

# How to control PEDV in Era of ASF

**Suphot Wattanaphansak, DVM, MS, PhD**

*Science-driven solutions®*

Department of Veterinary Medicine

Faculty of Veterinary Science

Chulalongkorn University





S. Wattanaphansak

A photograph showing several piglets in a farrowing crate. The piglets are white and appear to be nursing from a sow. The crate has metal bars and a green plastic pipe running through it.



S. Wattanaphansak

A photograph showing piglets in a farrowing crate. A large, reddish-brown piglet is visible in the foreground, and several smaller piglets are behind it. The crate has metal bars and a green plastic pipe running through it.

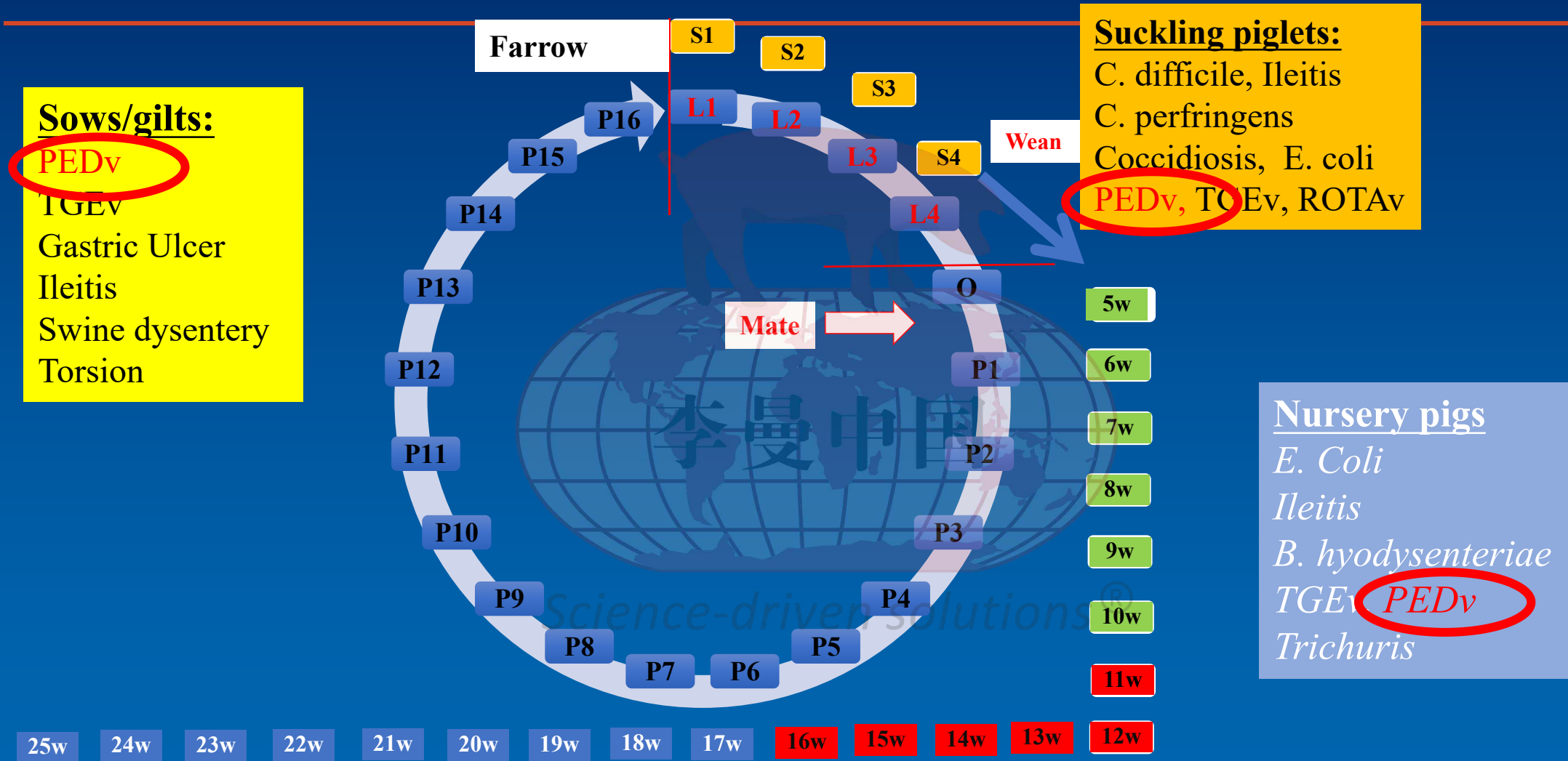


S. Wattanaphansak

A photograph showing a large number of piglets packed closely together in a metal cage. The piglets are white and appear to be of various ages. The cage is made of metal bars and is situated on a concrete floor.



# Swine production cycle: where can we find PED



**Growers/Finishers:** *Ileitis*, Swine dysentery, PEDv, Salmonellosis, PMWS, Gastric ulcer



Wattanaphansak S

Day 1



Day 2



Day 3

Wattanaphansak S

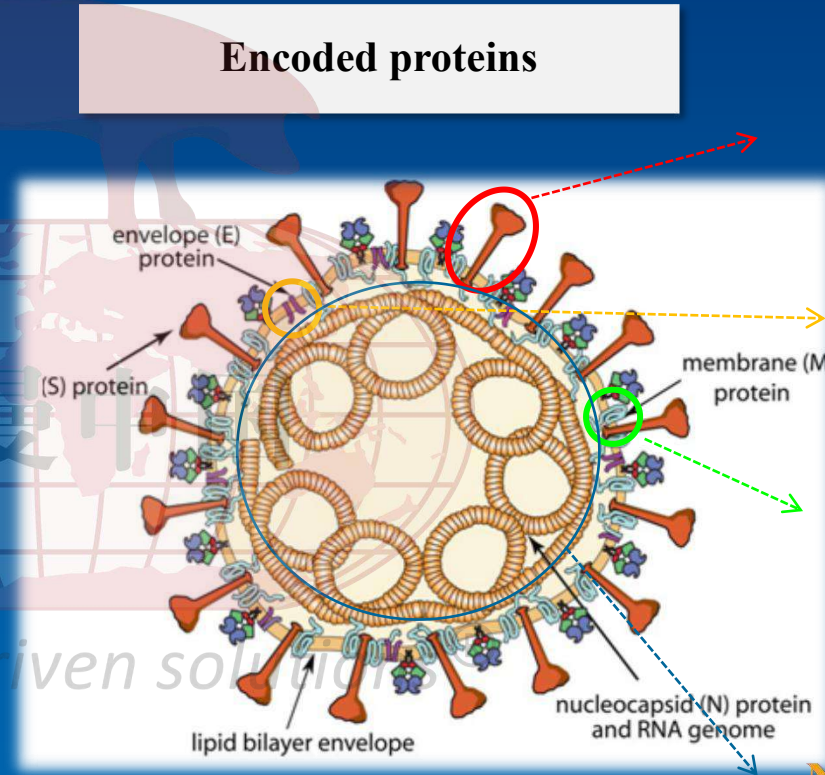
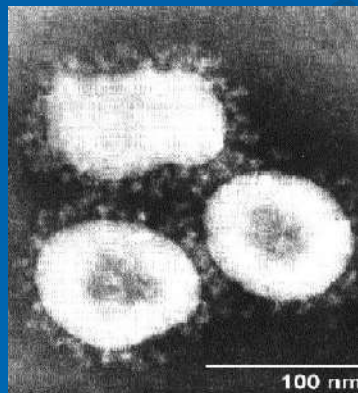


Day 4



# Porcine epidemic diarrhea (PED)

- Caused by porcine epidemic diarrhea virus, a member of the *Coronaviridae*
- The same family as:
  - Transmissible gastroenteritis virus (TGE)
  - Porcine respiratory coronavirus, PRCV
  - Hemagglutinating encephalomyelitis virus



## Spike protein

Receptor binding activity  
Neutralizing antibody induction

## Envelope protein

Envelope organization

## Membrane protein

Viral assembly process  
(S and N protein fusion)  
 $\alpha$ -IFN induction

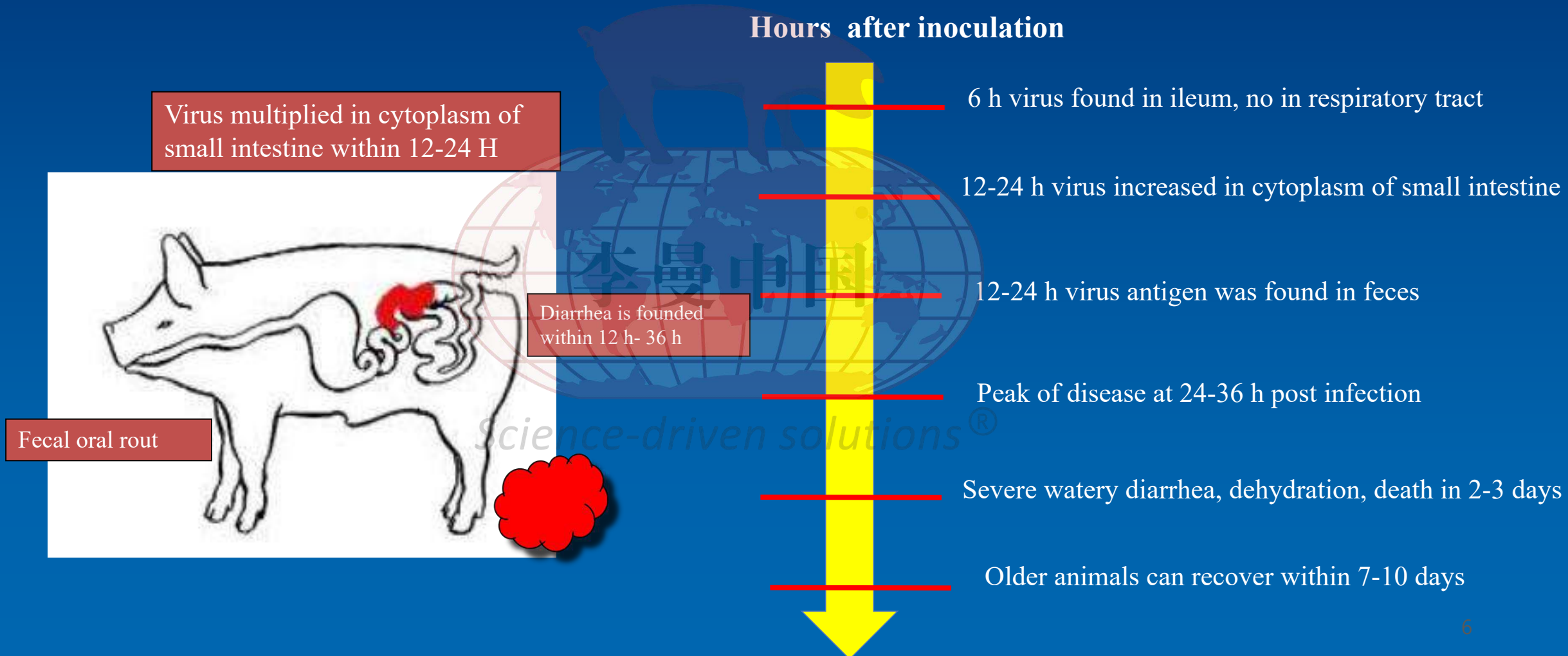
## Nucleocapsid protein

Package of viral RNA,  
Transcription process  
Antigenic determinant  
Inducing CMI

## ORF3 protein

; Pathogenicity factors

# Pathogenesis of PEDV infection





# 7 steps for control PED during an outbreak

1. Take a DEEP breath and accept what will happen in next 2 -3 months
  - First time outbreak 100% morbidity; 90-100% mortality



2. Confirmed and identified an outbreak ASAP : PED, TGE, PDCoV, Rota, or mixed infection

Clinical signs & Necropsy Vs Laboratory diagnosis

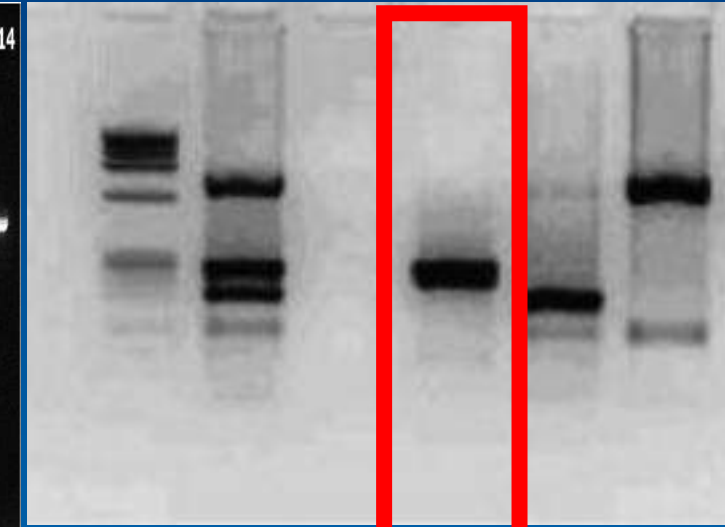
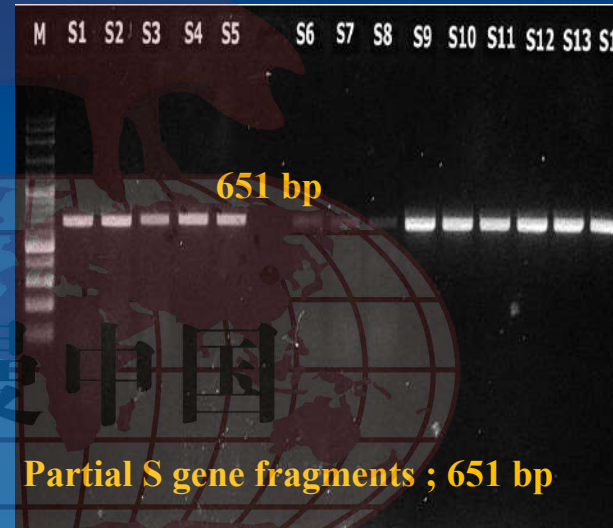
\*\*\* First time PED outbreak can not be clinically differentiated from TGE and Delta Corona virus\*\*\*

# 7 steps for control PED during an outbreak

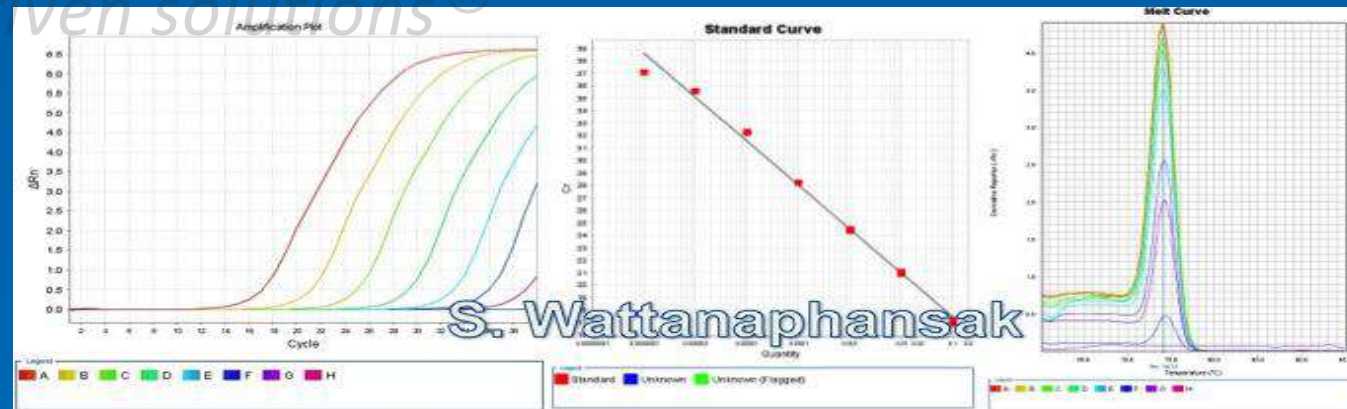
## 2. Confirmed and identified PED: Laboratory diagnosis

- Laboratory methods are necessary:

- PCR or Multiplex RT-PCR (PED, TGE, Rotavirus)
- RT-PCR of PEDV alone is more sensitive than multiplex RT-PCR
- qRT-PCR for PED quantification



PEDV RotaV TGEV





# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Clinical signs of PED in piglets

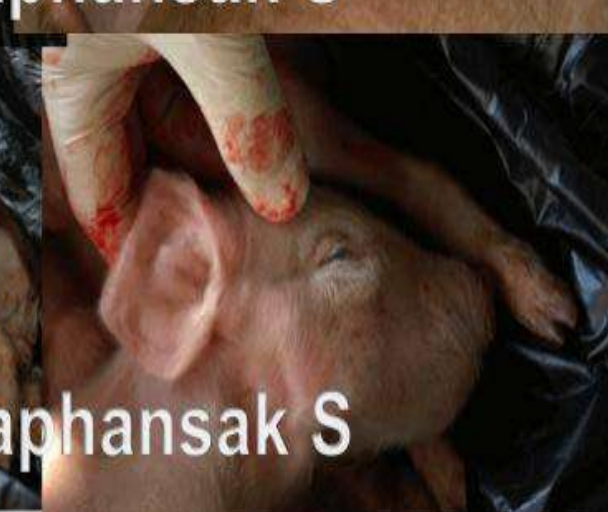


- First, vomit with undigested milk then diarrhea with in 24H, incubation period 1-3 days
- Piglets <7 days: morbidity 100%, watery diarrhea, dehydration, metabolic acidosis, mortality 90%-100%



# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Clinical signs of PED in piglets





# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Clinical signs of PED in piglets



- Piglets >14 days old: morbidity 100%, watery diarrhea but less severe, mortality 20-30%
- Low weaning weight: 3.5-5.5 kg for 2-3 months



# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Clinical signs of PED in gilts/sows

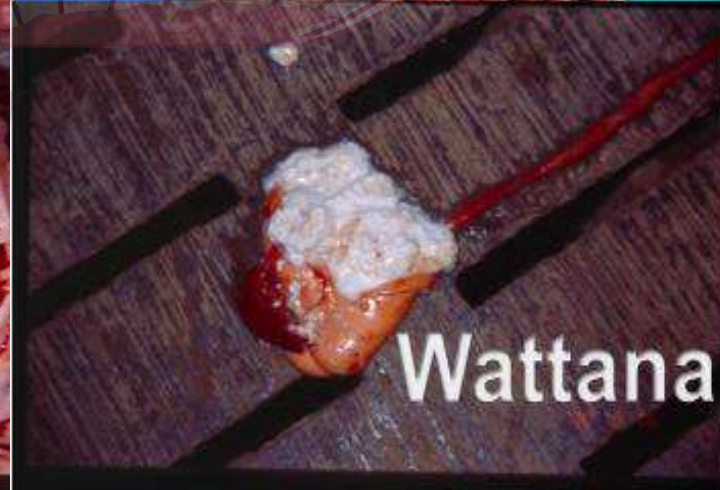
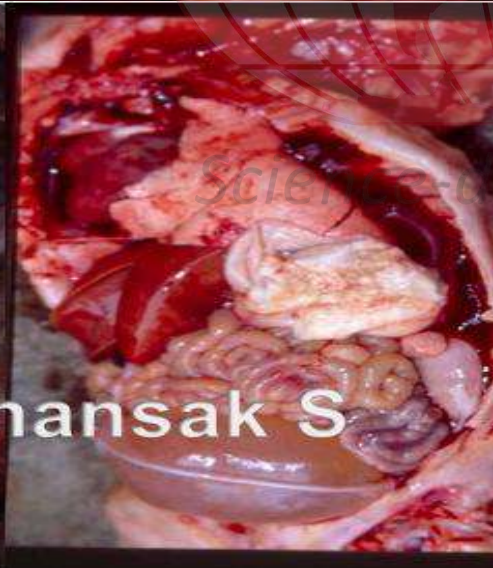


- Gilts/ Sows: watery diarrhea with fishy smell, the dynamic of diarrhea progress with in 1-2 days, off-feeding
- Gilts/ Sows recover after 7-10 days of infection but recover gilts/sows still shedding the virus for 14- 21 day



# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Necropsy lesions of PED in piglets

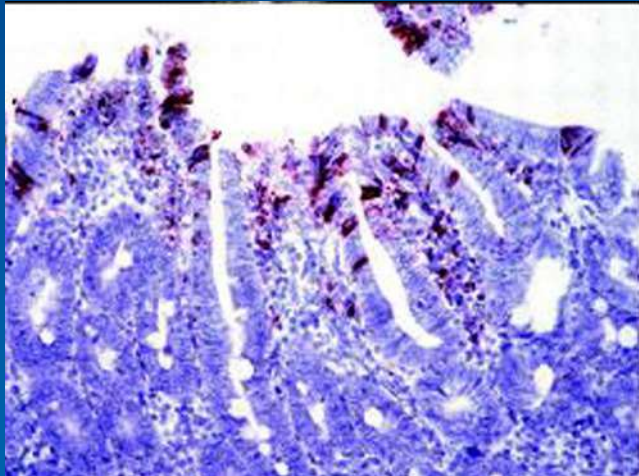




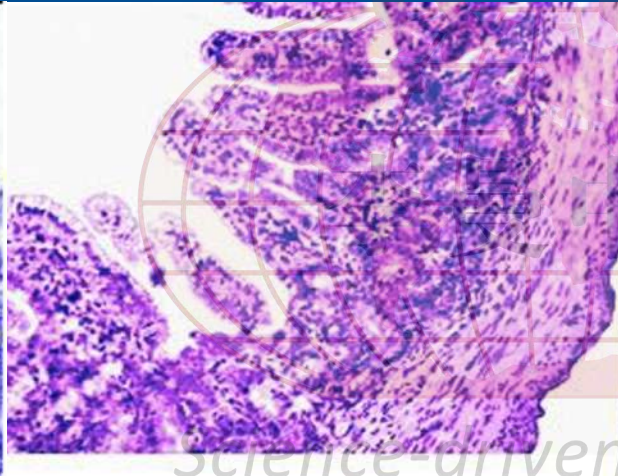
# 7 steps for control PED during an outbreak

## 2. Confirmed and identified PED: Histopathology & scanning EM

- Immunohistochemistry Vs H&E



IHC labeling of PEDV antigen in porcine small intestinal enterocytes



Small intestine from a infected pig with PEDV, villous shortening (H&E)



From non-infected pig

From pig infected with PEDV

(Pospischil A et al, 2002, JSHAP)



# 7 steps for control PED during an outbreak

## Differentiation between TGE vs PED vs PDCoV vs Rota

	TGEV	PEDV	PDCoV	RotaV (A&C)
Etiology	Very similar to each other (corona virus)			Reoviridae
Incidence	Seasonal	All year round	Seasonal	All year round
Survival of virus in the environment	Weak	Relatively resistant	Relatively resistant	Strong resistant in the environment
Piglet mortality	+++++	+++	+++	++
Duration of clinical losses	3-4 weeks	3-4 weeks	4-6 weeks	3 weeks
Fecal smell	Fishy smell	Fishy smell	Normal fecal smell	Normal fecal smell
Clinical sign	Vomiting and severe watery diarrhea, mortality rate 50-100%			Mild watery diarrhea but Rota C severe watery diarrhea

# 7 steps for control PED during an outbreak



Disease	Assay	Samples
<ul style="list-style-type: none"> <li>-Transmissible gastroenteritis (TGE),</li> <li>-Porcine epidemic diarrhea (PED)</li> <li>-Porcine Deltacoronavirus (PDCoV)</li> <li>- Rota virus (A,C)</li> </ul>	<ol style="list-style-type: none"> <li>1. Virus isolation</li> <li>2. PCR, qPCR</li> <li>3. Histopathology, SEM</li> <li>4. Immunohistochemistry, IPMA</li> </ol>	Feces, small intestine, Colostrum milk, serum



# 7 steps for control PED during an outbreak

## 3. Applied strictly bio-security

- Eliminated biological and mechanical vectors- human, vehicle, birds, fly, rat
- Limited moving people, sows, gilts, and piglets - prevent virus enter to FARROWING UNIT
- Applied disinfectants and intensive cleaning
  - Sodium hydroxide 2%
  - Potassium peroxymonosulfate 1:100
  - Calcium oxide powder



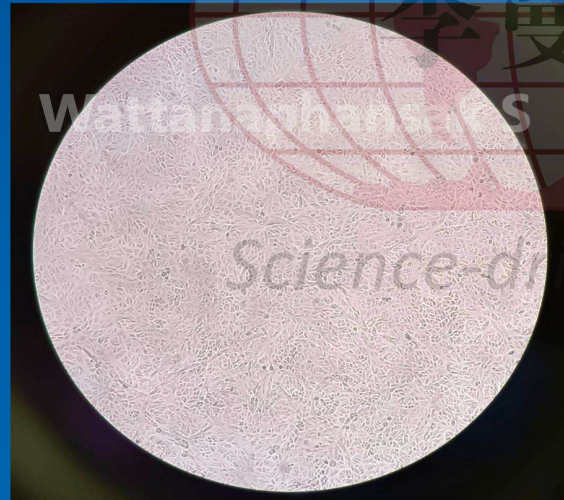
\*\*\* Never reuse SACK in Farrowing Unit\*\*\*



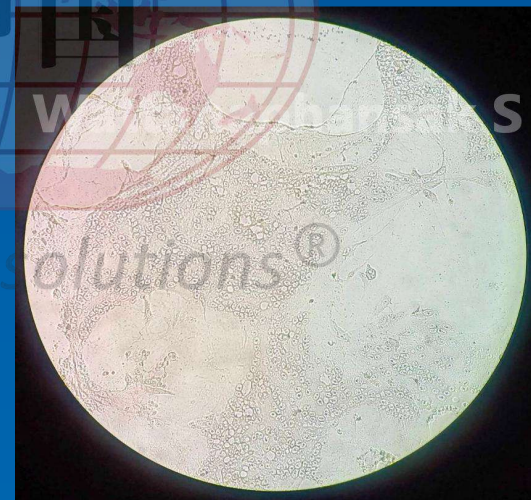
# 7 steps for control PED during an outbreak

## 4. Stimulate intestinal mucosa or humoral immune response

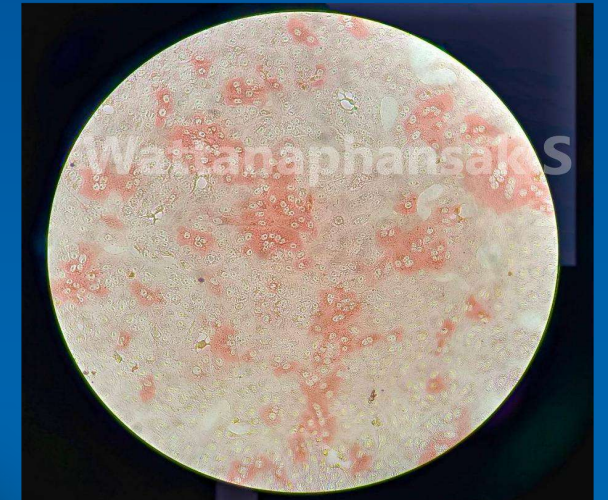
- No more gut feedback, high risk of ASF outbreak
- PED live attenuated vaccine or killed vaccine is the best option- Farm with No outbreak
- **Live PED pure culture low passage – whole herd orally- during an outbreak**



Non-infected cell



CPE of cell after 36 H PEDV infection and its monoclone straining





# 7 steps for control PED during an outbreak

## 4. Stimulate intestinal mucosa or humoral immune response

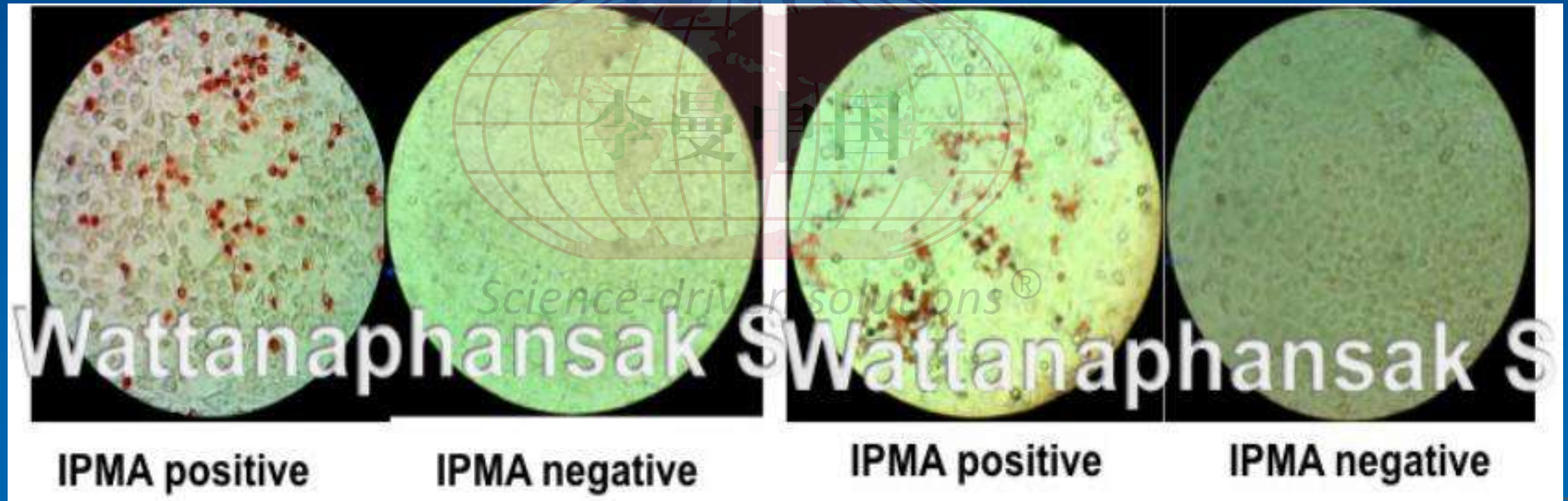


# 7 steps for control PED during an outbreak

- Detected IgA, IgG level in colostrum by using IPMA: Imuunoperoxidase monolayer assay, 1:30, 1:60, 1:120, 1:240, 1:480, 1:960

Serum IgG

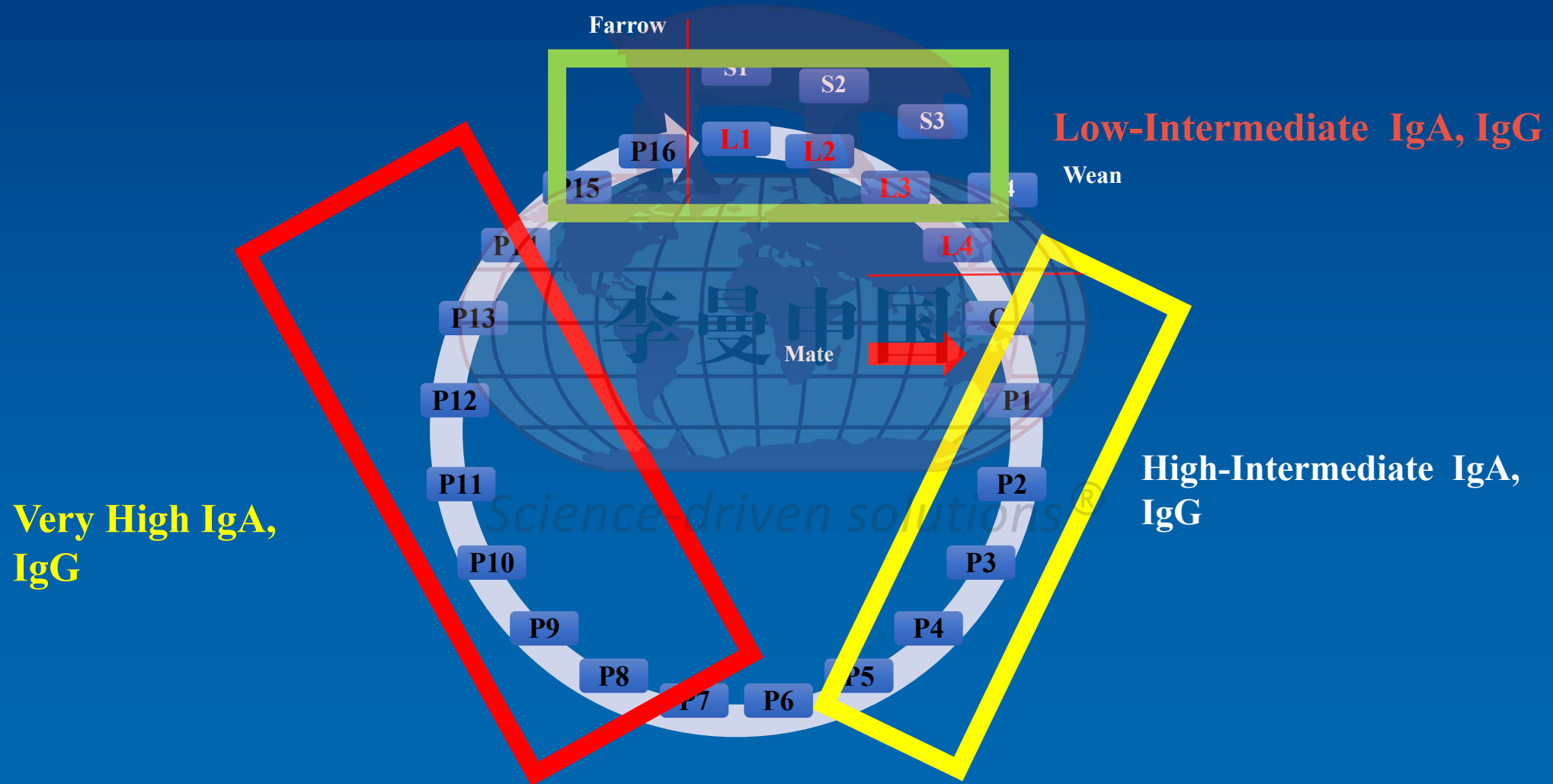
Colostrum IgA



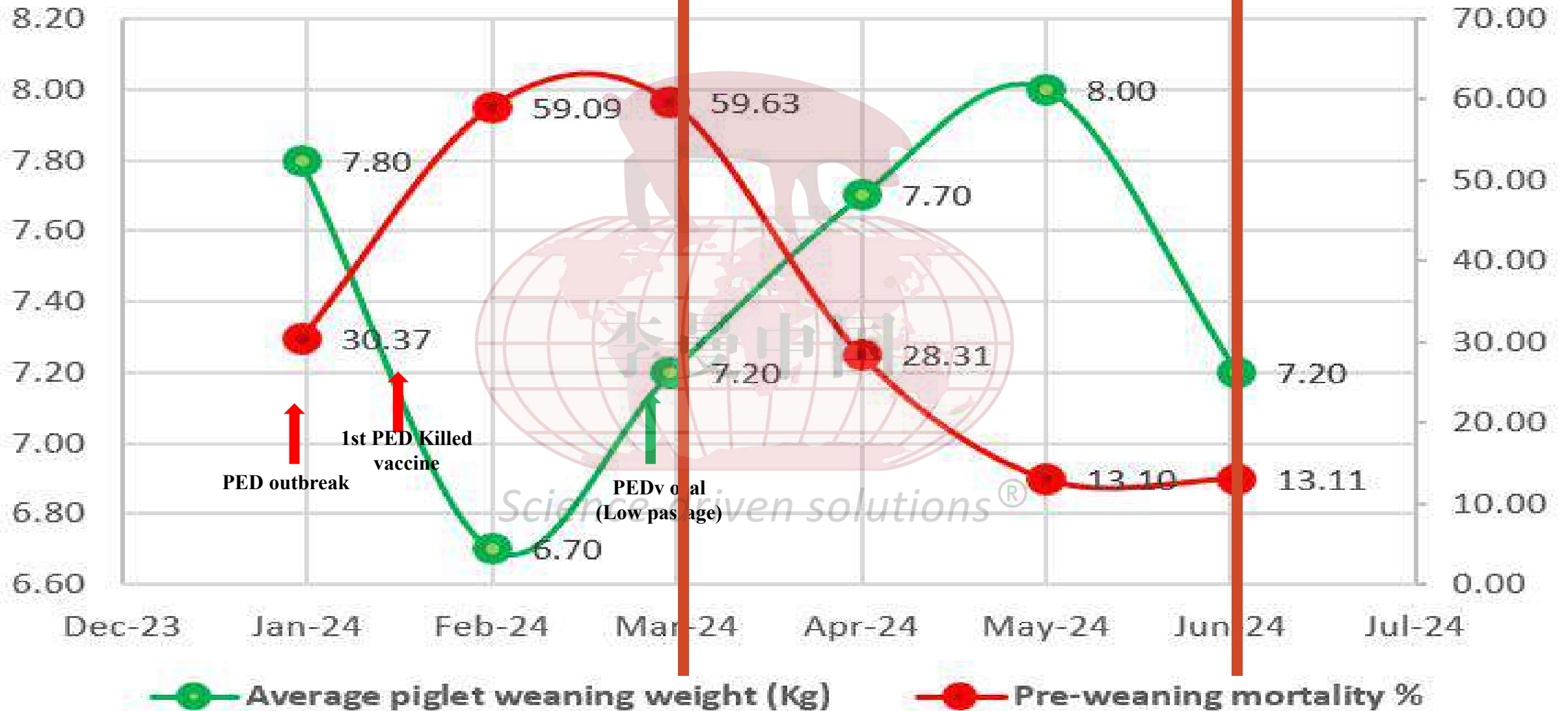


# 7 steps for control PED during an outbreak

Level of colostrum IgA, IgG after stimulate whole herds

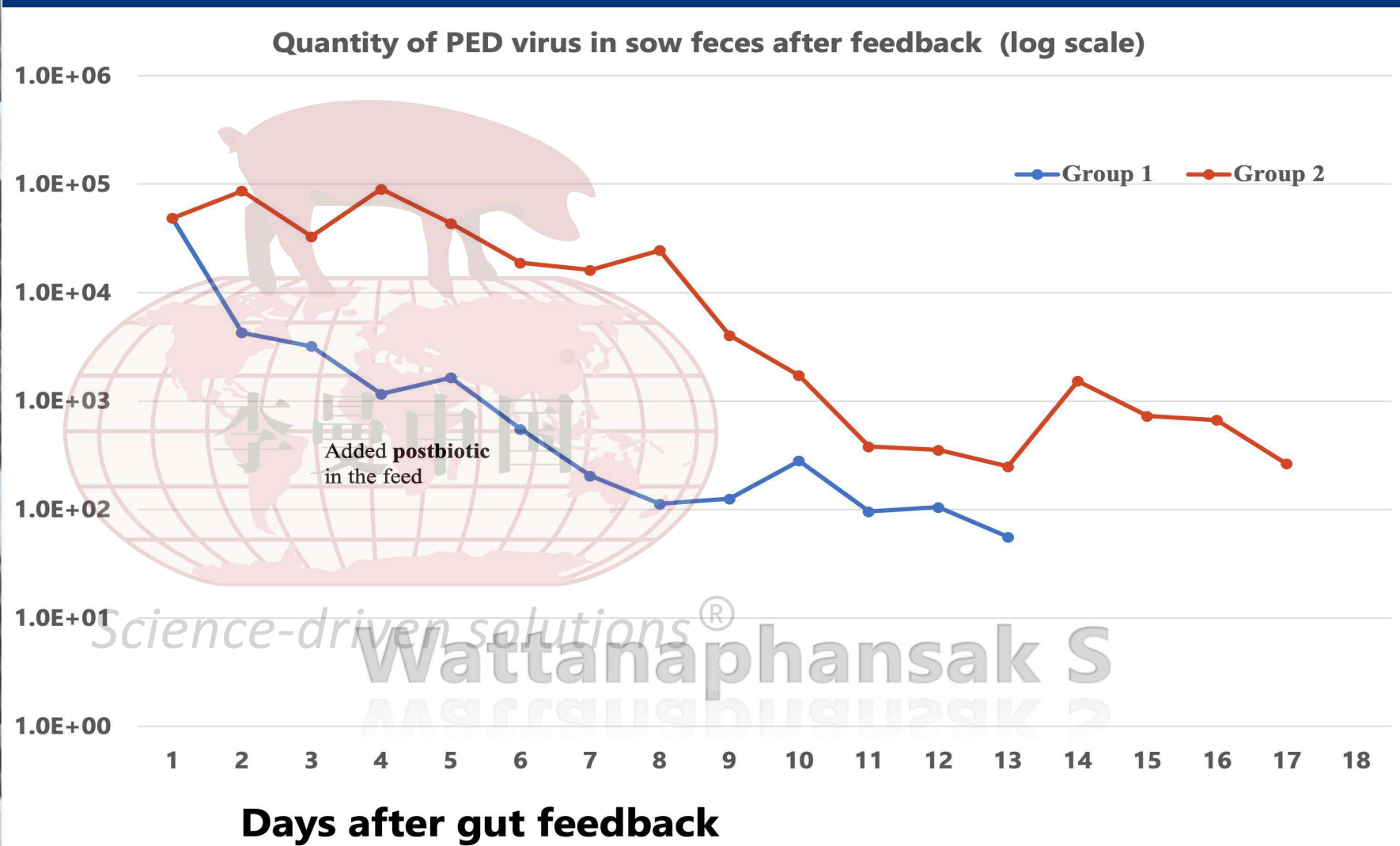


# 7 steps for control PED during an outbreak





# 7 steps for control PED during an outbreak



## 5. Collected the colostrum from sows/gilts after orally virus as much as possible “Magic milk”



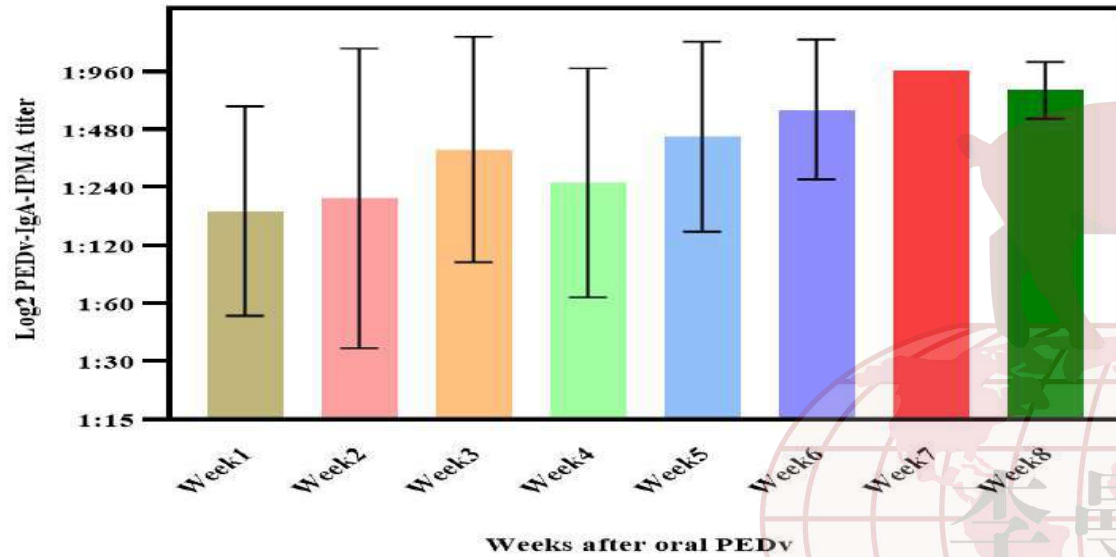
Wattanaphansak S

- Gave 10-15 cc/piglets at the first day of life, repeat 2-3 times, the more the better

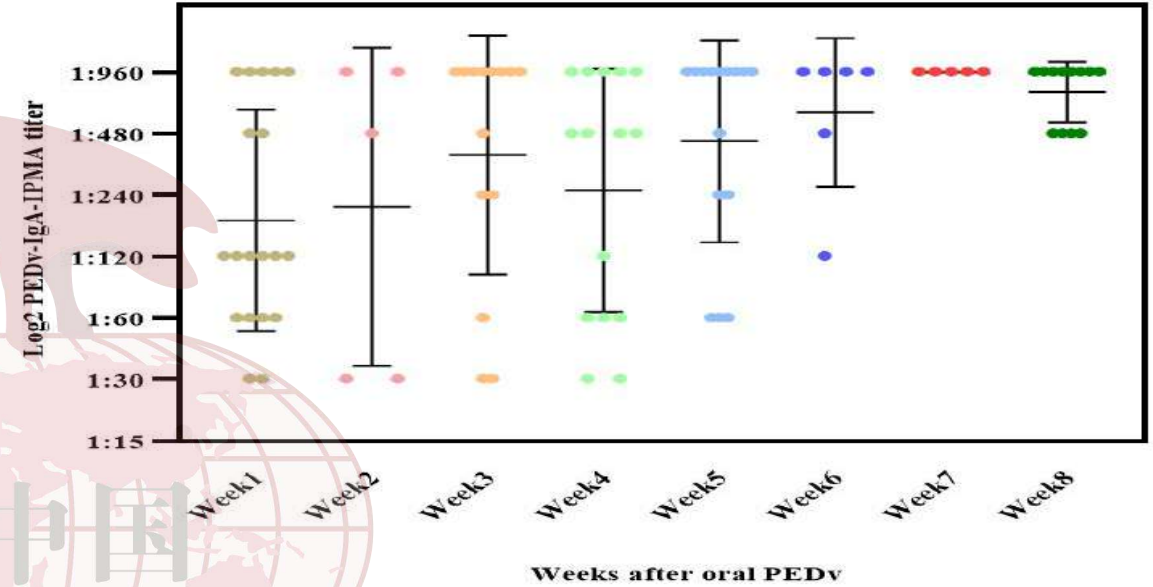


# Level of IgA and IgG in colostrum after oral PEDV low passage

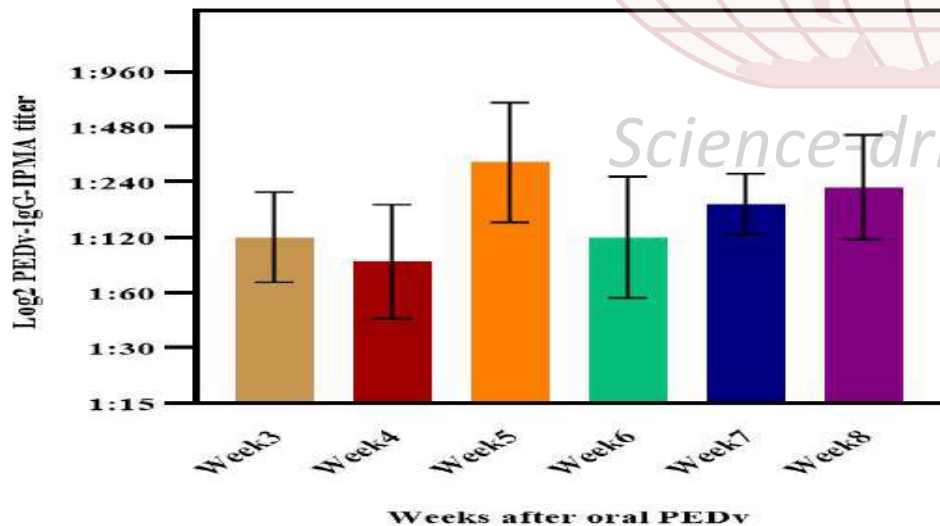
Ratio-Average IPMA-IgA-PEDV-Colostrum



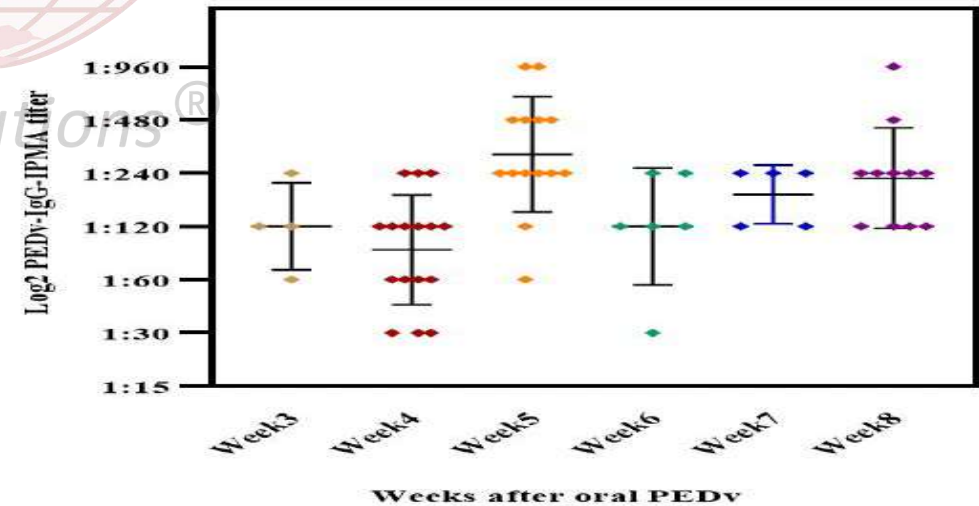
IPMA-IgA-PEDV-Colostrum



Average IPMA-IgG-PEDV-Colostrum

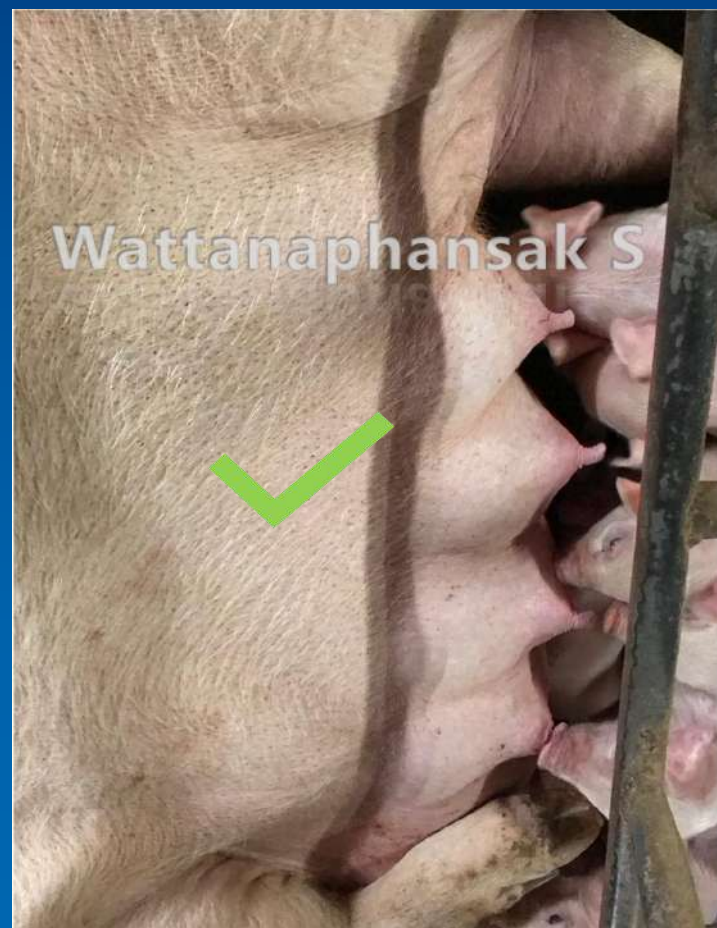


IPMA-IgG-PEDV-Colostrum



# 7 steps for control PED during an outbreak

6. Control Mastitis-Metritis-Agalactia (MMA) for prevent the 2<sup>nd</sup> outbreak due to piglets lacked or lose of the passive PED protective immunity





# 7 steps for control PED during an outbreak

## 7. Applied PED vaccines (If available) to sows/gilts 2 times before farrowing

- Modified live vaccine and killed vaccine alone: Both had GOOD and POOR results
- Route of administrations: IM, PO, IR
- Orally PED low passage should perform in gilts then maintained with vaccines (Killed or MLV) at 12 and 14 week of gestation
- Goal: increased and maintained IgA level in sows/gilts milk and colostrum

IgG immunity is poor protection

# PEDV outbreak in finisher pigs: what we should do ?

- PEDV in adults pigs, very low mortality, mainly effect ADG & FCR
- Making all pigs infect at the same time then:
  - Added high concentration of electrolyte and mineral
  - Virus shedding though feces at 14-21 days
  - powder disinfectant to eliminate virus outside the pig
  - Added Probiotic or Postbiotic in the feed to improve gut health





# Thank you



[Science-driven solutions®  
wsupot@shulane.th](mailto:wsupot@shulane.th)

[watta004@umn.edu](mailto:watta004@umn.edu)