197 - Supplementation of *Bacillus amyloliquefaciens* on Growth Performance and Diarrhea Score of Weaned Pigs Experimentally Infected with a Pathogenic *E. coli*

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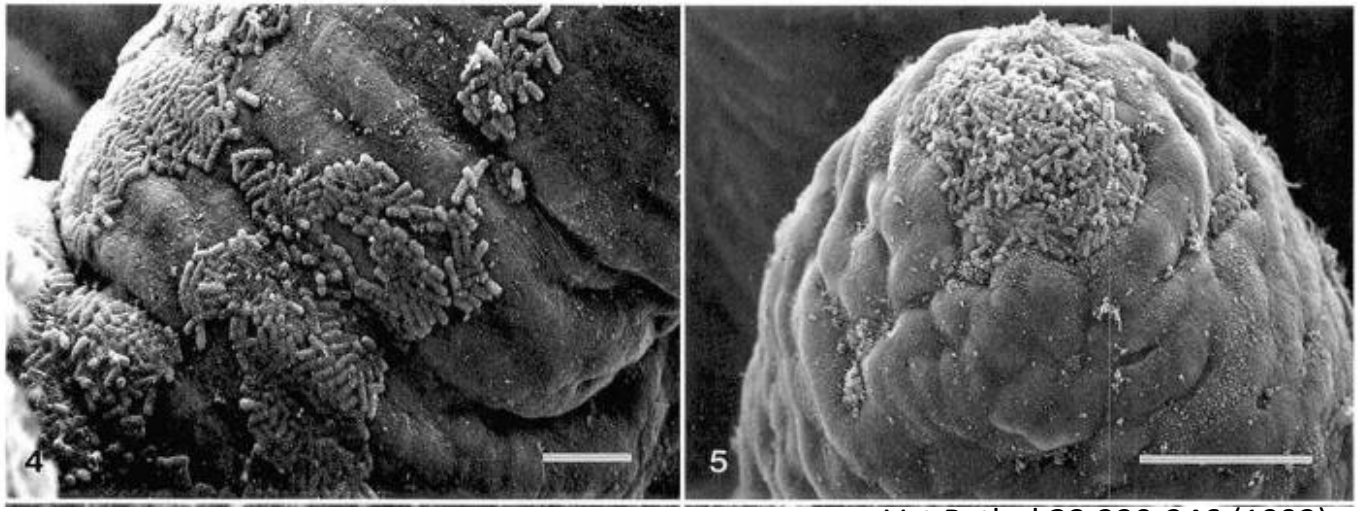
Introduction

- Postweaning diarrhea
  - Been a threat for the swine industry
  - Cause high morbidity rate in weaning pigs along with huge economical loss
- Postweaning diarrhea is commonly induced by enterotoxigenic *E. coli* (ETEC)



Vet Pathol **29:**239-246 (1992)

ETEC pathogenesis

ETEC invades the gut

↓

Fimbrial adhesion to epithelial cells of the host

↓

Toxins (heat labile toxin and heat stable toxin) are released and invades into epithelial cells

↓

Chloride ions are secreted into the lumen

↓

Electrolyte-rich fluid are released into the lumen (Van Metre et al., 2008)

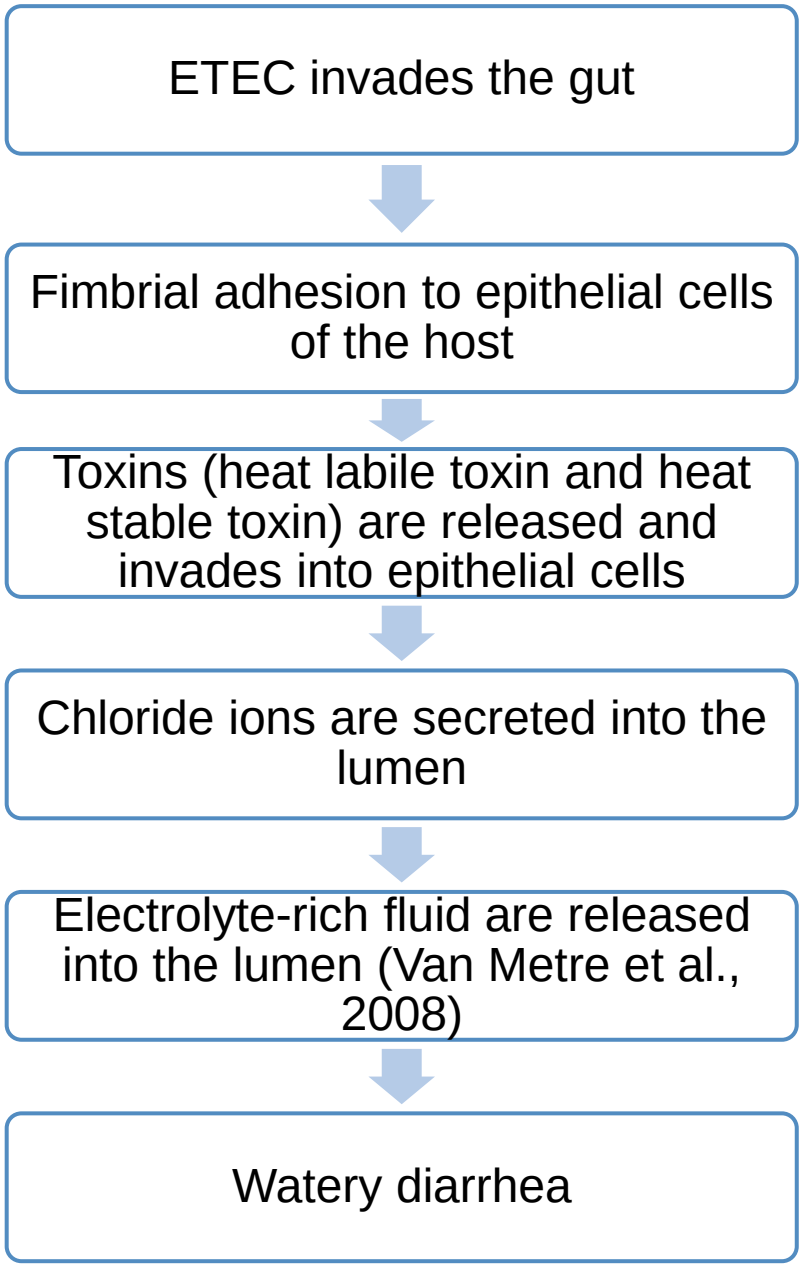
↓

Watery diarrhea

Introduction

- Postweaning diarrhea
  - Been a threat for the swine industry
  - Cause high morbidity rate in weaning pigs along with huge economical loss
- Postweaning diarrhea commonly induced by enterotoxigenic *E. coli* (ETEC)
  - Enterotoxins are nonimmunogenic, but immune response can be initiated with antigens present on the fimbrial (surface) proteins

ETEC pathogenesis



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Introduction

Antibiotics

- Currently known to be the most effective strategy to alleviate postweaning diarrhea
- However, resistance to antibiotics increased in ETEC and public concern as well
  - Ciprofloxacin increased from 13% in 2005 to 34% in 2009 (Begum et al., 2016)

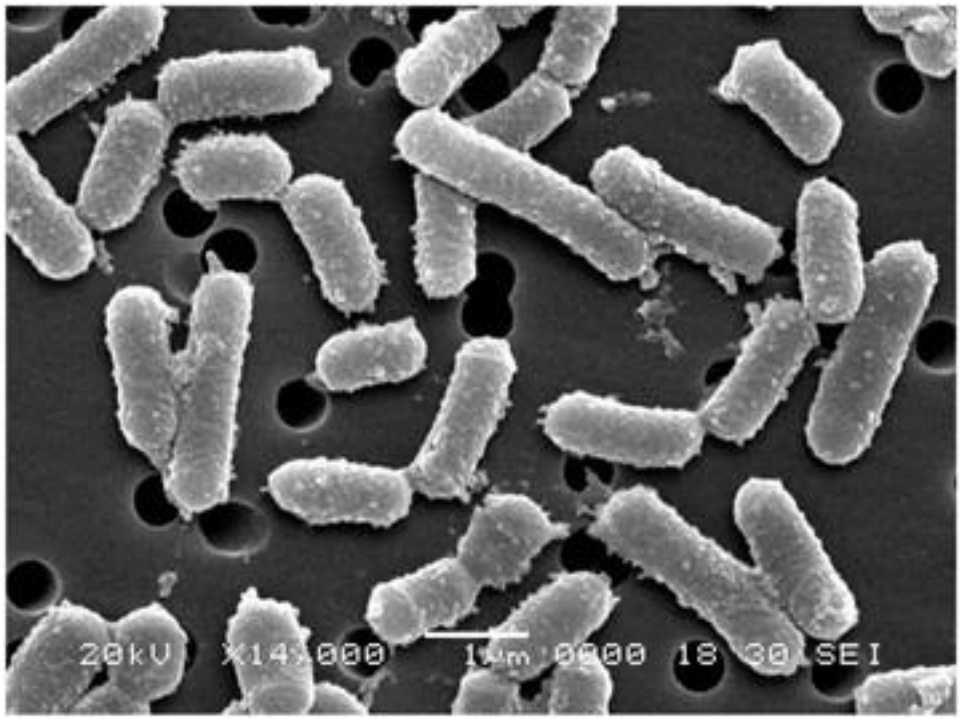
Probiotics

- Probiotics as potential antibiotic alternative
- Shown to improve growth performance and strengthen immune health of weaning pigs (He et al., 2020; Betancur et al., 2020; Liao and Nyanchoti, 2017)
  - i.e., *Lactobacillus spp.*, *Bacillus subtilis*, etc.

Bacillus amyloliquefaciens

- Gram-positive aerobic spore forming bacteria
- Usually synthesize polysaccharides and polypeptides
- Rod shaped with flagella

- Induces autophagy by modulating macrophage immunity *in vitro*(Wu et al., 2017)
- Supplementing *B. amyloliquefaciens* may be a potential probiotics for weaning pigs under diarrheal stress



Annals of clinical microbiology and antimicrobials, *14*(1), 1-11.

Objective

To investigate effects of dietary supplementation of *Bacillus amyloliquefaciens* (BAM) on diarrhea and growth performance of weaned pigs experimentally infected with pathogenic *E. coli*

Materials & methods

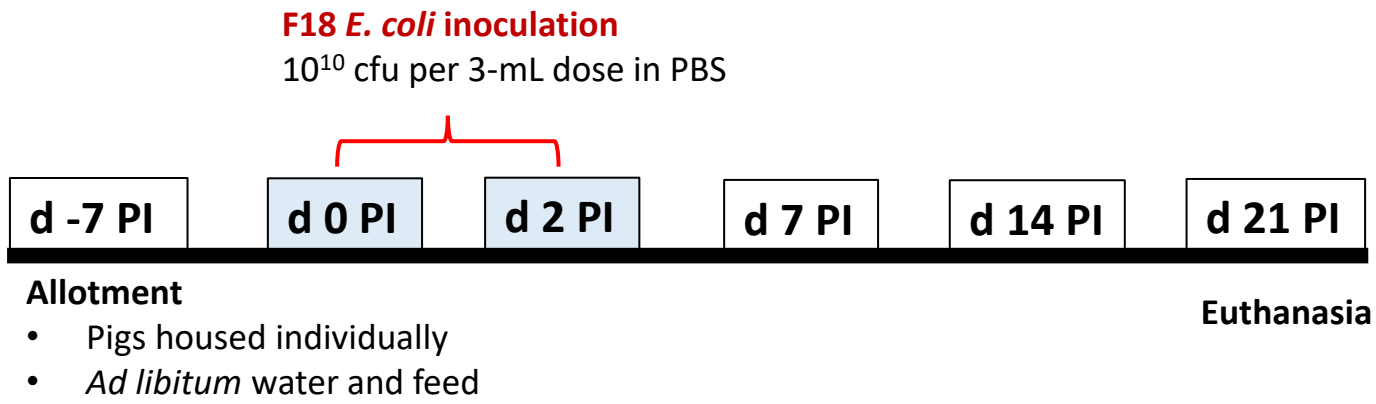
- 50 weaned pigs (7.41 ± 1.35 kg)
  - Around 21 day of age
- 5 treatments (10 pigs per treatment)

Sham (-)	**CON -**	Control diet
	BAM -	0.10% inclusion rate with 10^9 CFU/kg
***E. coli* challenge (+)**	**CON +**	Control diet
	BAM +	0.10% inclusion rate with 10^9 CFU/kg
	CAR +	0.90% inclusion rate with 50 mg/kg as Carbadox

Materials & methods

Timeline

Pigs were screened for F18 *E. coli* sensitivity prior experimentation



Totaling 28 days (7 d before challenge and 21 days after challenge)

Sample collection

DAILY
• Diarrhea score
  • 1 = normal feces
  • 5 = watery diarrhea
• Feed intake

WEEKLY (d-7, 0, 7, 14, and 21) • Body weight
d 2, 7, 14, and 21 • Fecal swabbing

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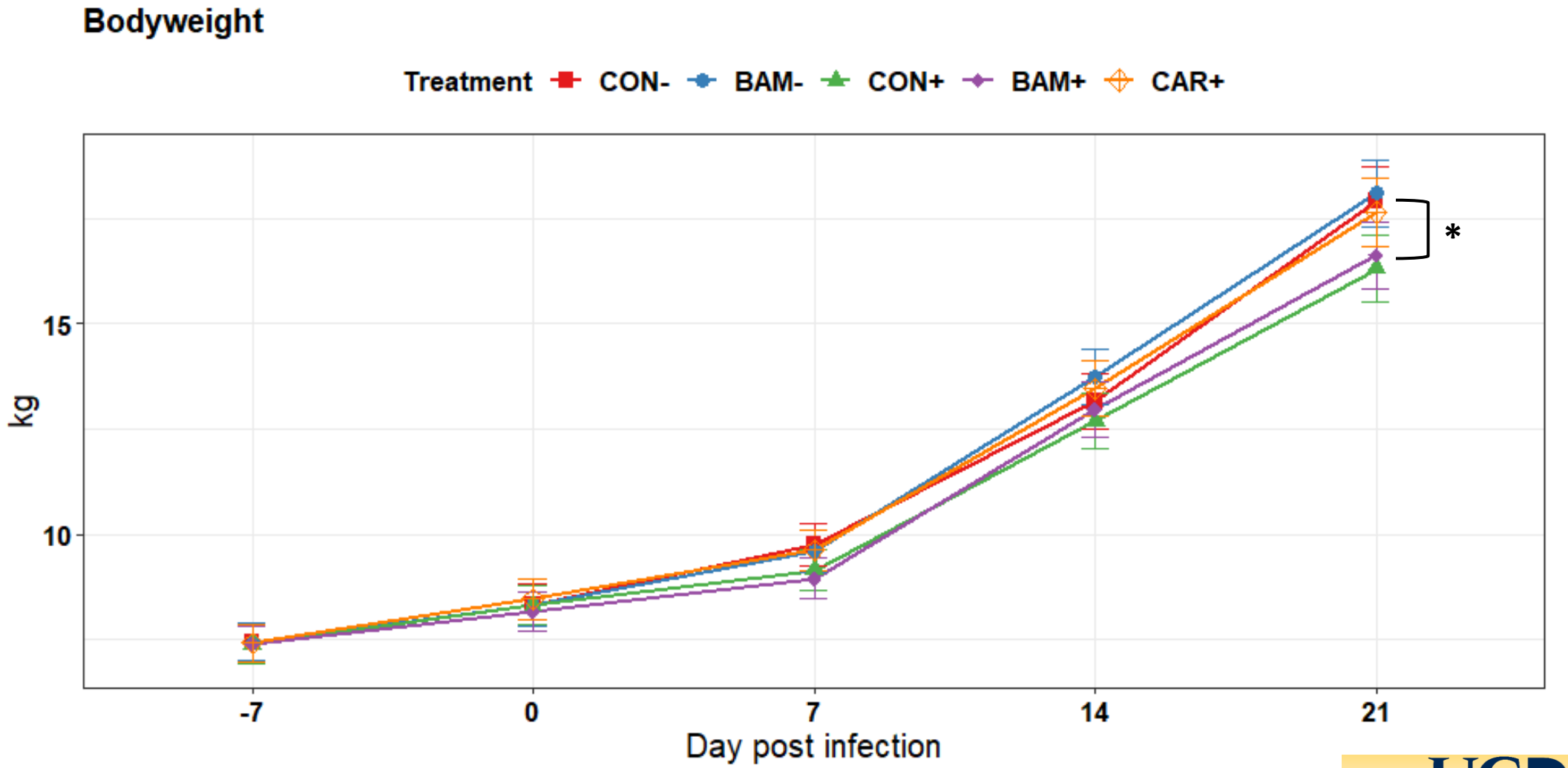
Statistical analysis

PROC MIXED of SAS

- Randomized complete block design
- Pig as experimental unit
- Diet and challenge as main effect
- Block as random effect

Results



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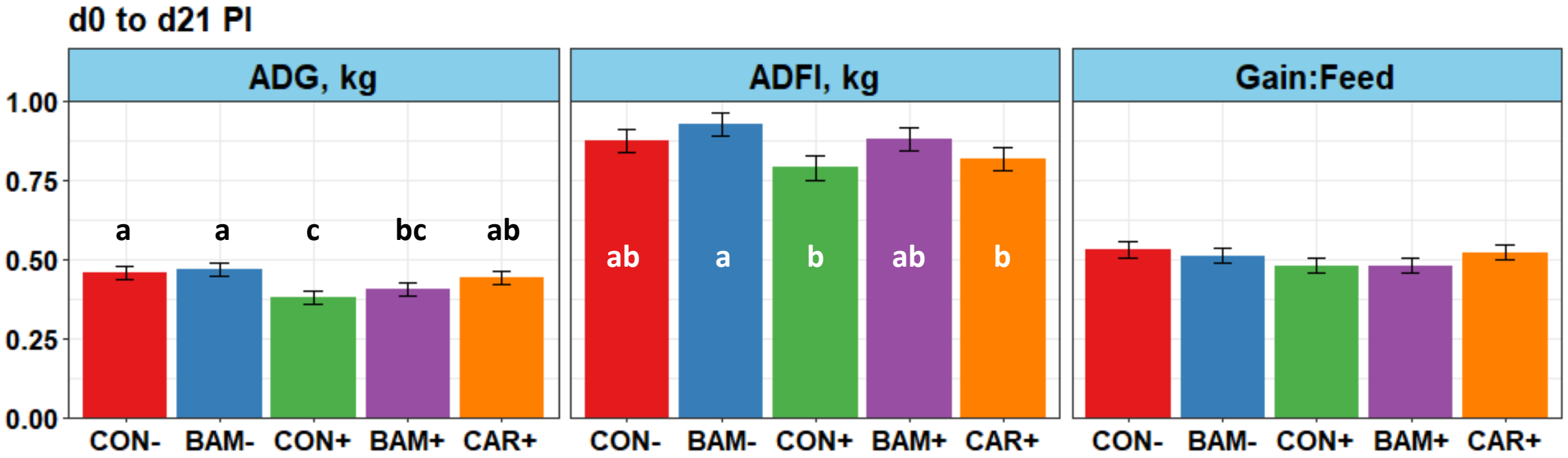
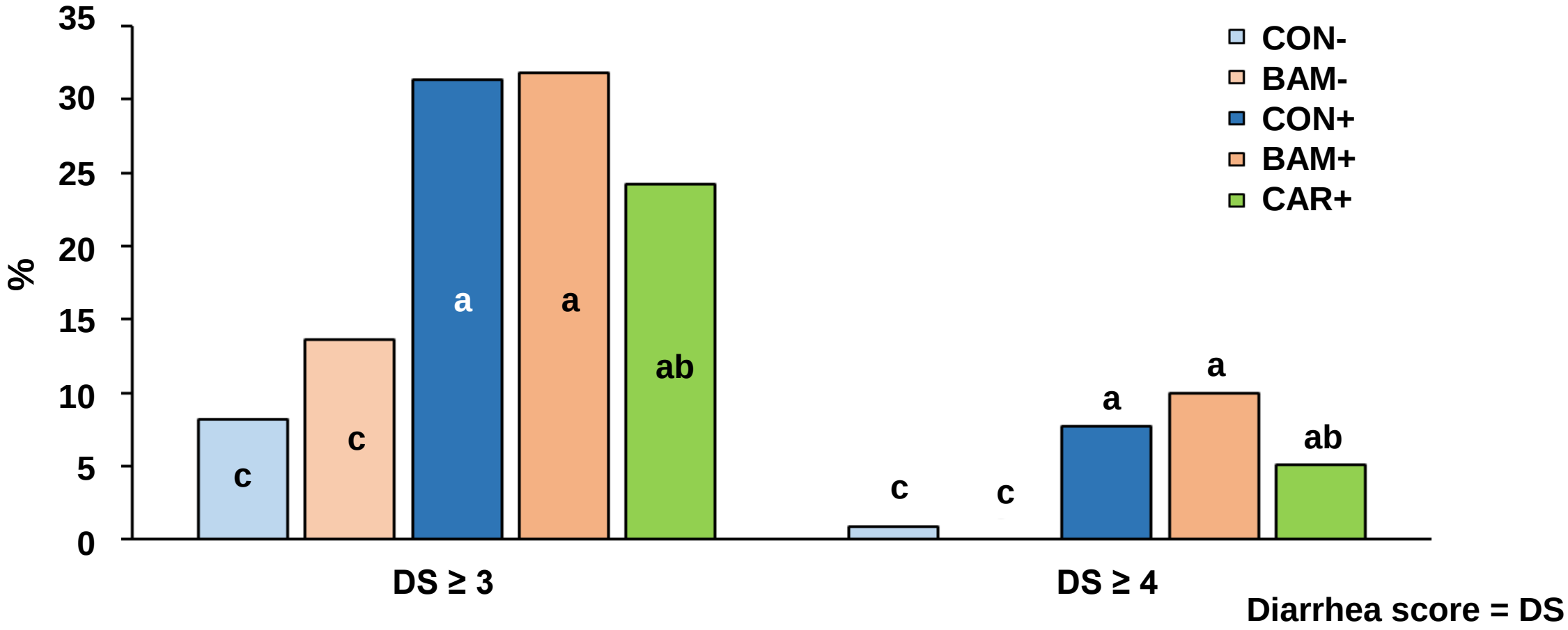
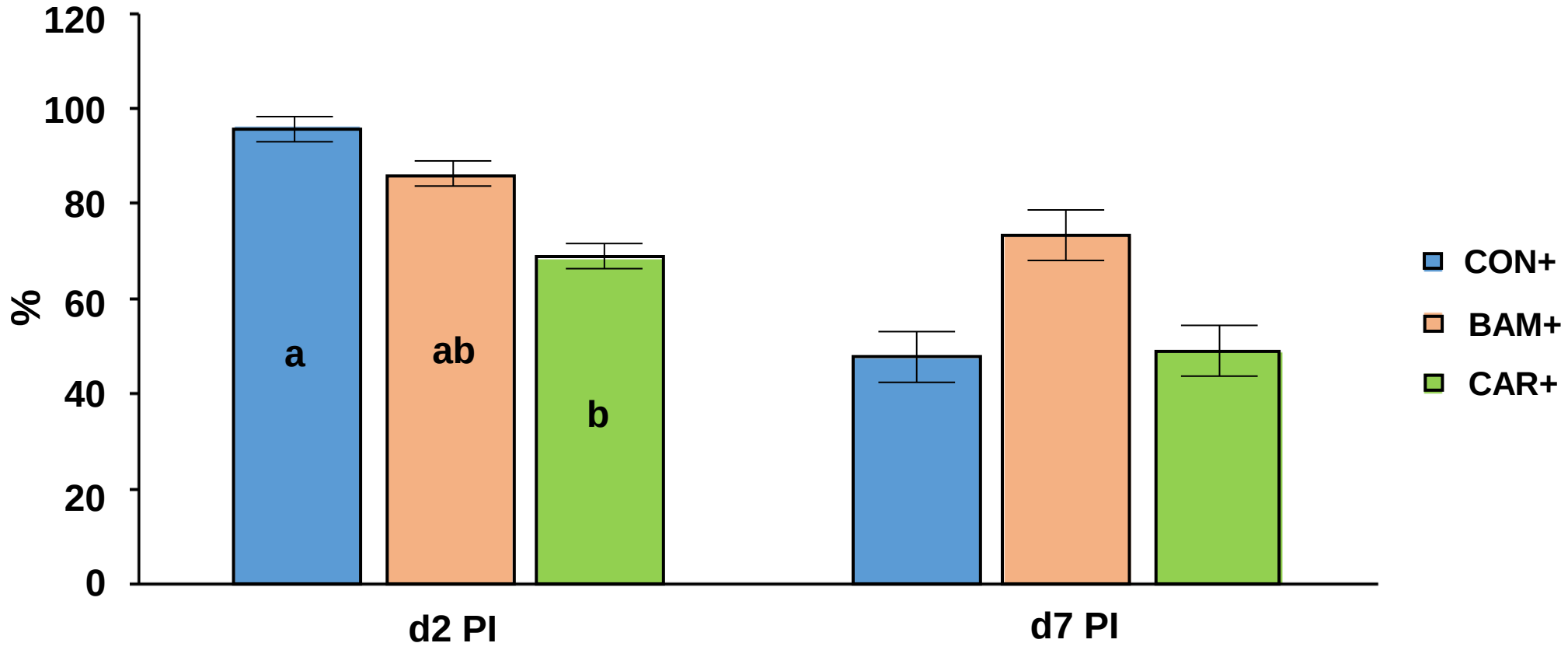
Growth performance



Diarrhea frequency



β-hemolytic coliforms



Conclusions

- Supplementing *B. amyloliquefaciens* tended to enhance growth performance but had limited effects on diarrhea of weaned pigs challenged with *E. coli*
- Further study investigated the systemic immunity of weaned pigs supplemented with *B. amyloliquefaciens* when challenged with *E. coli*
  - Presented in poster presentation "**PSII-14 - Supplementation of *Bacillus amyloliquefaciens* on Systemic Immunity of Weaned Pigs Experimentally Infected with a Pathogenic *E. coli*"**

Thank you!

Research was supported by a grant from Evonik

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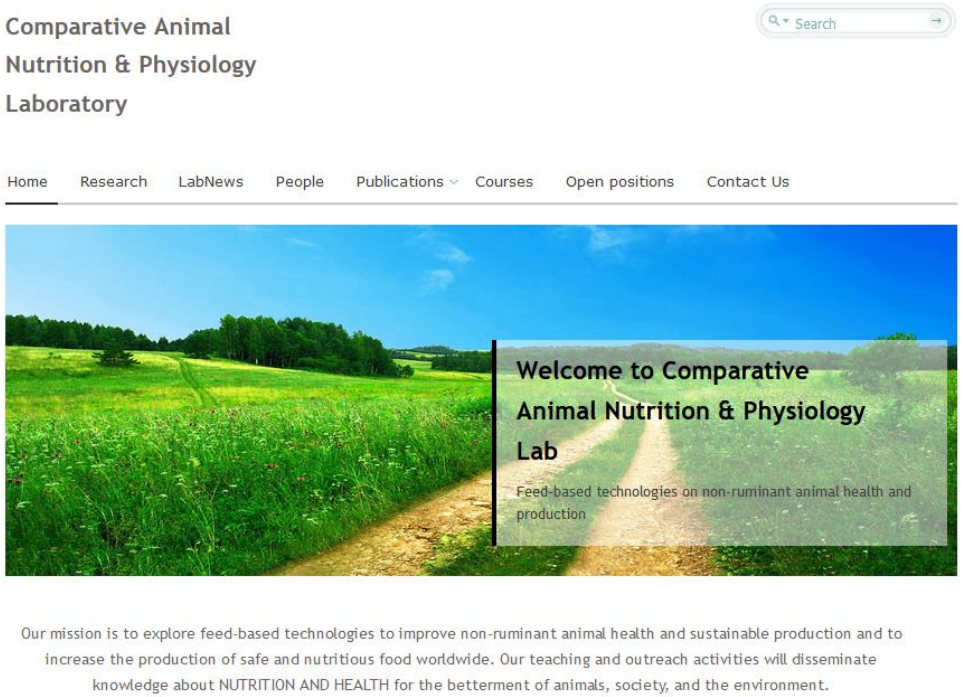

Check out our lab website!
https://animalnutr-ansci.faculty.ucdavis.edu/

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