



Chula
Chulalongkorn University



CUV#ET

Swine ileitis: the forbidden disease that caused of huge economic loss

Science-driven solutions[®]
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Before ASF Era: LI circulation problem in swine herds



After ASF Era: Ileitis or ASF

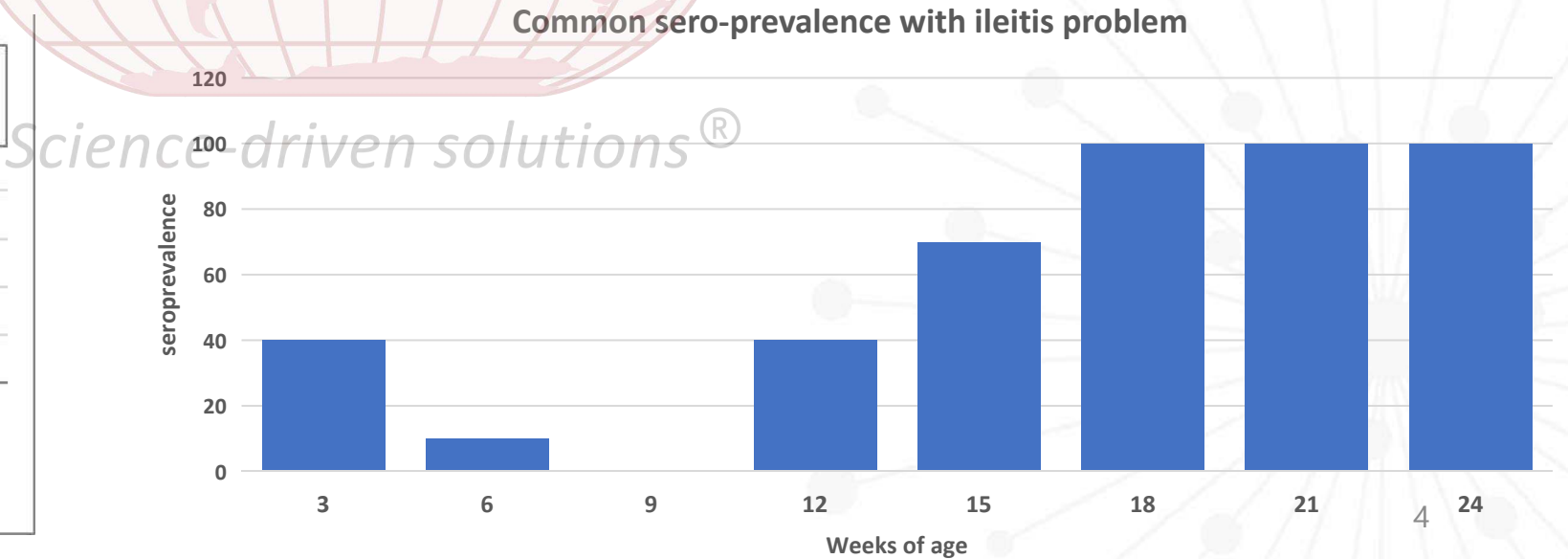
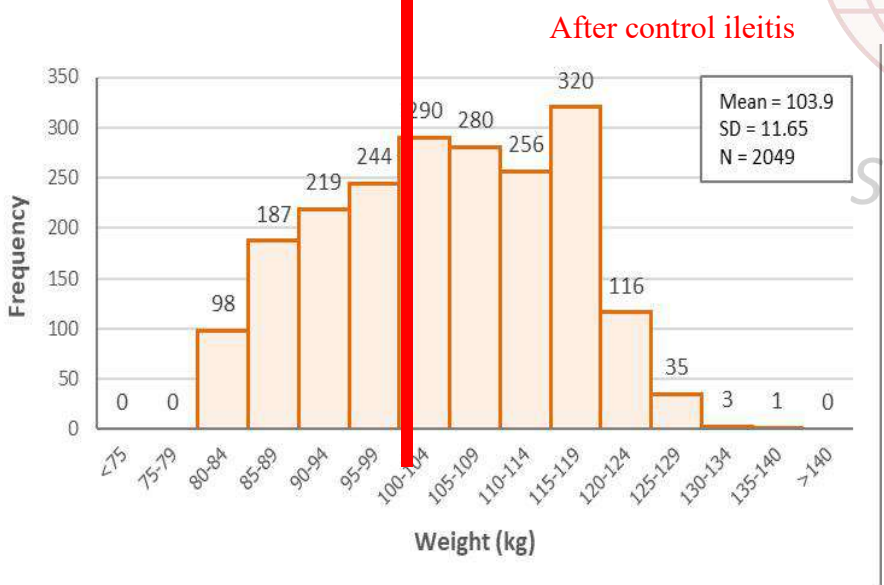
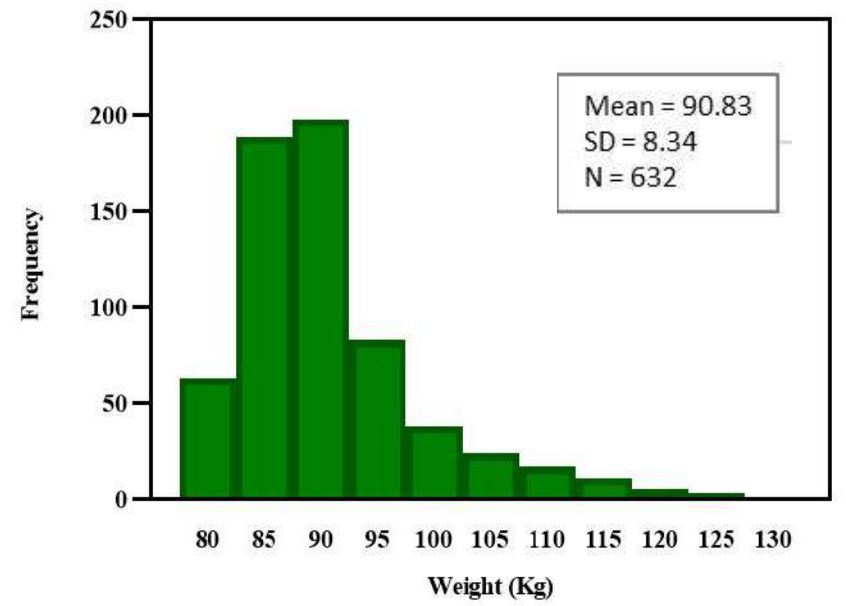
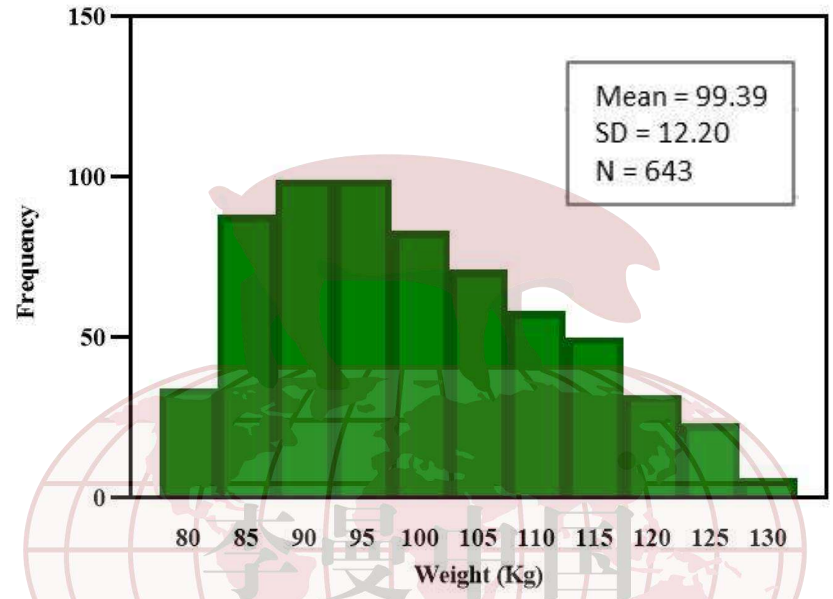
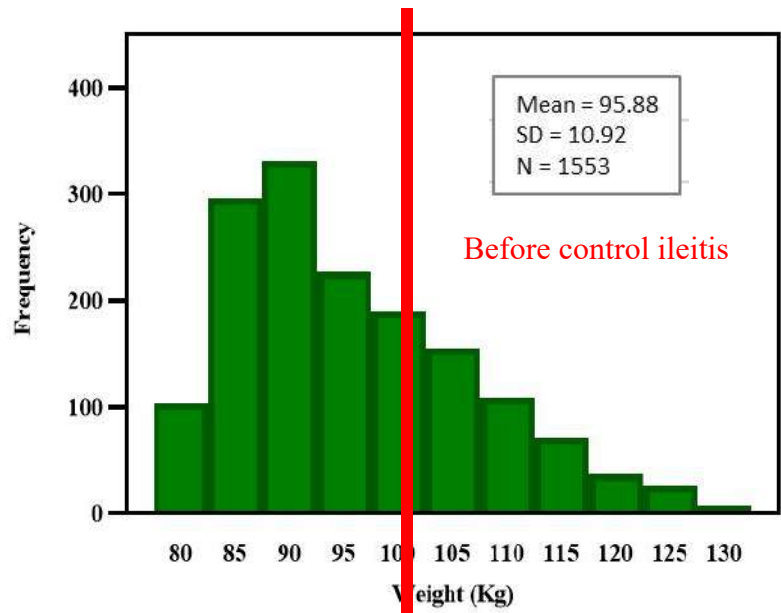


Wattanaphansak S

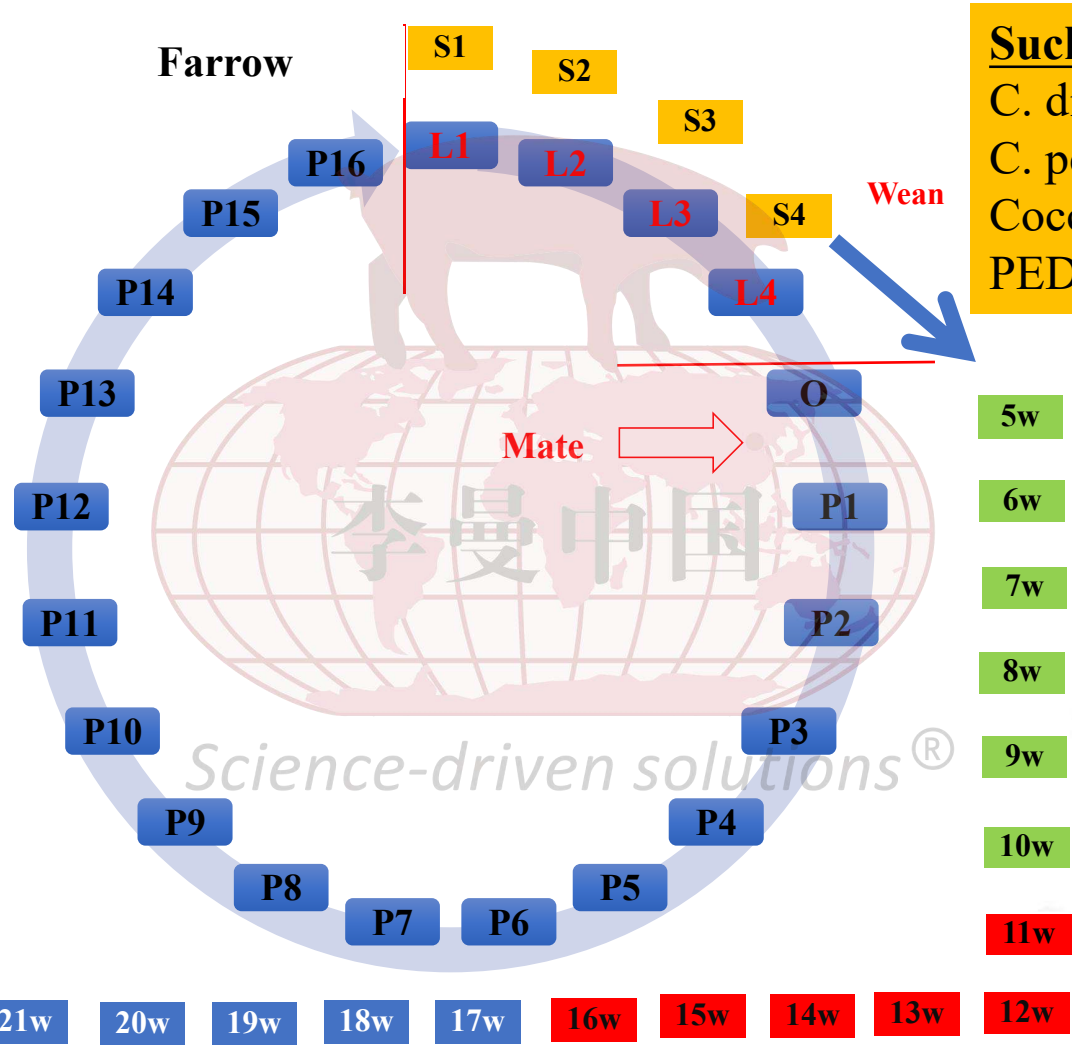


Wattanaphansak S

How do you know your farm have ileitis problem



Sows/gilts:
 PEDv
 TGEv
 Gastric Ulcer
Ileitis
 Swine dysentery
 Torsion



Suckling piglets:
 C. difficile, **Ileitis**
 C. perfringens
 Coccidiosis, E. coli
 PEDv, TGEv, ROTAv

Nursery pigs
 E. Coli
Ileitis
 B. hyodysenteriae
 TGEv, PEDv
 Trichuris

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

Proliferative enteropathy (PE)

- It is caused by *Lawsonia intracellularis*.

- Three forms of clinical signs in pigs

- Proliferative hemorrhagic enteropathy (PHE)

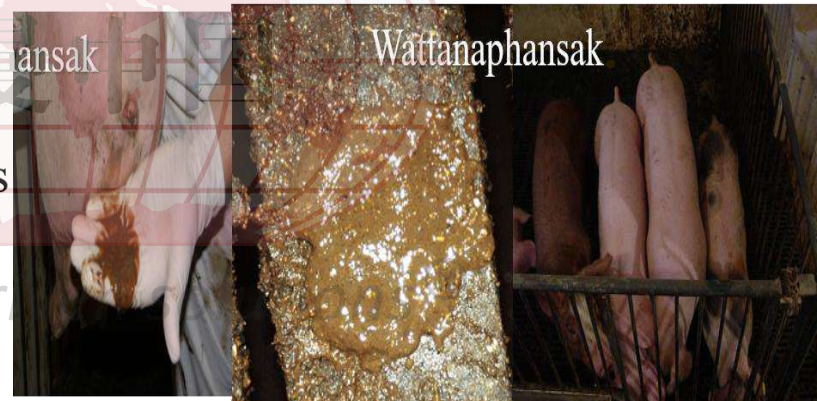
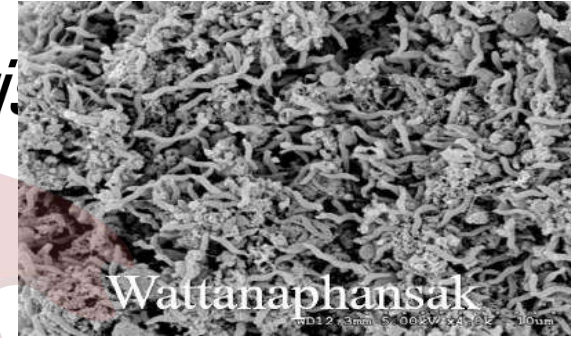
- Acute form
- Bloody diarrhea
- Sudden death in adult pigs

- Porcine intestinal adenomatosis (PIA)

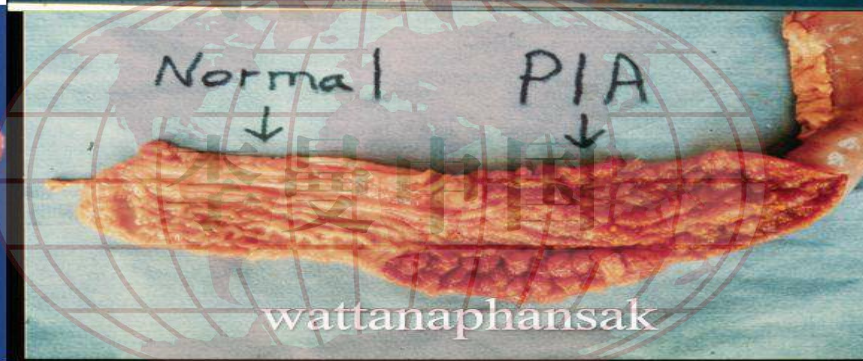
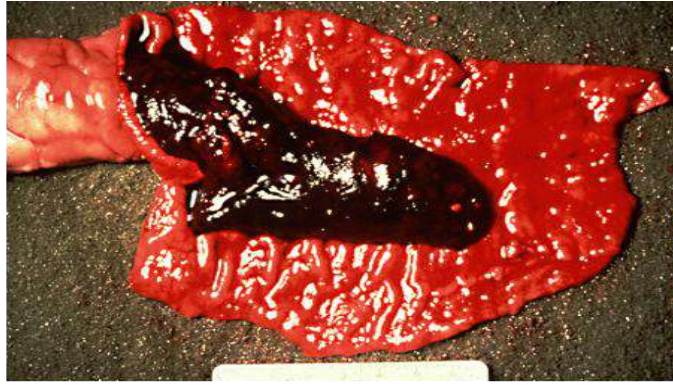
- Chronic form: Usually found in younger pigs
- Chronic diarrhea
- Abnormal proliferation of small intestine

- Subclinical ileitis

- Slow growth
- No sign of diarrhea or not detectable
- Gross lesions: not easily to recognize



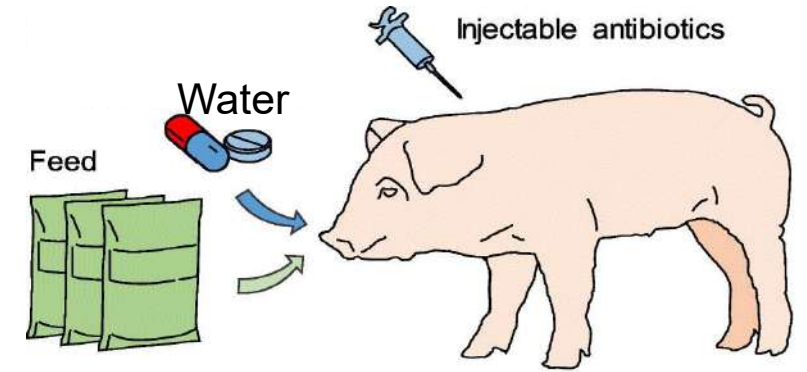
Proliferative enteropathy (PE)



Disease	Diagnostic methods	Organs
Ileitis	<ol style="list-style-type: none"> 1. Bacterial culture (Not practical) 2. PCR: conventional or real-time PCR 3. Immunohistochemistry 4. Serological assay: IPMA, IFAT, ELISA 	Small intestine especially Ileum, feces

Treatment and control of PE

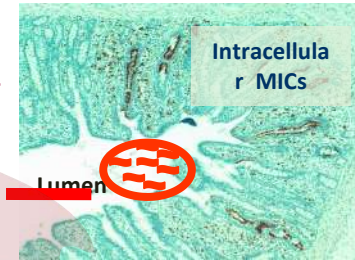
- Antimicrobials therapy- Clear bacteria inside pigs
 - Feed antimicrobials
 - Water antimicrobials
 - Injectable antimicrobials
- Vaccinations-modified live/killed vaccine-active antibody
- Gut homogenate/ pure culture inoculum+antimicrobials
- Nutrition management: passive egg antibodies/ Pre, Pro, Postbiotics, immune stimulant feed supplements- improved gut health, reduced bacterial shedding and lesion
- Biosecurity and Disinfections- Clear bacteria in the environment



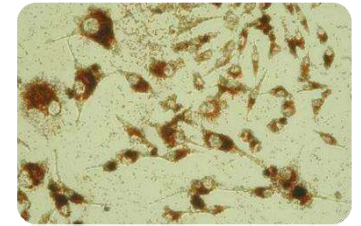
Conducted antemortem diagnostic: qPCR or serology tests

Control ileitis with Antimicrobials

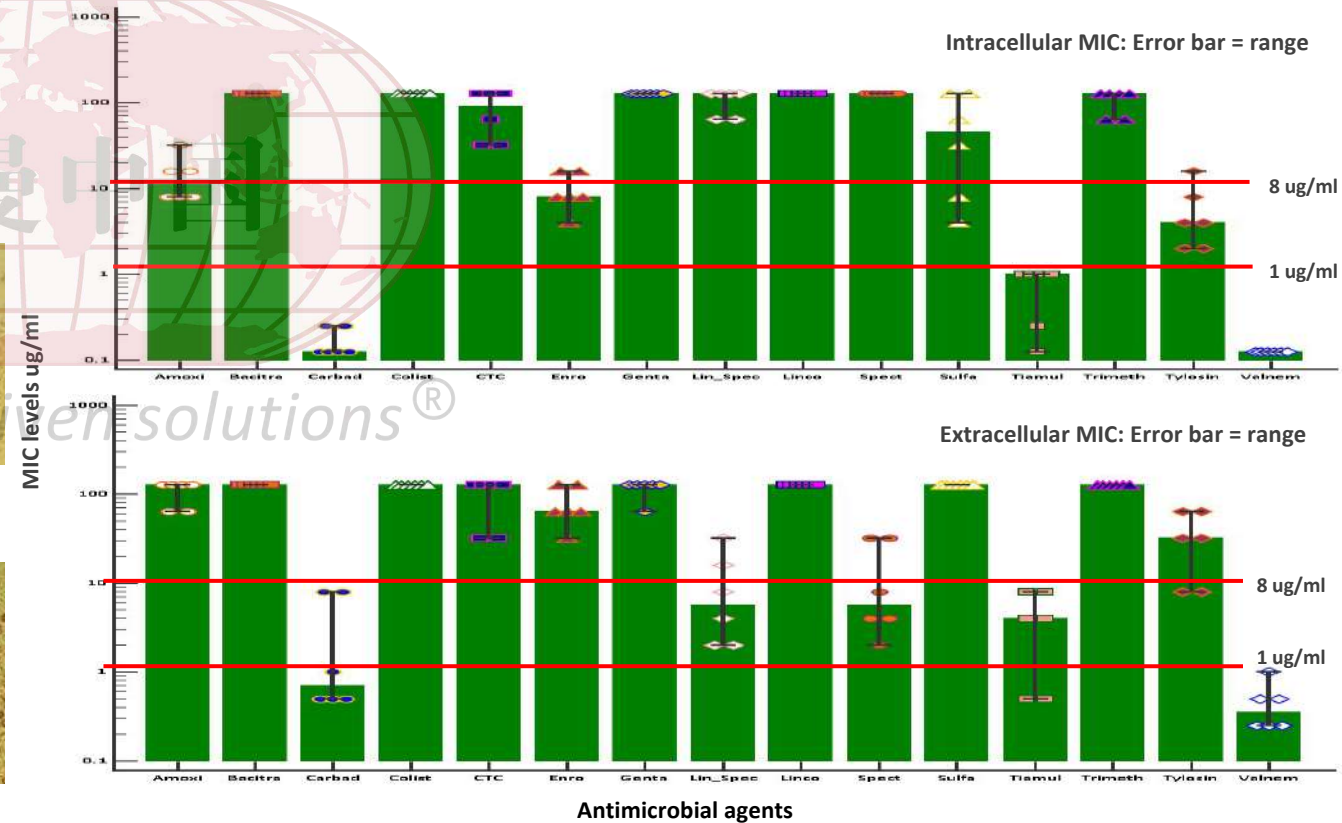
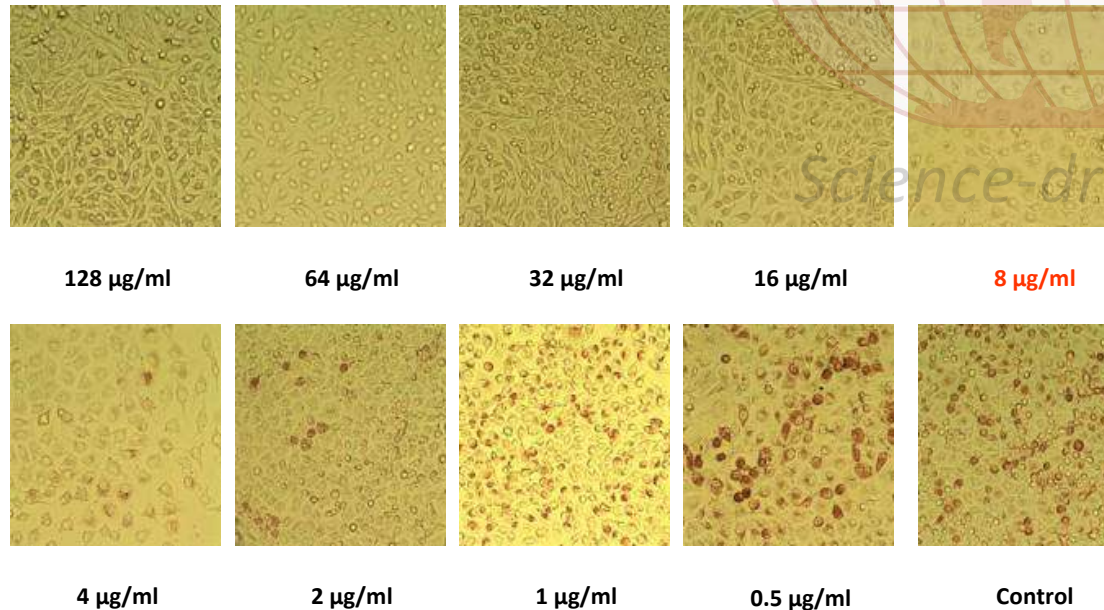
- MICs = the lowest concentration that inhibited 99% of LI growth indicated by Extracellular MICs heavily infected cells (HIC), compared to the untreated controls
- Extracellular MICs = the effect of antimicrobial on LI prior to infection of intestinal cells
- Intracellular MICs = the effect of antimicrobial on LI after infecting the intestinal cells



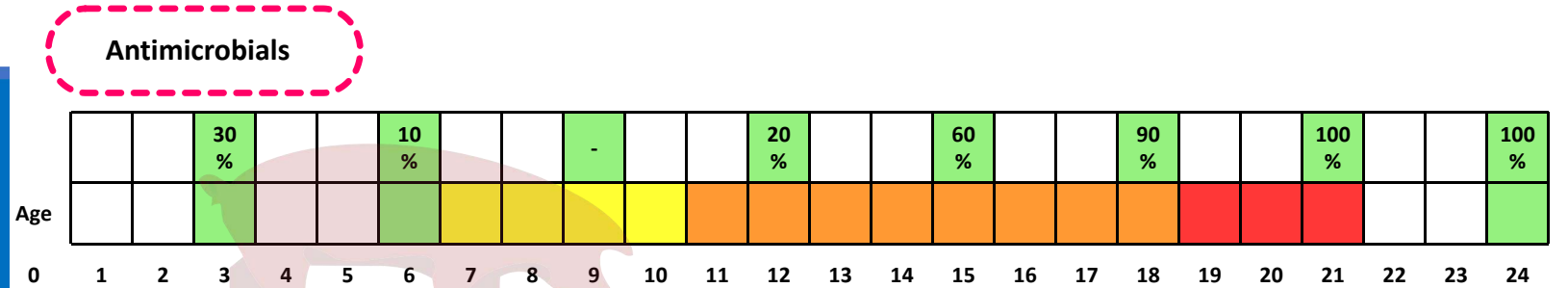
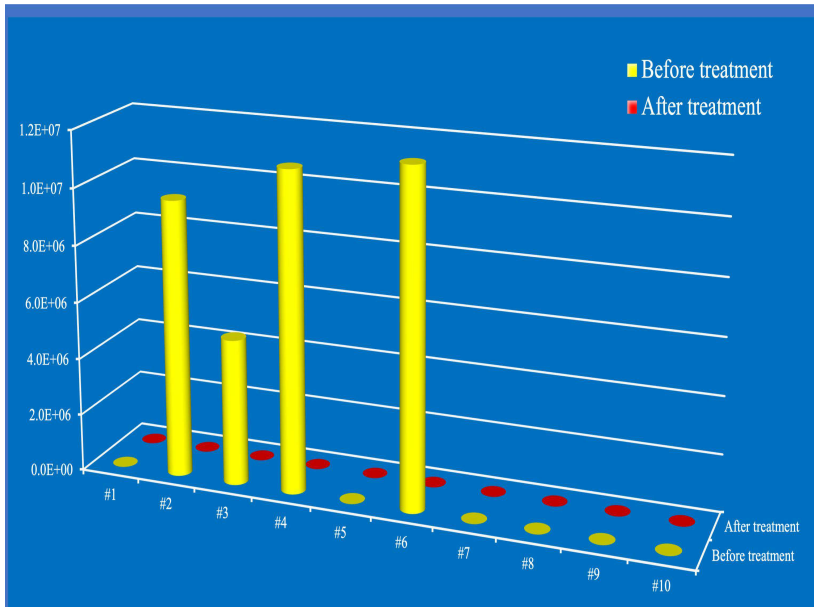
Uninfected cells






Heavily infected cells



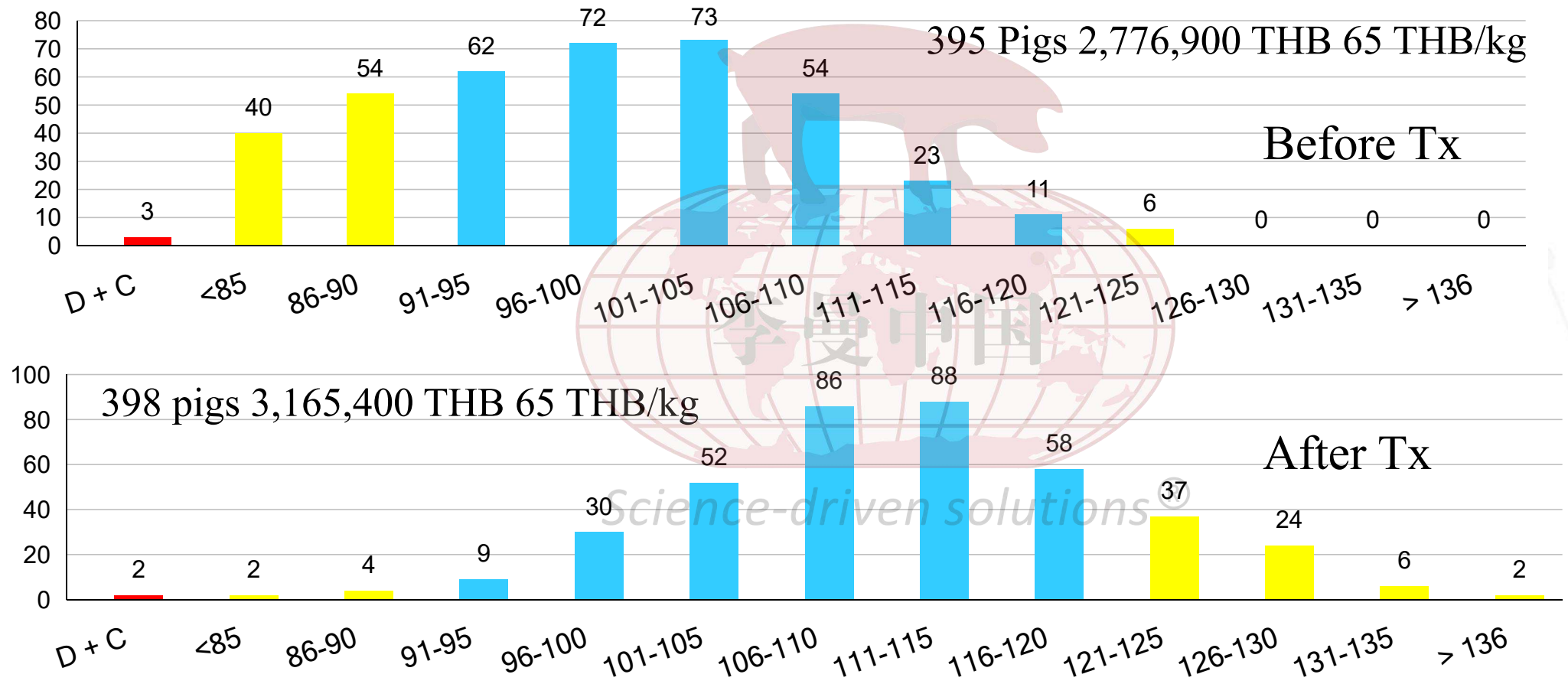
Control ileitis with Antimicrobials



-  **Early treatment, no immune responded, reinfection occurs**
-  **Balance infected animals, immune response developed, less proportion of reinfection**
-  **Too late treatment, animal suffer from clinical signs, less proportion of reinfection**

- Rapid action, using during an outbreak
- Select right antimicrobials at the right time
- Antimicrobials changed dynamic of infection
- Each strain of Li have their own antimicrobial susceptible pattern

Frequency of weight out of finisher pigs before and after control ileitis with tylosin

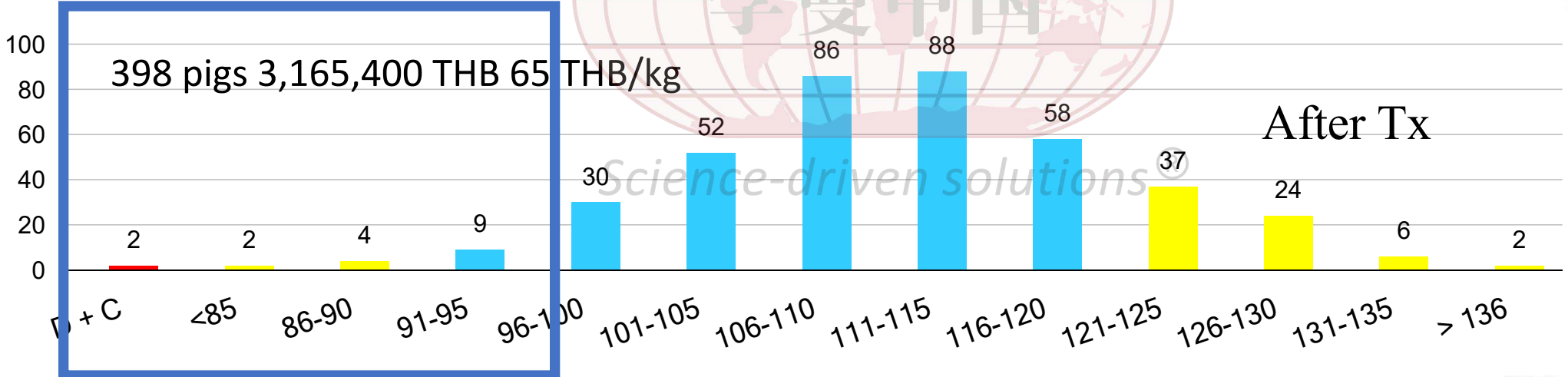
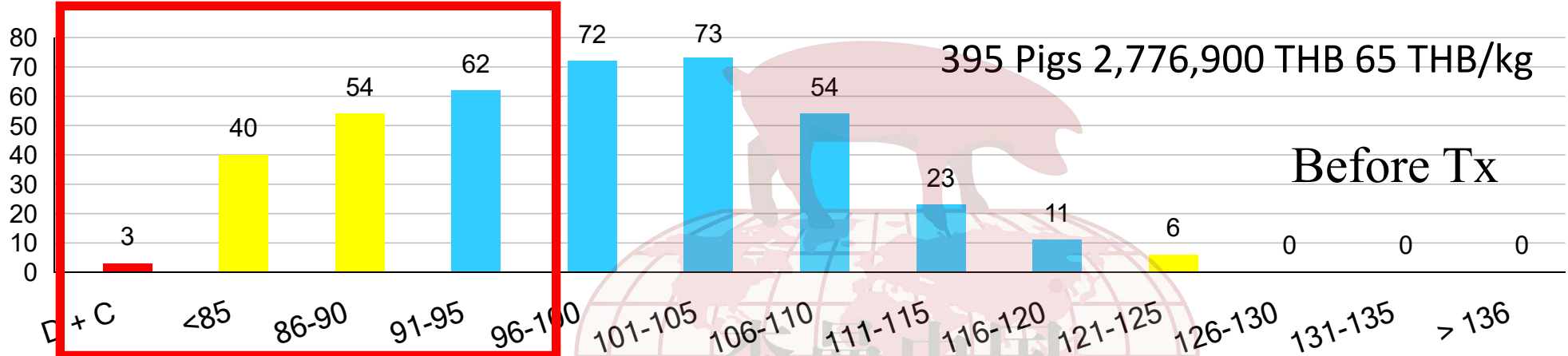


+388,500 THB
Cost of AB in Feed
35,000 THB

- Improved growth performances, ADG **↑** FCR **↓**

Frequency of weight out of finisher pigs before and after control ileitis with tylosin

Reduced light weight pigs 39.25%

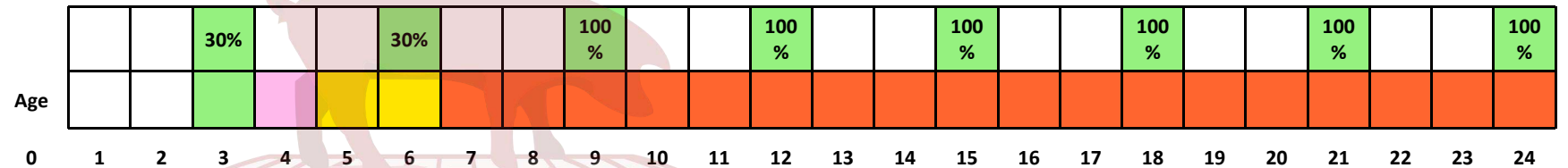





+388,500 THB
Cost of AB in Feed
35,000 THB

- Improved growth performances, ADG \uparrow FCR \downarrow

Control ileitis with gut homogenate/Li pure culture+ antimicrobials

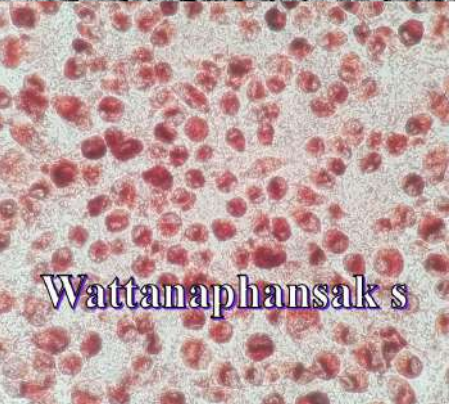
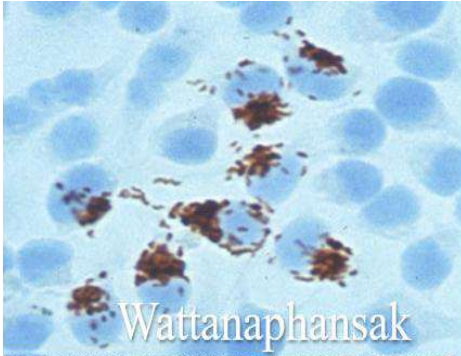
Gut Homogenate/Pure culture challenge + antimicrobials



-  Inoculated with pure culture, or gut homogenate
-  Treatment with antimicrobials for 2-3 weeks
-  Local immunity developed, no reinfection occurs

Caution ***

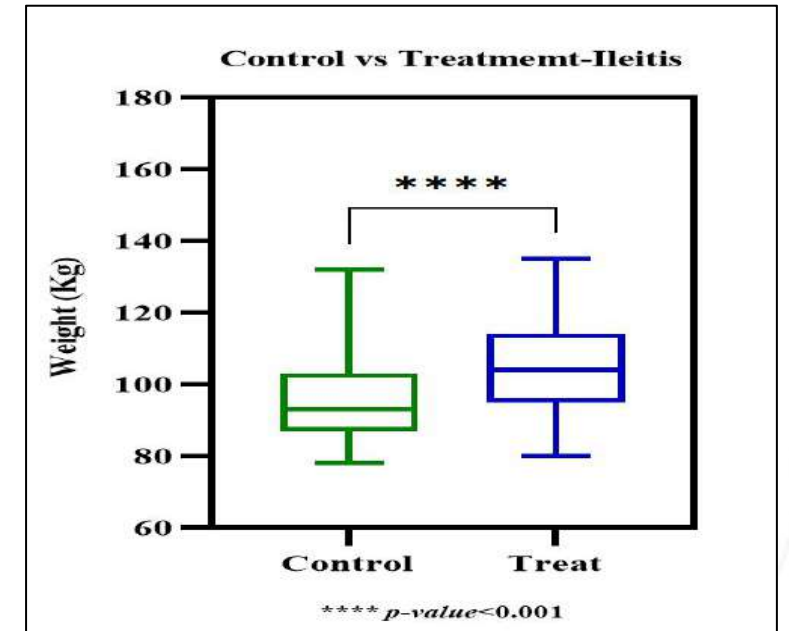
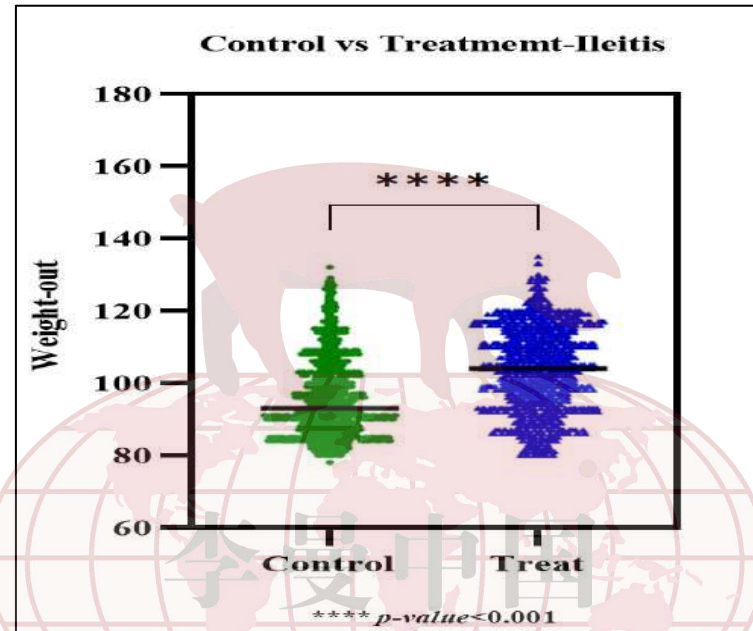
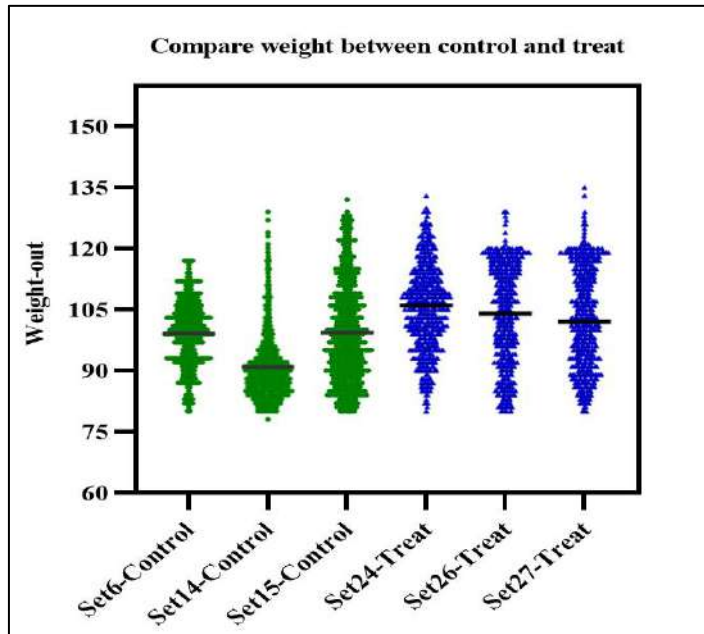
- Gut-homogenate can contain other pathogens that the selected antimicrobials can not eliminated
- After ASF era, gut homogenate inoculum will have high risk for ASF outbreak
- Li pure culture still virulence, it needs susceptible antimicrobials control bacterial propagation



Control ileitis with gut homogenate/Li pure culture+ antimicrobials



Control ileitis with gut homogenate/Li pure culture+ antimicrobials



Group		Mean of Weight (kg)	SD of Weight	No. of pigs	Value pigs at 65THB/kg live pig	Value/pig	Value improve/pig THB	Total value improve after control ileitis THB
Control	Set 6	99.25	8.13	278	1,793,448	6,451.25		
	Set 14	90.83	8.34	632	3,731,296	5,903.95		
	Set 15	99.39	12.20	643	4,154,005	6,460.35		
	Total	95.88	10.92	1553	9,678,607	6,232.20	521.30 = 112 CNY	1,068,143.70
Treatment	Set 24	105.22	10.31	694	4,746,474	6,839.30		= 229,215 CNY
	Set 26	103.69	12.44	613	4,131,528	6,739.85		
	Set 27	102.84	12.05	742	4,959,973	6,684.60		
	Total	103.9	11.65	2049	13,837,922	6,753.50		

- Only one live attenuated and only one killed vaccine commercially available

- **Live-attenuated vaccine:**

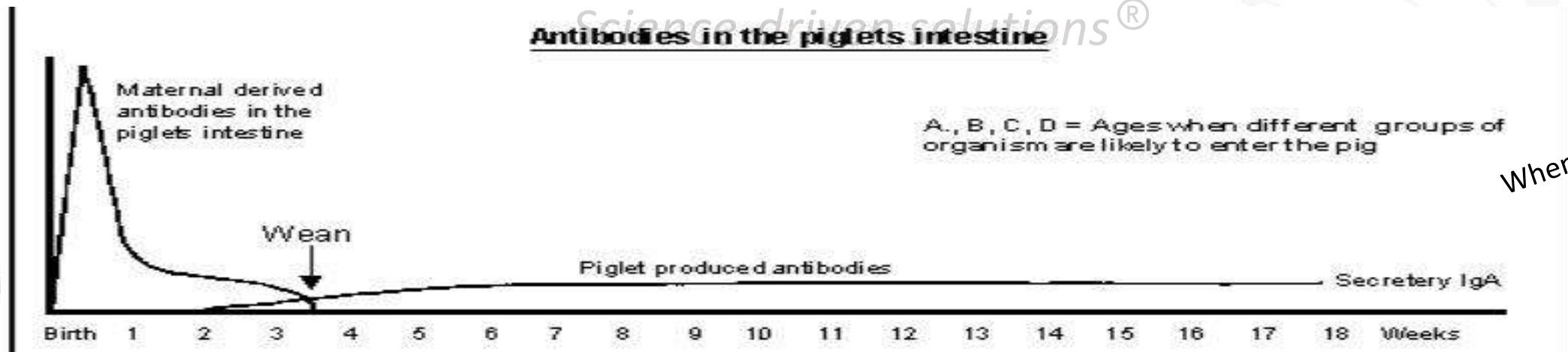
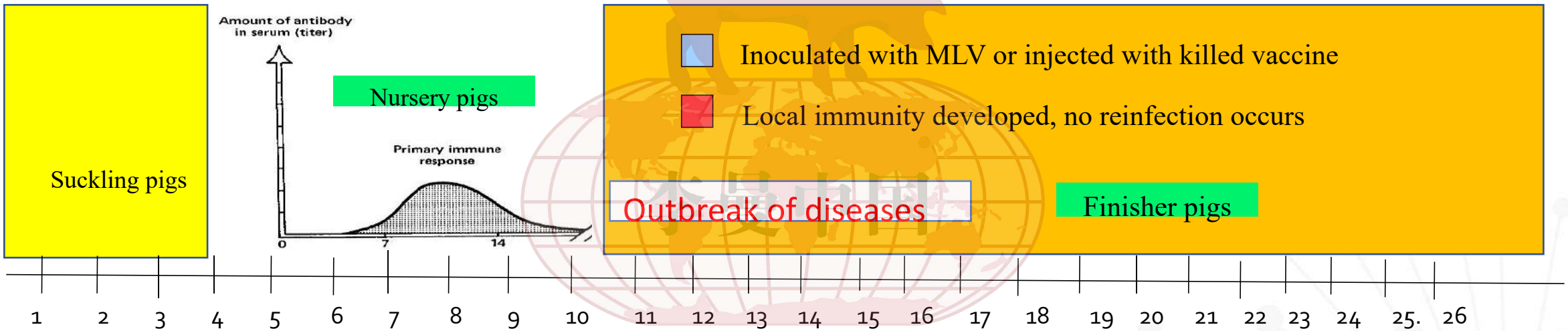
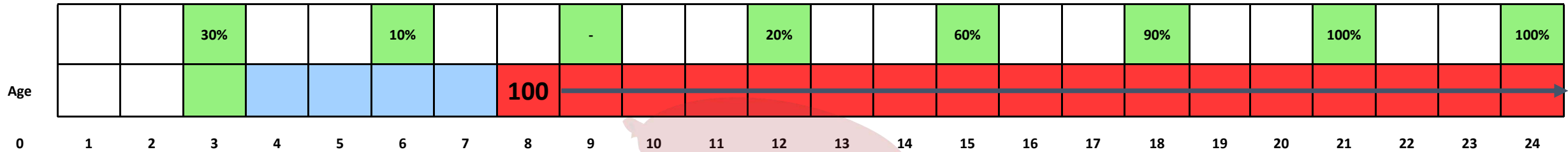
- Stimulate both humoral and cellular immune responses
- Only one time orally vaccinated long-lasting protection against the disease
- Protection against PPE-reduce weight loss, fecal shedding, mortality, and clinical signs
- Recommended at least 3 weeks before natural infection
- Required antibiotic free during vaccination, 5 days before and 7 days after vaccinated

- **Inactivated vaccine**

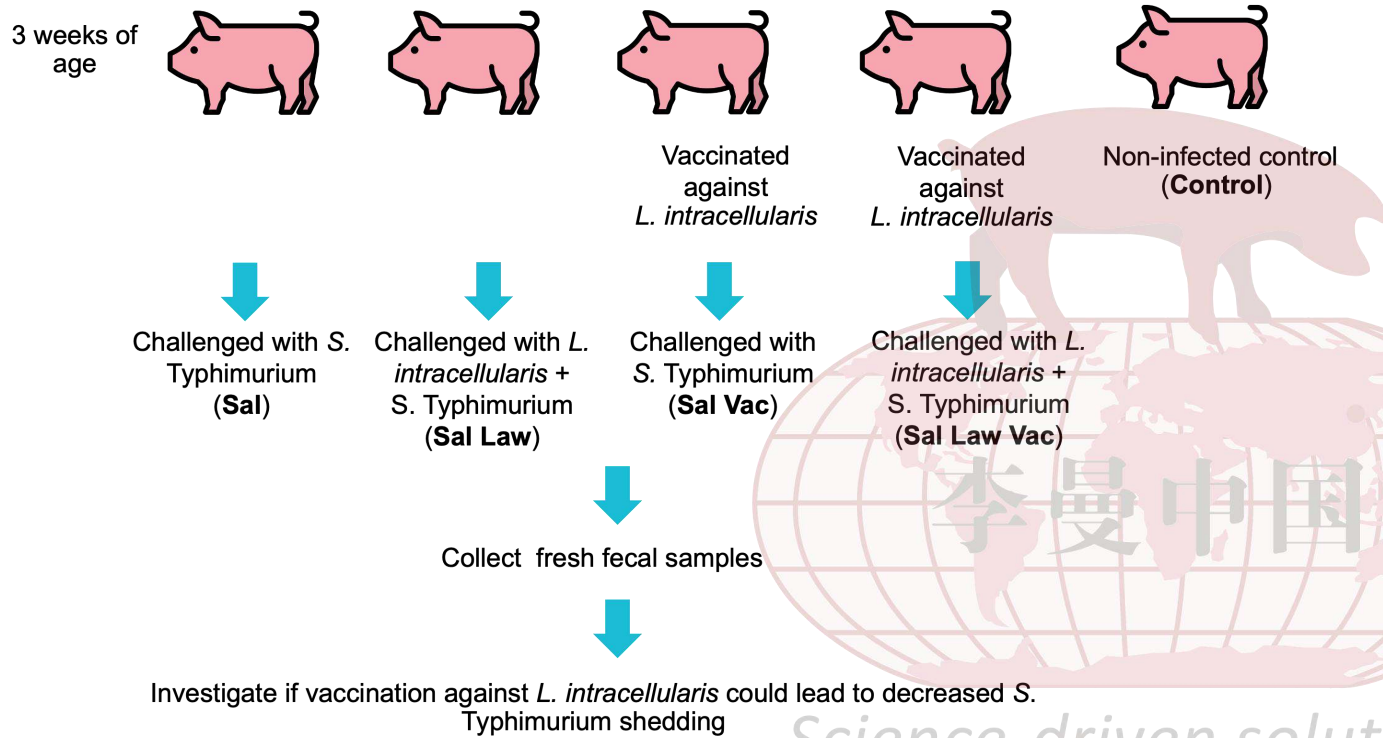
- Stimulate mainly humoral immune response,
- Require 1-2 time vaccinations to achieve and maintain immunity
- Reduced clinical signs, and improved production performances
- The vaccine can be used in the present of antibiotic
- Recommend vaccinated at least 3 weeks before natural infection

Science-driven solutions®

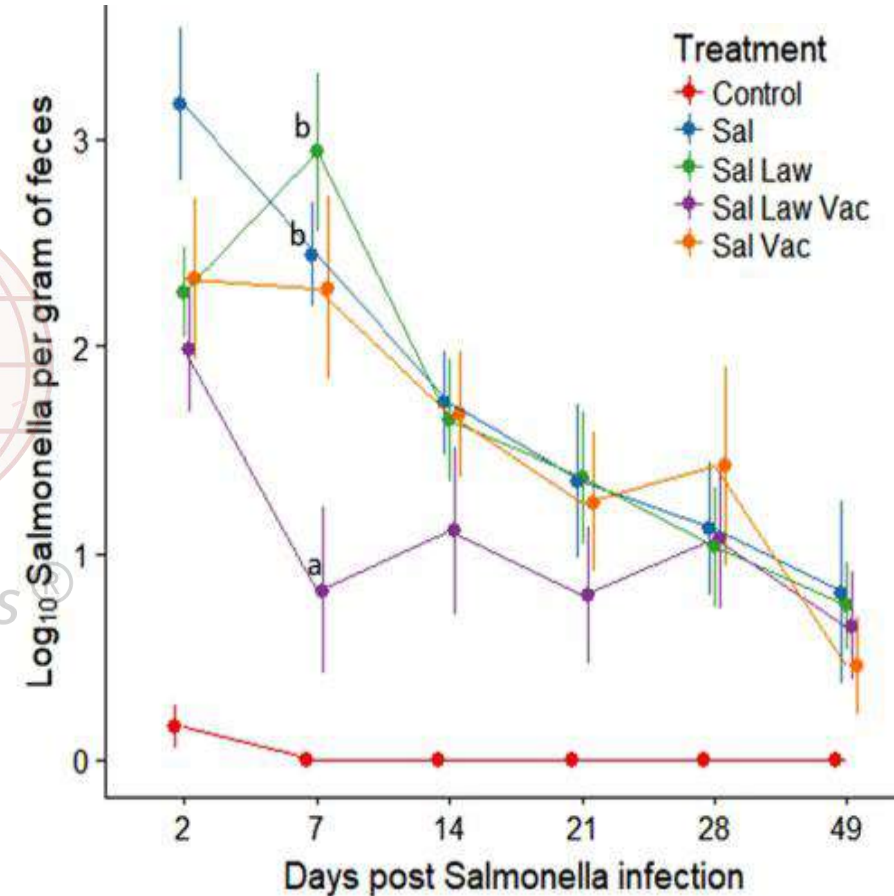
Vaccination program for ileitis vaccines in pigs



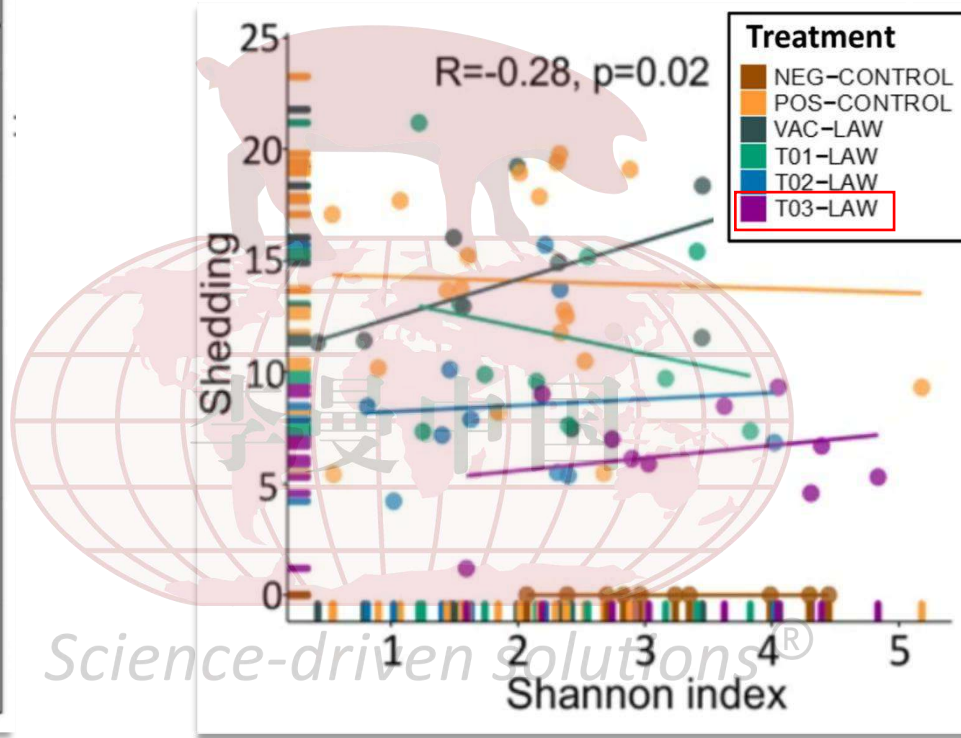
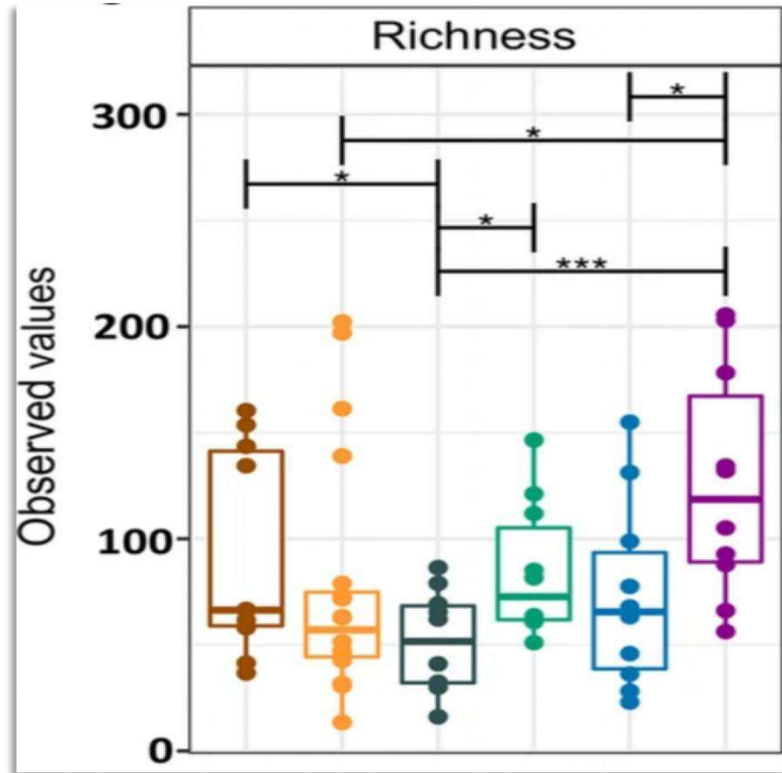
When is the right time to vaccinate?



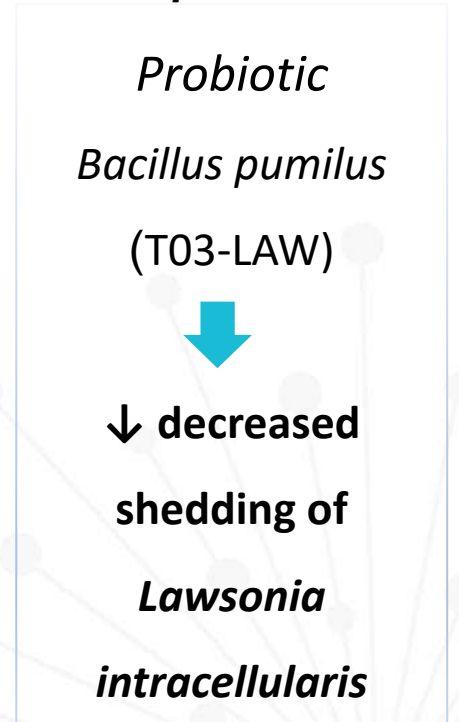
- Vaccination against *L. intracellularis* decreased *S. Typhimurium* shedding
- Vaccination against *L. intracellularis* may be used as a tool to prevent foodborne diseases associated with *Salmonella*



Bacillus pumilus reduce shedding of *L. intracellularis*



T01-LAW = *B. amyloliquefaciens*
T02-LAW = *B. licheniformis*
T03-LAW = *B. pumilus*

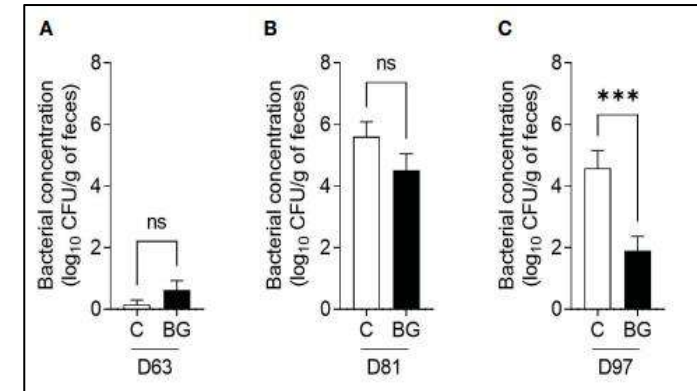


- Feeding with *Bacillus pumilus* (T03-LAW): ↑ microbiota diversity, highest richness
- T03-LAW: ↓ levels of shedding of *L. intracellularis*
- ↑ diversity of ileal microbiota → ↓ shedding (2.8 log)

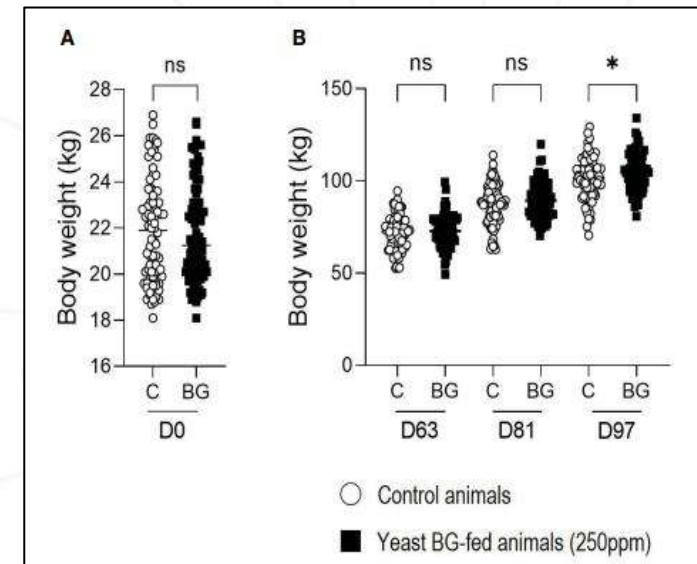
B-glucans against *Lawsonia intracellularis*

- ✓ **Immunomodulatory effects:** Stimulate the innate immune system, enhancing the activity of immune cells
- ✓ **Reduced disease severity:** milder symptoms and reduced tissue damage associated with *L. intracellularis*
- ✓ **Enhanced gut health:** Promote the growth of beneficial gut microbiota that is less conducive to *L. intracellularis* colonization and proliferation
- ✓ **Potential productivity benefits:**
 - Maintain optimal growth performance and feed efficiency in finishing pigs
 - Improve productivity outcomes

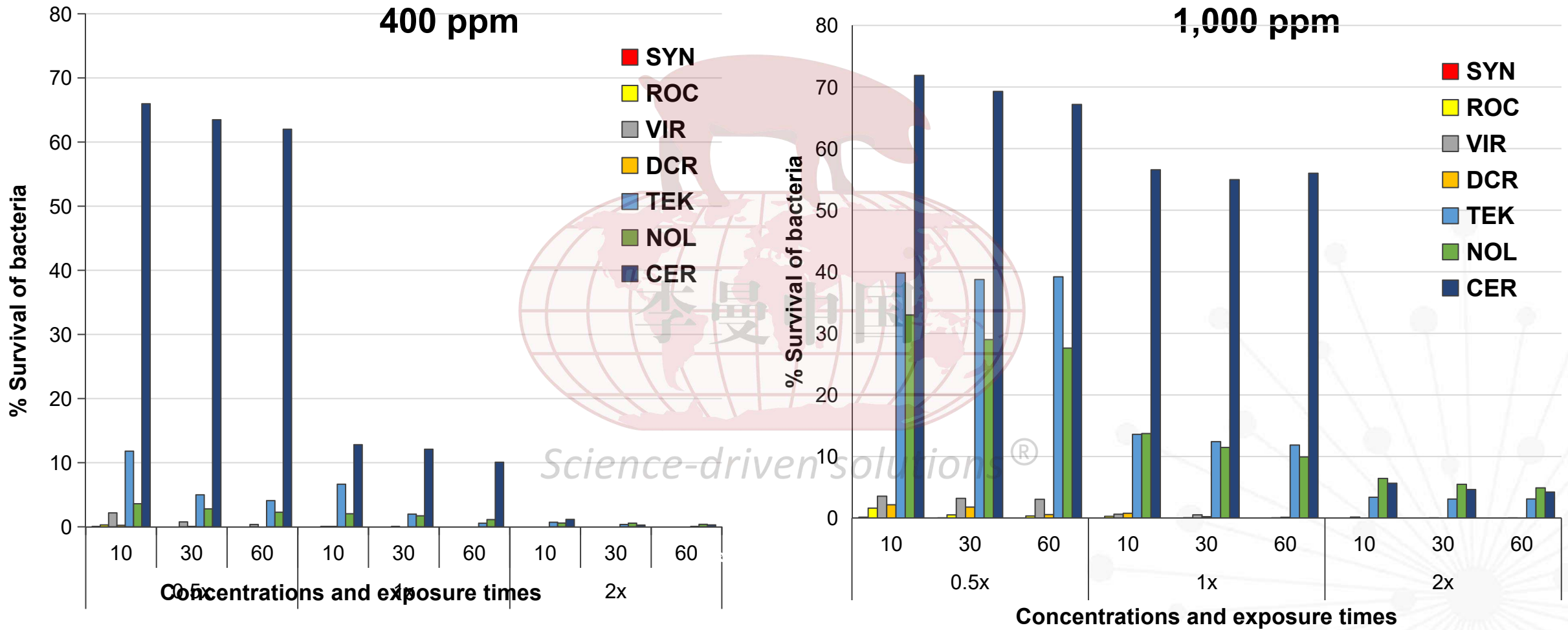
The shedding of *L. intracellularis* is reduced in the group of yeast BG-fed pigs.



Supplementation in yeast BG increases the average body weight (BW) of fattening pigs



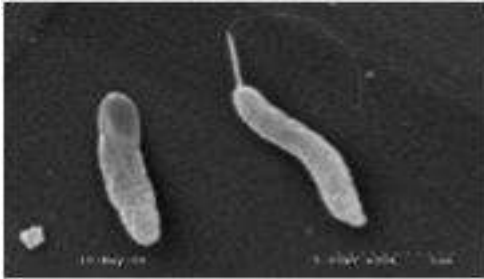
Control ileitis with biosecurity and disinfections



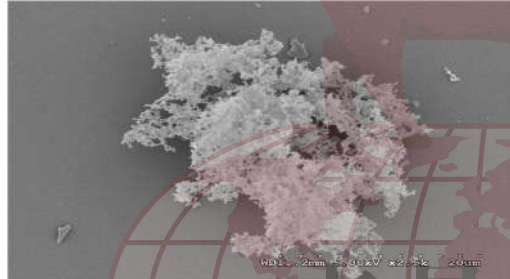
The effectiveness of 7 disinfectants against **PHE/MN1-00** at CaCO₃ 400 ppm (A) and 1000 ppm (B) (Wattanaphansak et al, 2010)

Control ileitis with biosecurity and disinfections

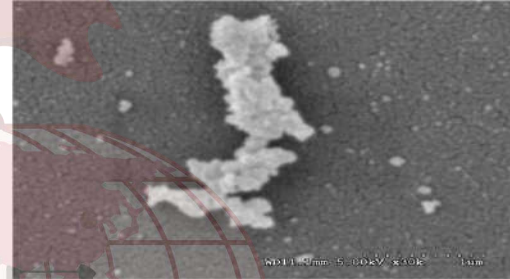
Scanning electron micrograph of LI after exposure to disinfectant for 10 min



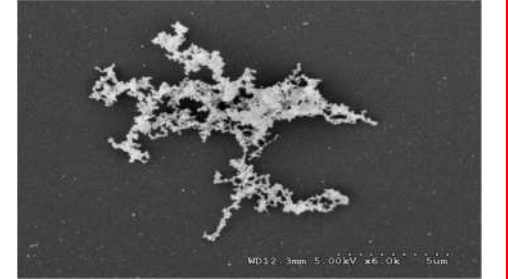
Control



Glutaraldehyde + QAC



QAC



Peroxygens



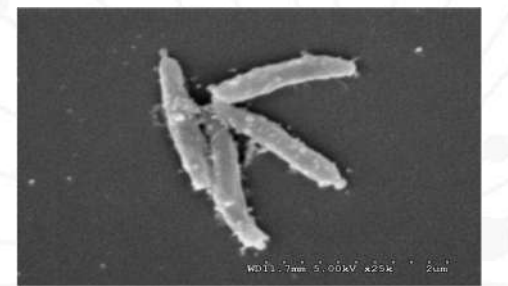
Formaldehyde + QAC



Phenols





Iodine



Chlorhexidine

Control with antimicrobials Vs vaccines

- Applied antemortem tests to identify time of infection
 - To select the best time for using antimicrobials
 - Making decision on which antimicrobials will be used (available in each region, cost, dosages)
 - Goal: pig developed natural immunity after antimicrobials removal
 - Continuous using of antimicrobials, natural immunity will not develop  reinfection occurs
 - Use of antimicrobials changes the dynamics of infection
 - Applied antemortem tests to identify time of infection
 - To select the best time for using the vaccine
 - Making decision on which vaccine will be used
 - Goal: pig developed 100% herd immunity after vaccination, IgA, IgG- no reinfection occurs
 - Aware antimicrobials and chlorine used during MLV vaccination but killed vaccine can be used with antimicrobials
- 

		30%			10%			-			20%			60%			90%			100%						
WK 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25.	26.
Day 0	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168	175	182

X=115 kg

Weaned weight at 4 weeks of age = 7 kg

Finisher weight at 26 weeks of age =110 kg

day of raising pigs=154 days

$ADG=115-7/154 =701.2$

ADG<700 “ The lower ADG, ileitis is highly suspected ”

WK 0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24		
Day 0	7	14	21	28	35	42	49	56	63	70	77	84	91	98	105	112	119	126	133	140	147	154	161	168		

Tx with antimicrobials & vaccines

X=115 kg

Weaned weight at 4 weeks of age = 7 kg

Finisher weight at 24 weeks of age =115 kg

day of raising pigs=140 days

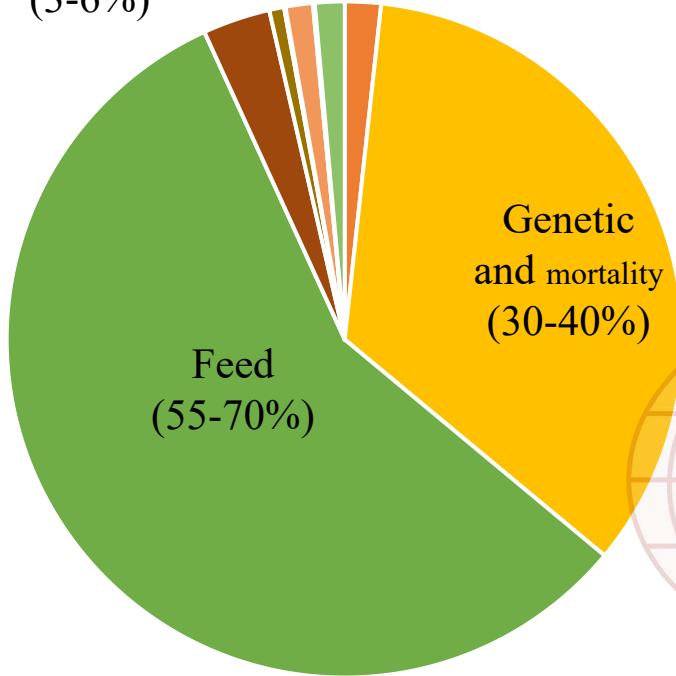
$ADG=115-7/140 =735.7$

ADG>771.4 “ The ADG is improved and ileitis is under controlled ”

14 days save feeding cost (14x10.3CNY/day=144.2CNY/pig x 100,000 pigs/month = 14,420,000 CNY/month

How much you can save ???

Vaccine+Antibiotic
(3-6%)



Feed cost/day = 3.43 CNY/kg x 3 kg = 10.29 CNY/day

Feed cost/14 day = 10.29 CNY X 14 = 144.06 CNY/pig

100,000 pigs/month = 14,406,000 CNY/month. Saving HUGE money!!!

Cost of : commercial ileitis vaccines
Antimicrobials
Pure culture Li+AB
Disinfectants
Supplements

2,680,000 CNY/month for
100,000 pigs

ROI > 5.37

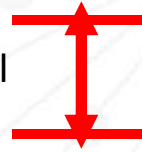
Profit: performances
and money

Science-driven solutions®

Having ileitis but not
spend money for control

Profit: performances
and money

Cost of ileitis control





Thank You

Science-driven solutions[®]

