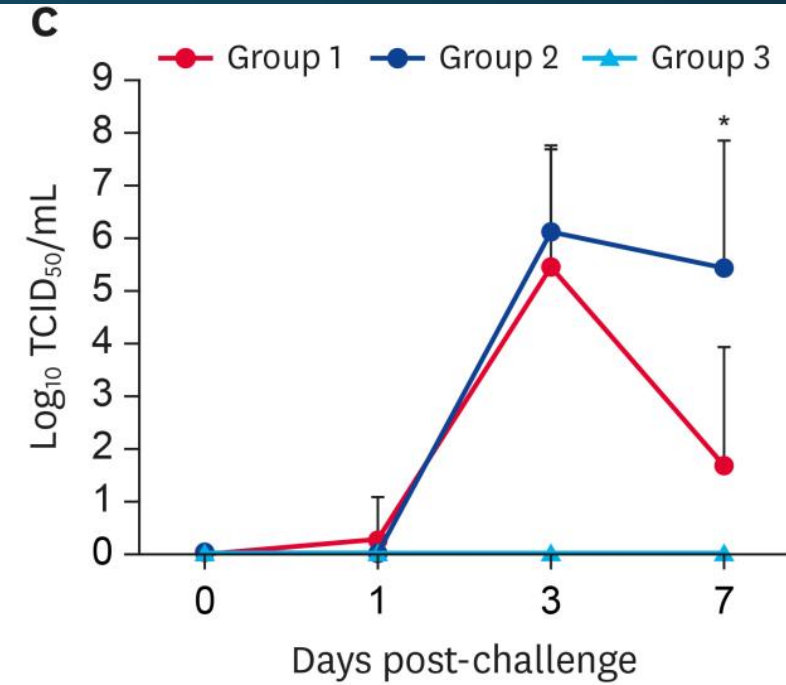
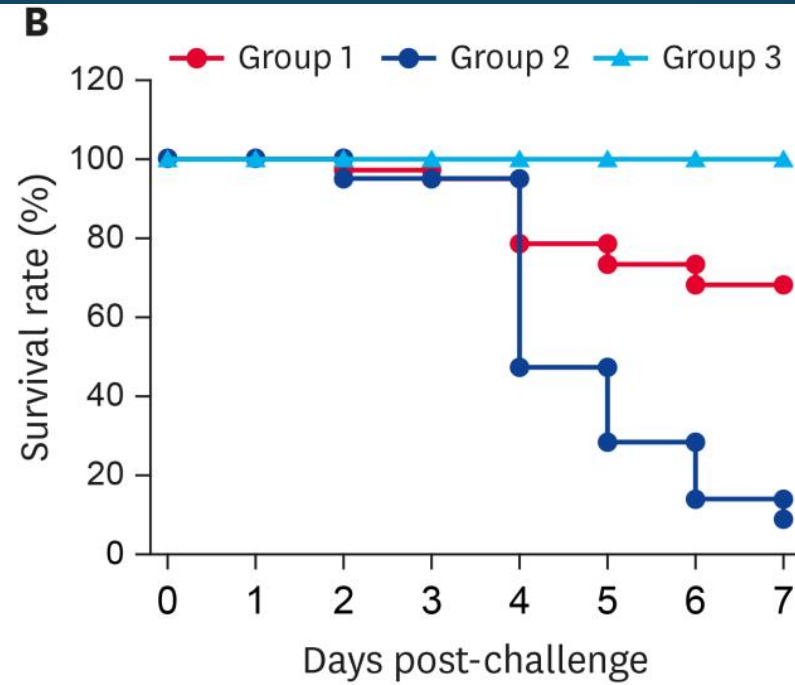
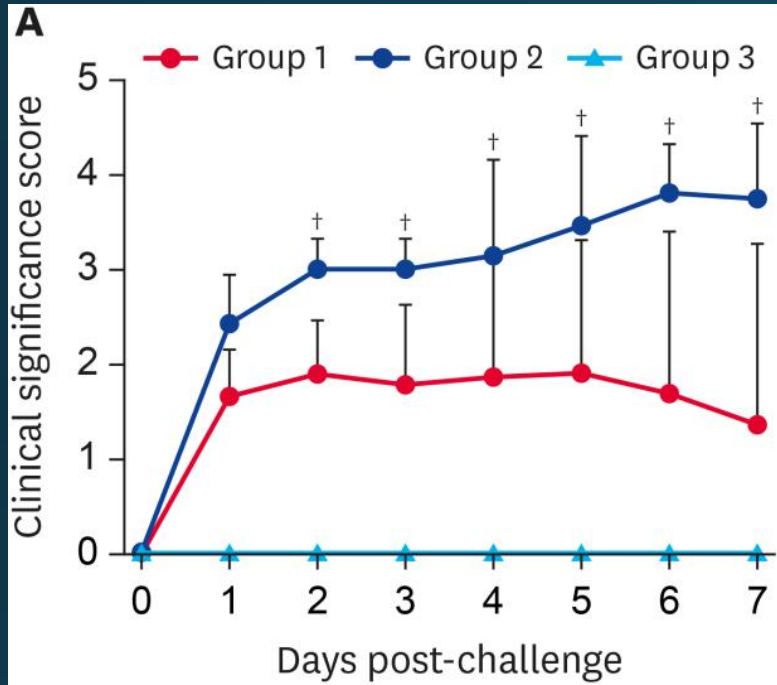


Prior exposure to PEDV prevents virus shedding upon subsequent infection.



Krishna VD, Kim Y, Yang M, Vannucci F, Molitor T, et al. (2020) Immune responses to porcine epidemic diarrhea virus (PEDV) in swine and protection against subsequent infection. PLOS ONE 15(4): e0231723. <https://doi.org/10.1371/journal.pone.0231723>
<https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0231723>





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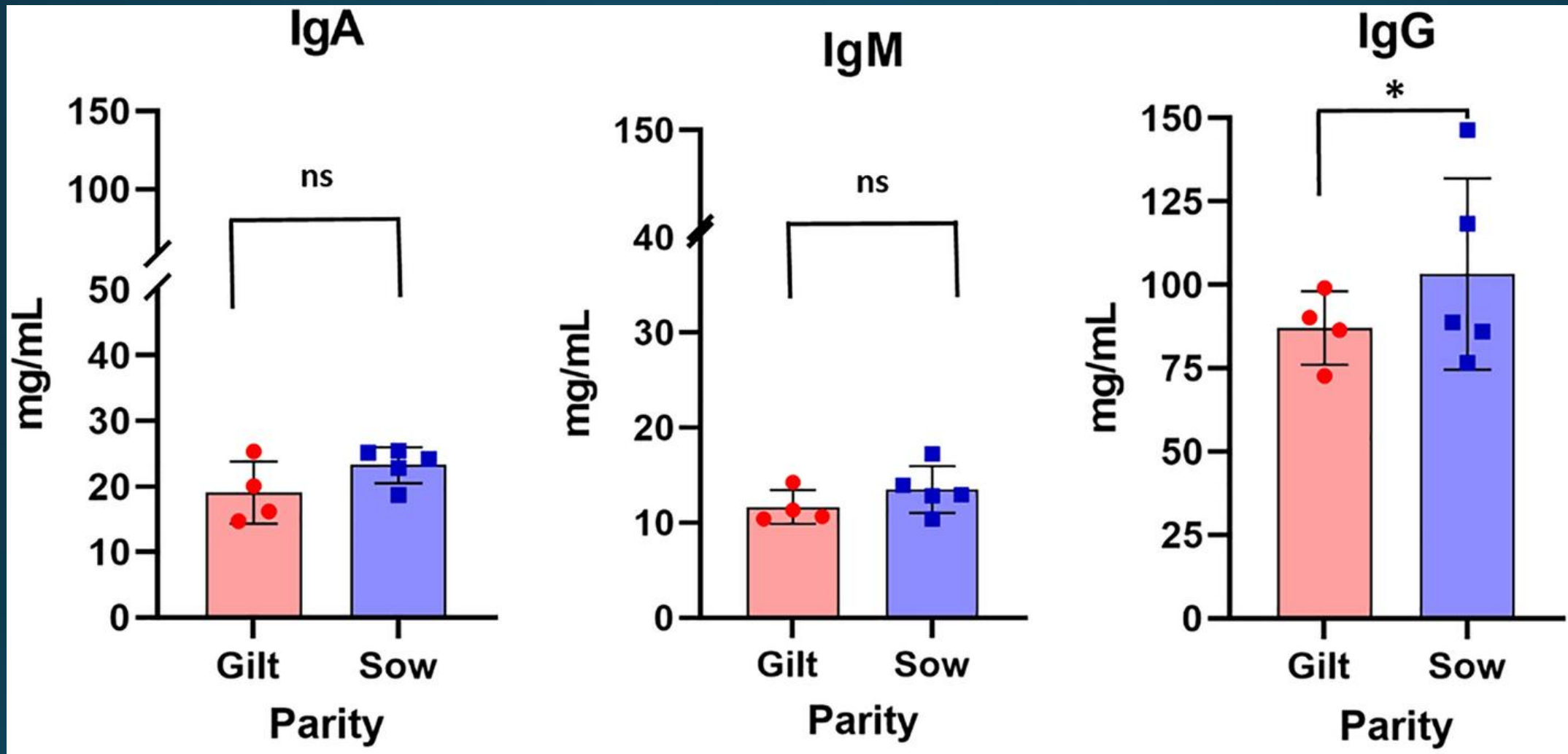


Disease Activity

- PEDV replicates in the epithelial cells of the small intestine
- Incubation period: 1-2 days
- Shedding in feces: 7-11 days
- Immune response: mucosal and serological: serum antibodies at 7-14 dpi

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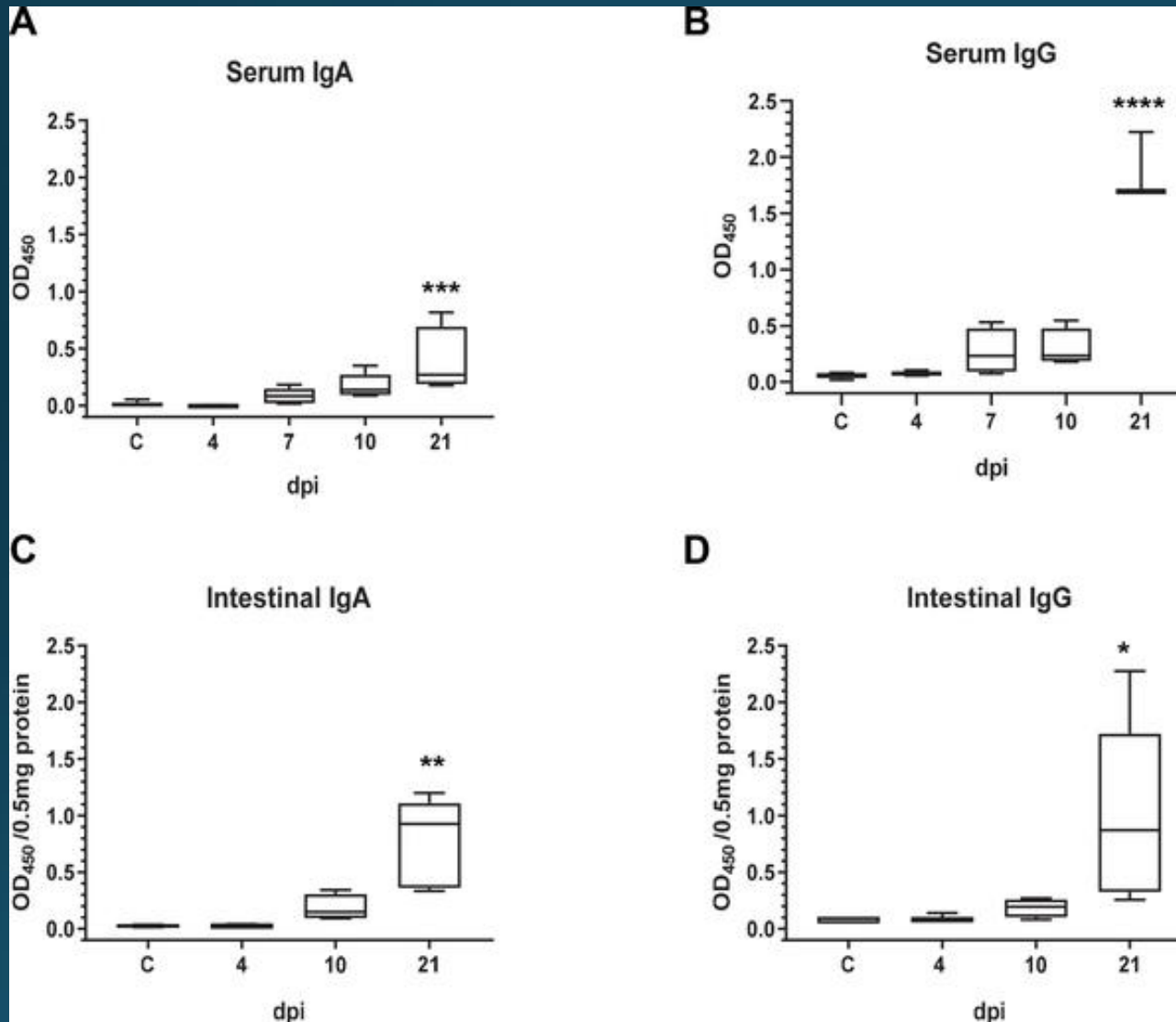




On the influence of the source of porcine colostrum in the development of early immune ontogeny in piglets
 Shaiana Salet Maciag, Franciana Volpato Bellaver, Gabrielly Bombassaro, Vanessa Haach, Marcos Antônio Zanella Morés, Lana Flávia Baron, Arlei Coldebella & Ana Paula Bastos
 Scientific Reports volume 12, Article number: 15630 (2022)



PEDV specific antibody response in serum and intestine of PEDV infected pigs.



Workup

Same basic guidelines of diarrhea diagnostic workups

- Select live, acutely affected pigs with diarrhea
- Perform necropsy and collect samples within 15 minutes of euthanasia
- Gross lesions: liquid intestinal contents, thin walled intestines?

Small intestine:

- 6 sections representing the whole length of the small intestine
- 10 cm segments fresh and 2 cm segments fixed • Other tissues for a complete workup and to rule out differential diagnoses
- Stomach, colon, tonsil, lymph node, lung, heart, spleen, liver, kidney -- fresh and fixed







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Sporadic shedding

No.	11.3	11.4	11.5	11.6	11.7	11.8	11.9	11.10	11.11	11.12	11.13
1	–	–	37.74	–	36.26	36.44	–	36.12	–	38.34	38.06
2	–	35.97	–	34.49	36.03	–	36.17	37.37	30.66	35.58	–
3	–	36.99	–	–	–	33.78	–	39.64	36.41	36.94	–
4	–	–	–	–	–	39.16	35.03	34.37	36.68	–	–
5	–	35.24	36.72	–	–	–	36.93	33.49	33.8	–	–
6	–	36.13	35.71	30.21	36.03	–	–	32.08	–	–	–
7	–	–	–	29.87	–	–	–	37.43	37.1	38.25	–

Bold values indicate the copies of PEDV is the highest and the amount of pigs excreted is the most.



PEDV Diagnostic tests

Virus isolation:

- Difficult to grow in vitro
- Electron Microscopy: – low sensitivity
- Histopathology:
 - atrophic enteritis
 - same as TGEV and Rotavirus
- Real time PCR:
 - sensitive and specific



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Other tests

IHC, ISH:

- less sensitive than PCR
- good for research, retrospective studies

- Serology:

- Indicative of previous exposure
- IFA/IPMA
- ELISA



Diagnostic investigation in farms with diarrhea: – Tissues from acutely affected pigs

– Fecal samples: 15 samples in pools of 5 (3 PCRs) – Oral fluid samples from 2 pens

• Monitoring the status of farms with no diarrhea: – Fecal samples: 15 samples in pools of 5

– 2 oral fluid samples

– 10-15 serum samples for serology

Testing protocols

• Monitoring the status of positive sow farms after herd closure

– Fecal samples: 30 samples in pools of 5

– Serology on sentinels? *Science-driven solutions™*

• Example:

– 8 wks after clinical signs: 10/10 positives

– 12 wks after clinical signs: 7/30 positives

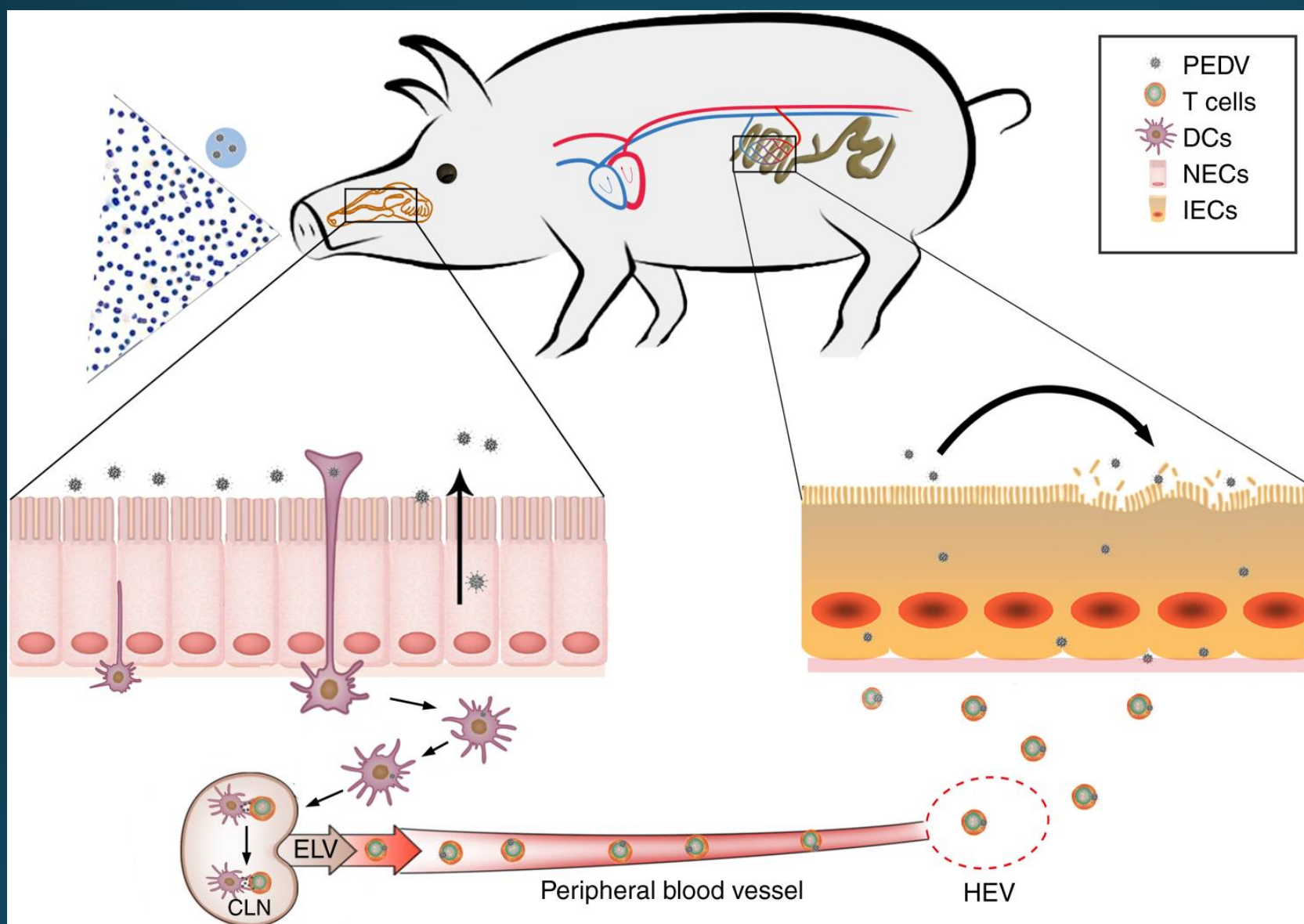
– 14 wks after clinical signs: 1/30 positives



How does it travel?

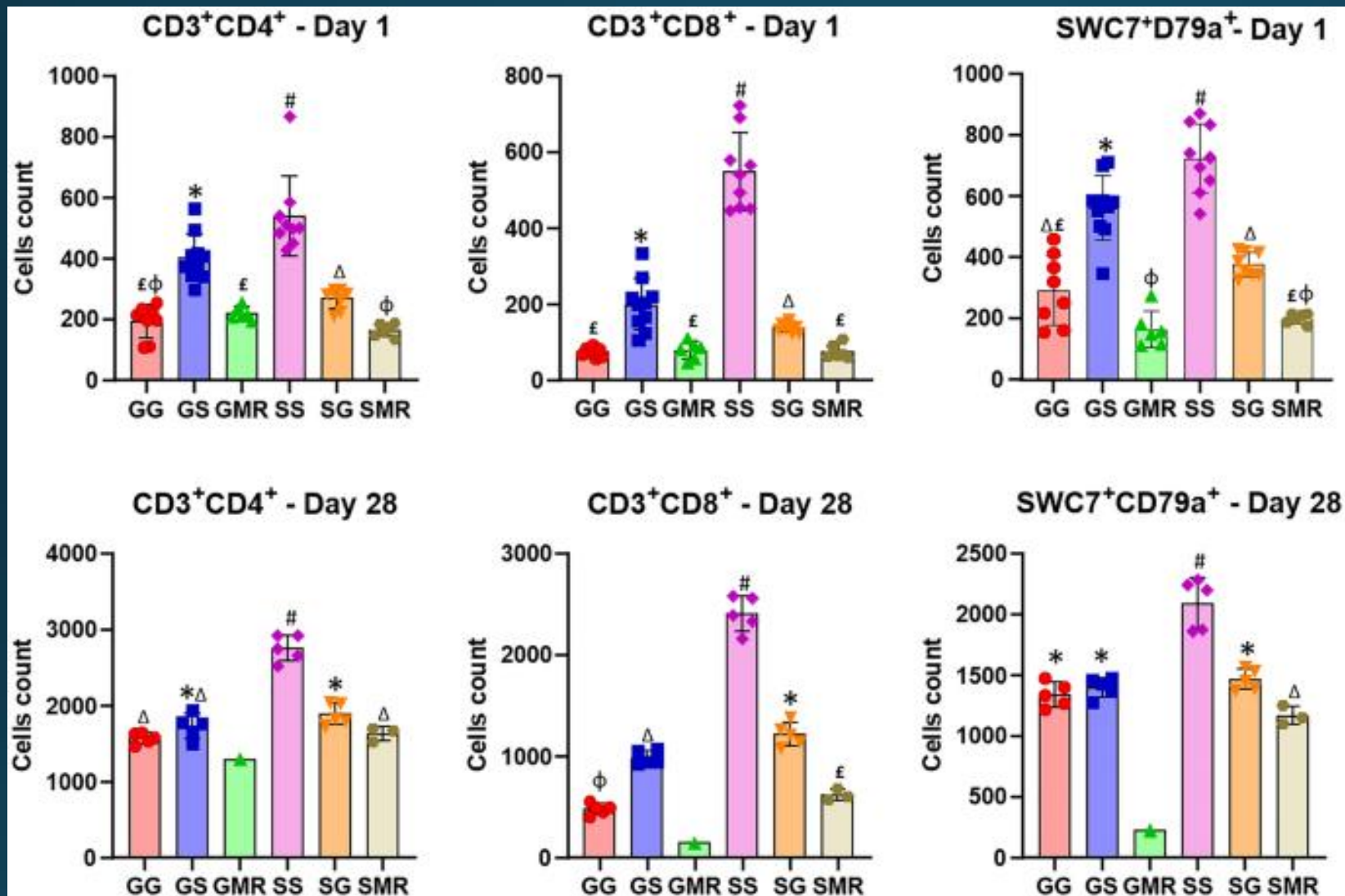
- Pigs: growing pigs contaminate environment
- Trucks
- Boots
- Air?





An alternative pathway of enteric PEDV dissemination from nasal cavity to intestinal mucosa in swine
 Yuchen Li, Qingxin Wu, Lulu Huang, Chen Yuan, Jialu Wang & Qian Yang
 Nature Communications volume 9, Article number: 3811 (2018)





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Vaccines

- Hard to produce
- Multivalent vaccines preferable
- Best used in endemic herds
- Currently not part of elimination protocols

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