



Trace amounts of antibiotic is detrimental to the health of weaned pigs

Kwangwook Kim and Yanhong Liu

Department of Animal Science, University of California, Davis, CA

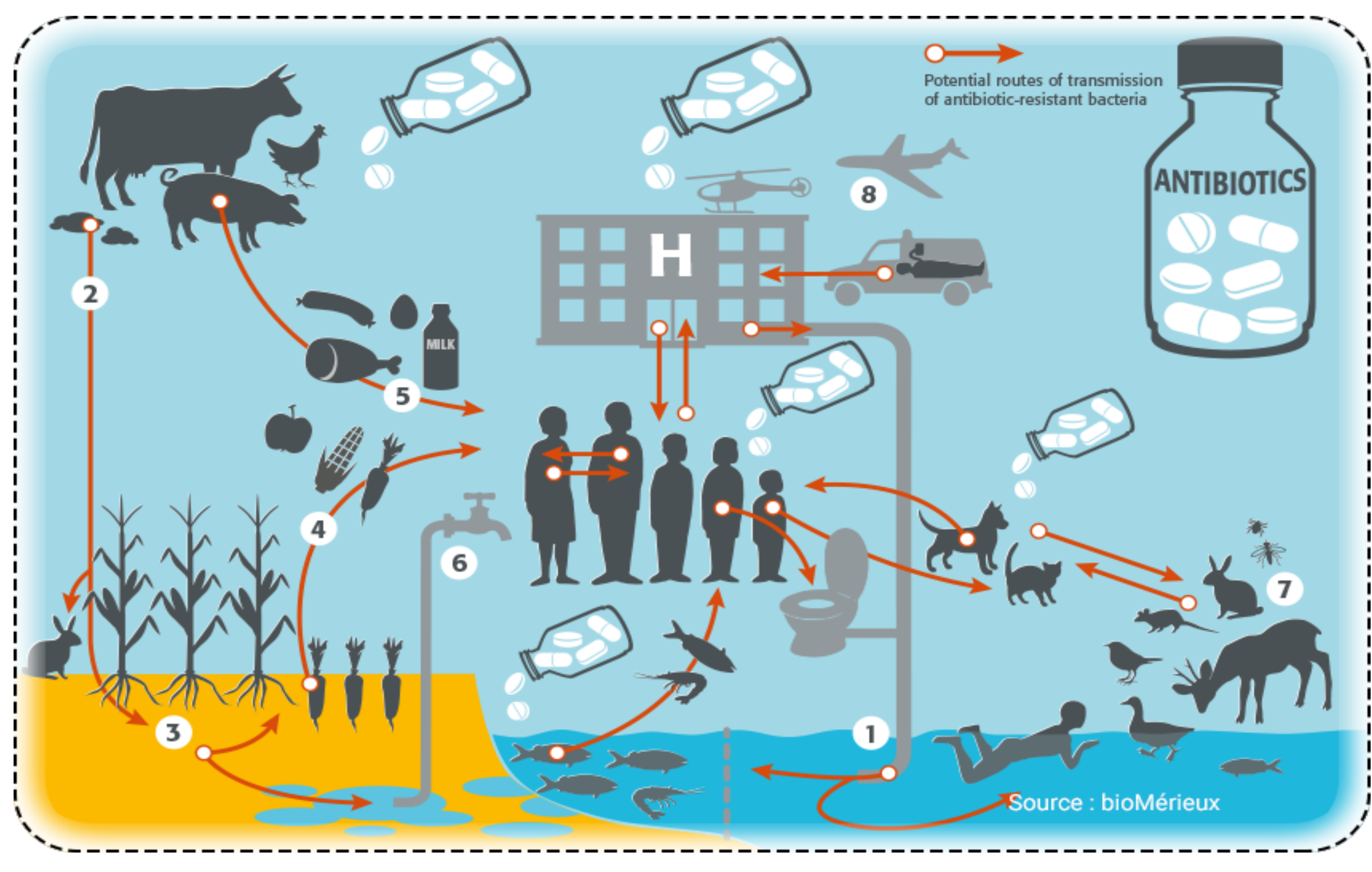


Comparative Animal Nutrition & Physiology Laboratory

Background

- Antibiotics have been widely used as a growth promoter and to treat the diseases caused by bacterial pathogens in livestock production.
- In the swine industry, subtherapeutic doses of in-feed antibiotics used to be commonly added to the diet at post-weaning period to prevent infectious diseases and promote the growth performance of weaned pigs.
- Trace amounts of antibiotics are one of the biggest public health concerns that lead to tremendous economic losses and increased mortality of both humans and livestock (Marshall and Levy, 2011).
- Growing evidence demonstrated that exposure to trace amounts of antibiotics might delay the growth and development of young animals and humans and delay recovery from diseases (Jayalakshmi et al., 2017).

Potential transmission routes of trace amounts of antibiotics and antibiotic-resistant bacteria



Objective

Investigate the potential detrimental effects of trace amounts of antibiotic on weaning pigs' growth performance and systemic immunity using a disease challenge model (ETEC F18)

Hypothesis

Trace amounts of antibiotic will adversely affect health of weaned pigs infected with ETEC F18.

Materials & Methods

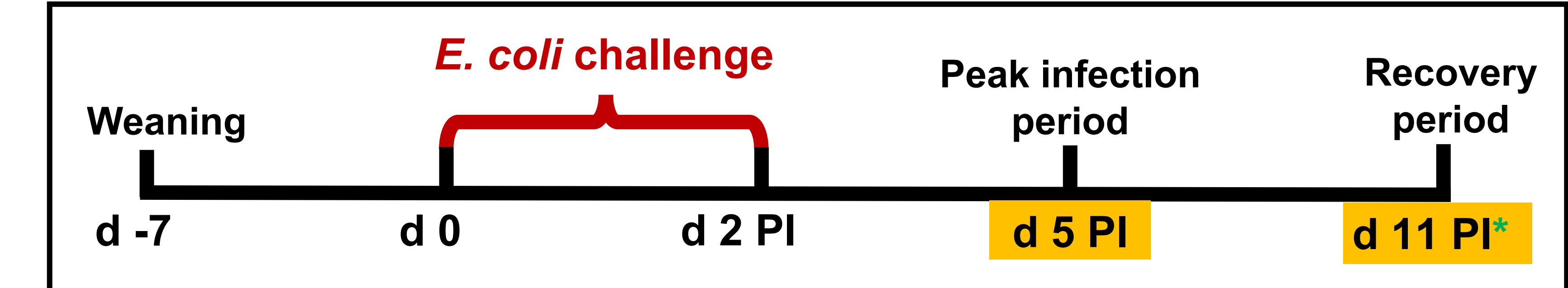
Experimental design & treatments

- Experimental design: RCBD (Blocks: BW x Sex)
- 34 weaning pigs (6.88 ± 1.03 kg, 21 d old)
- Treatments: 3 dietary treatments (9-13 pigs/treatment); **ETEC F18 E. coli challenge, oral inoculation, 10¹⁰ cfu/dose**
 - Control: Basal nursery diet (CON)
 - Trace amount of antibiotic: CON + 0.5 mg/kg antibiotic (TRA)
 - Label-recommended dose: CON + 50 mg/kg antibiotic (REC)

Statistical analysis

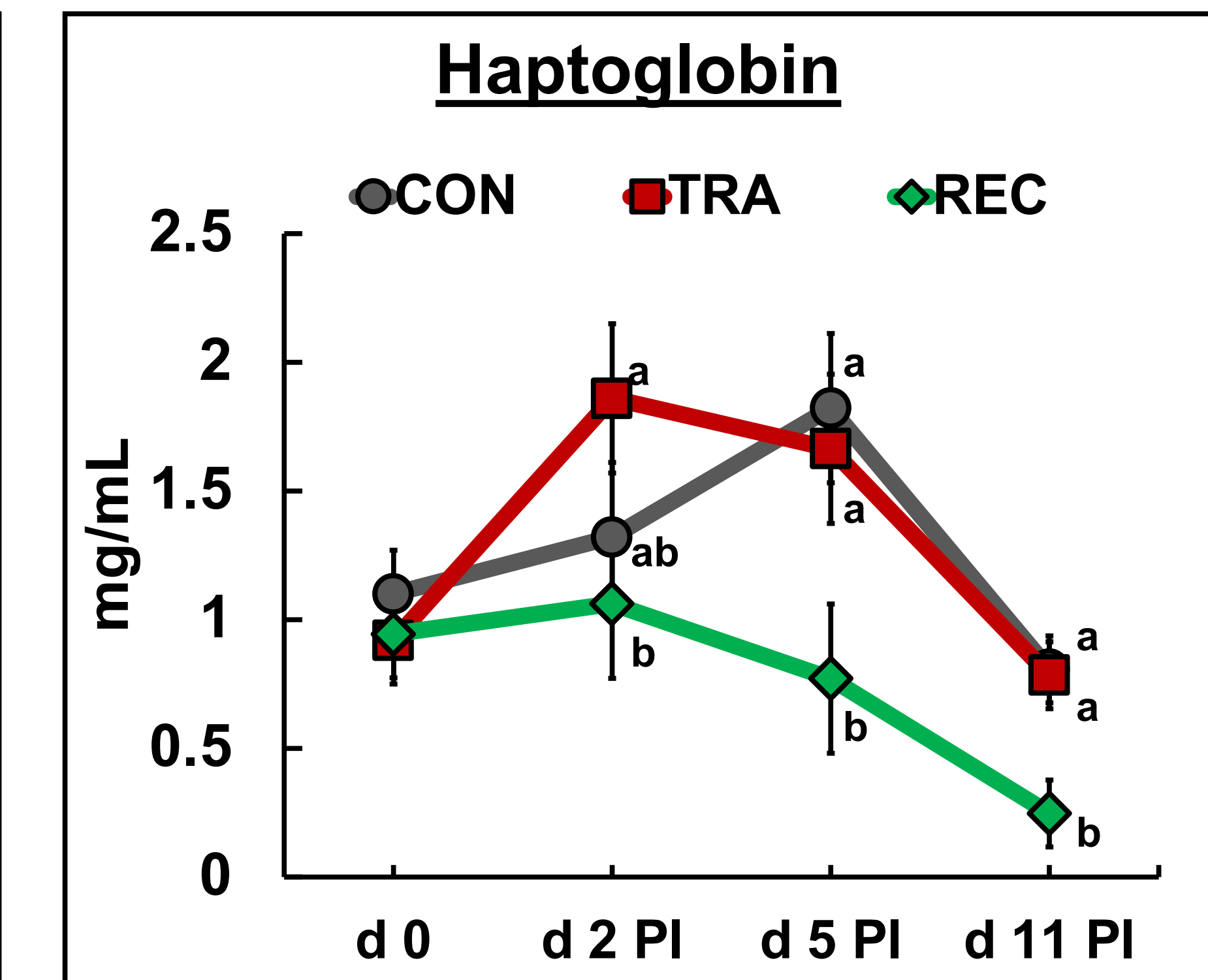
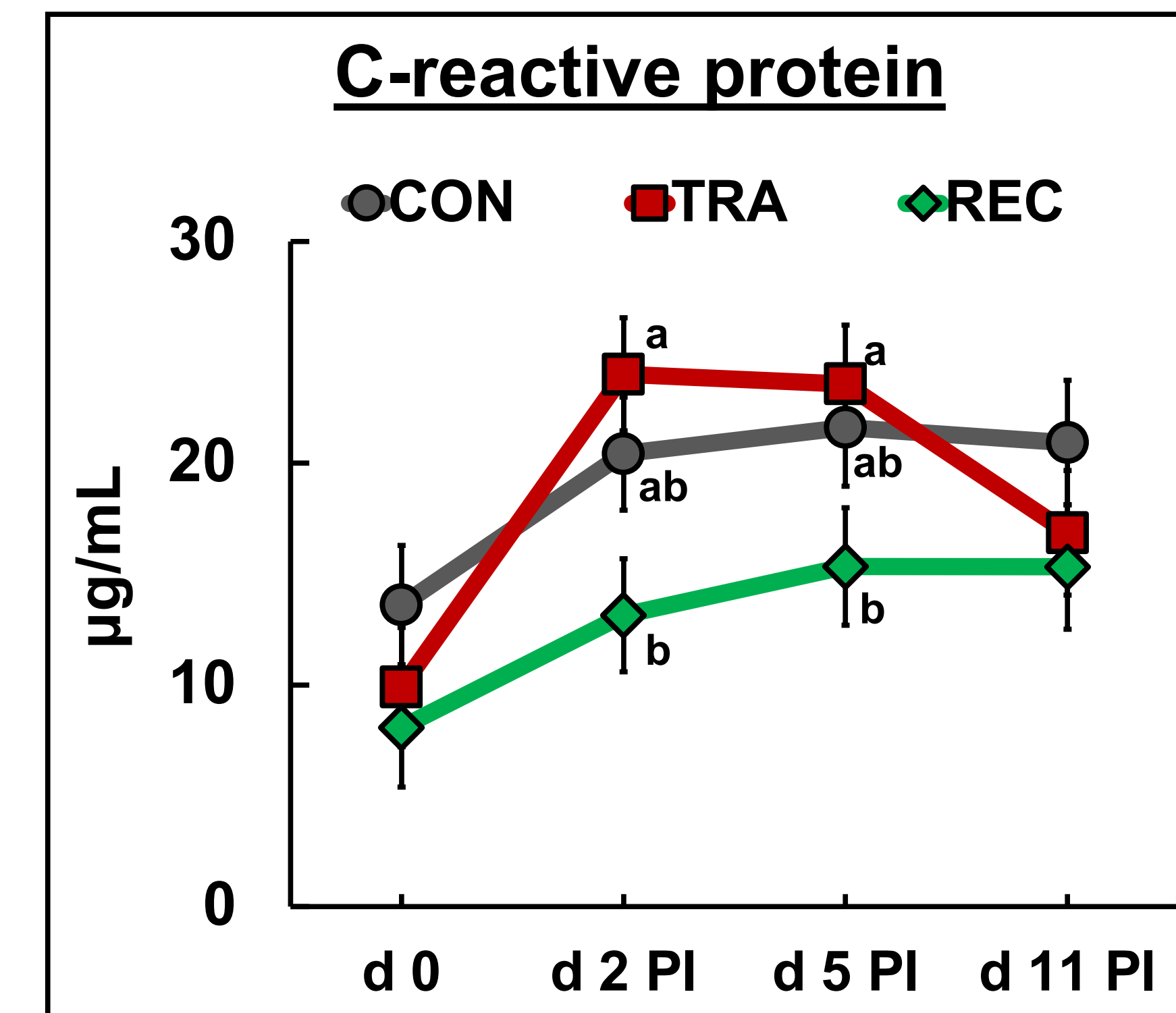
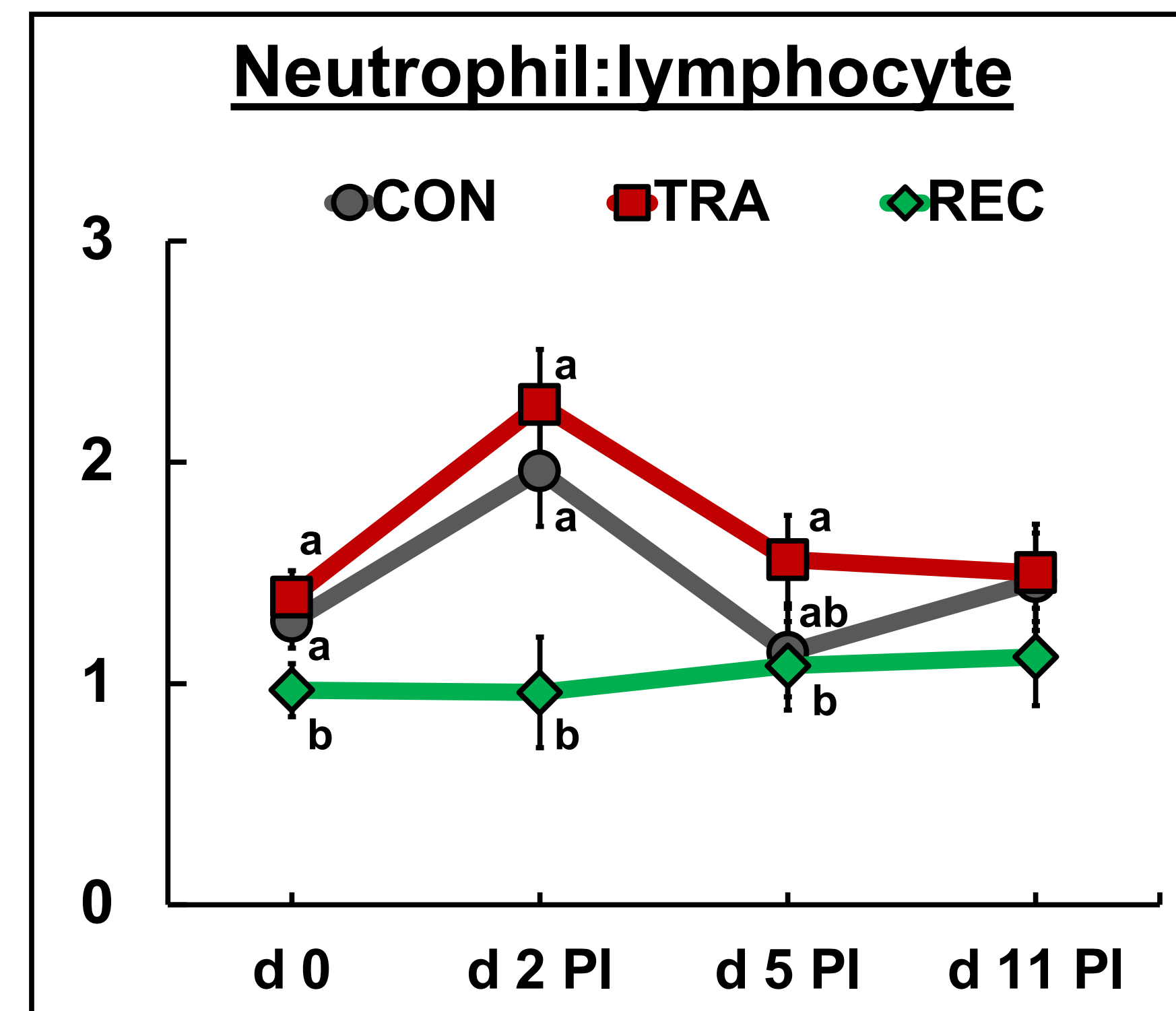
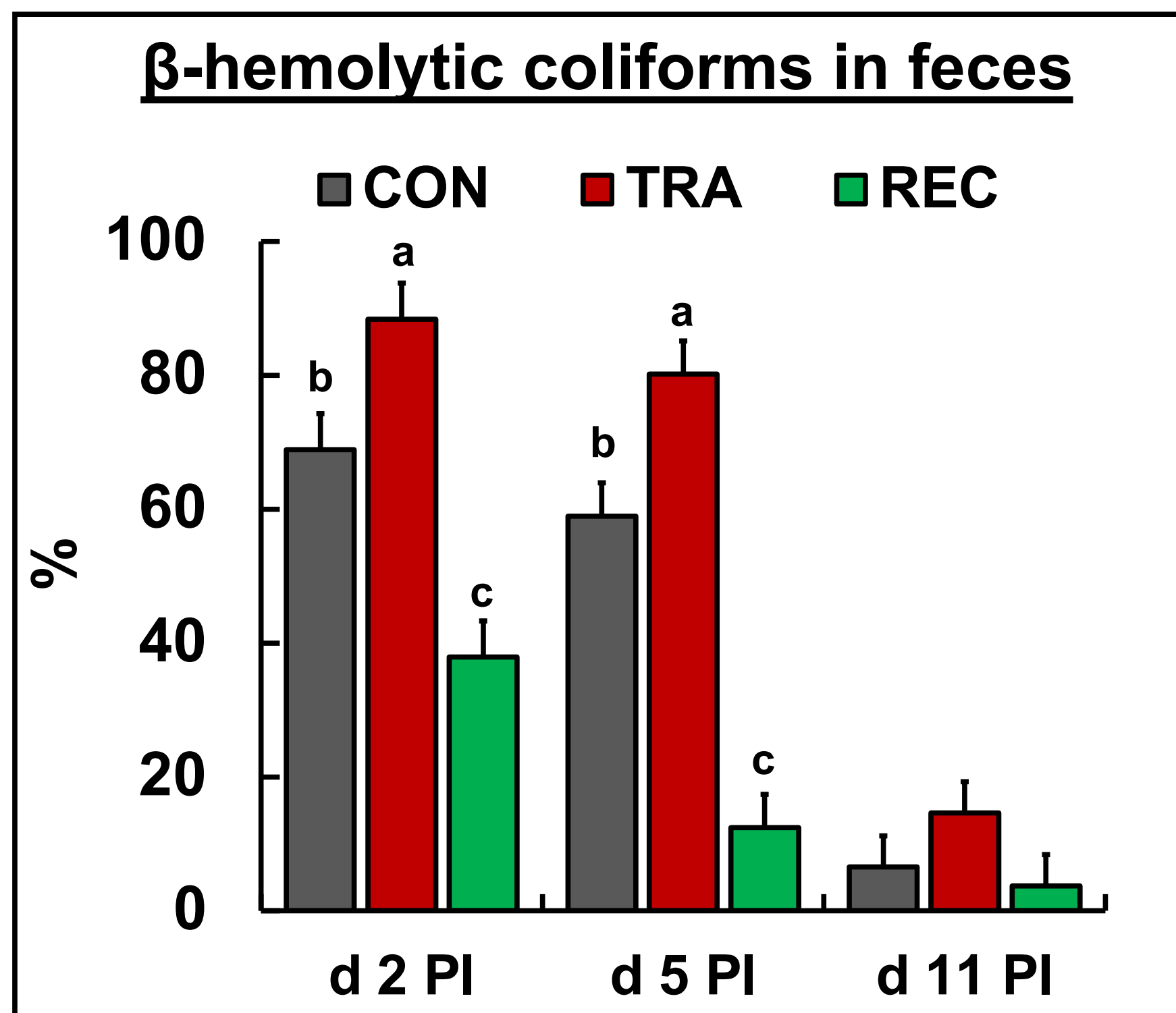
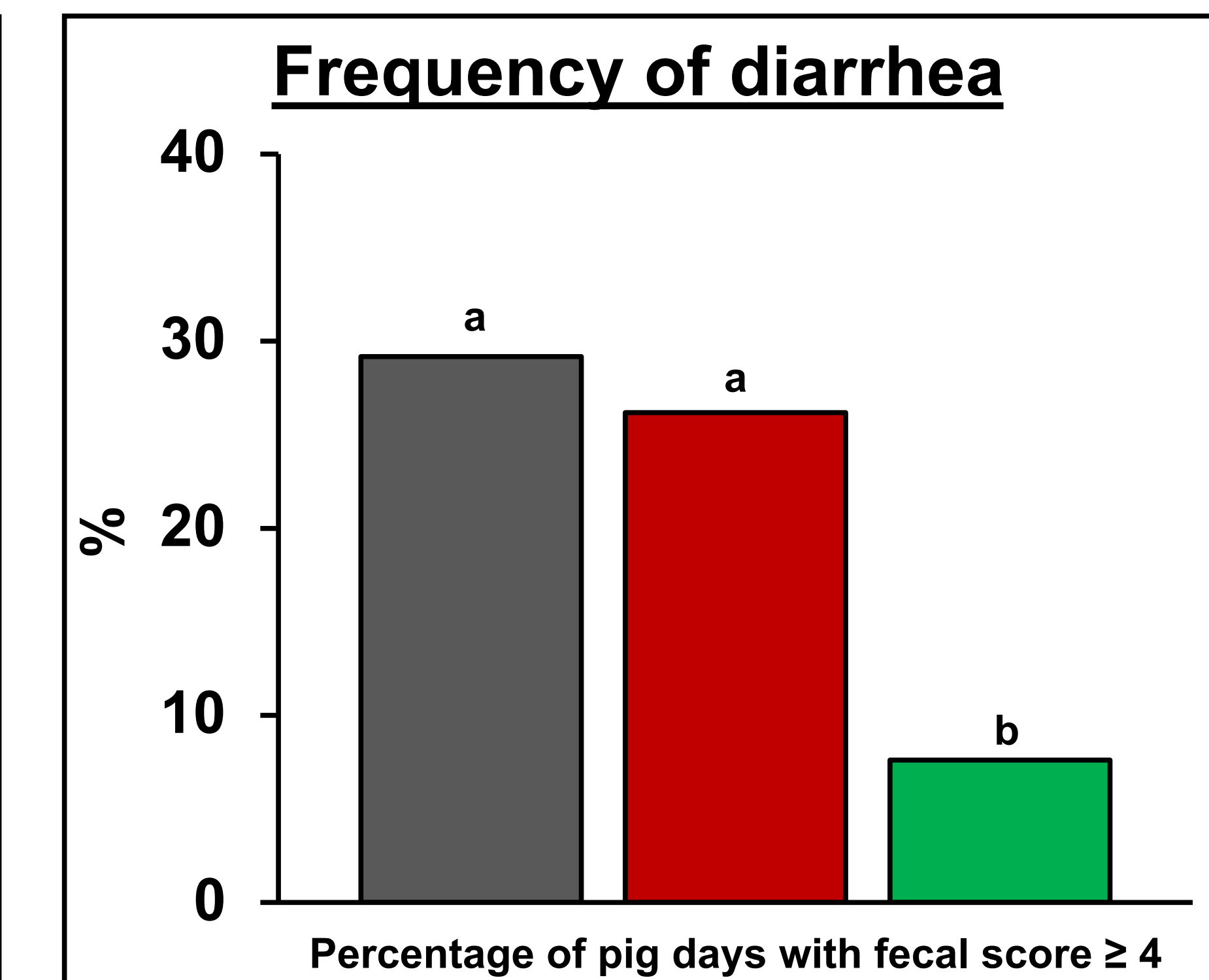
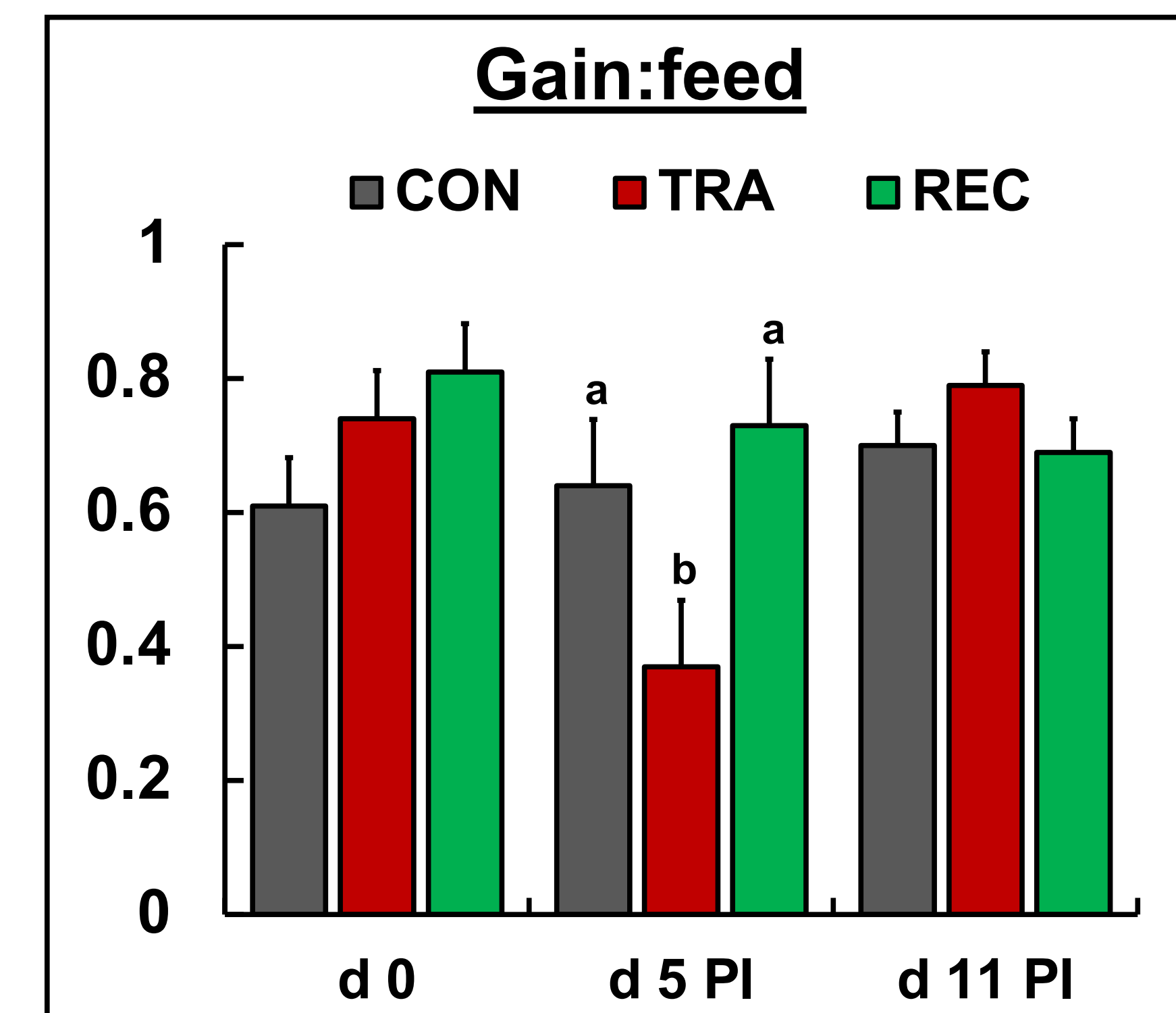
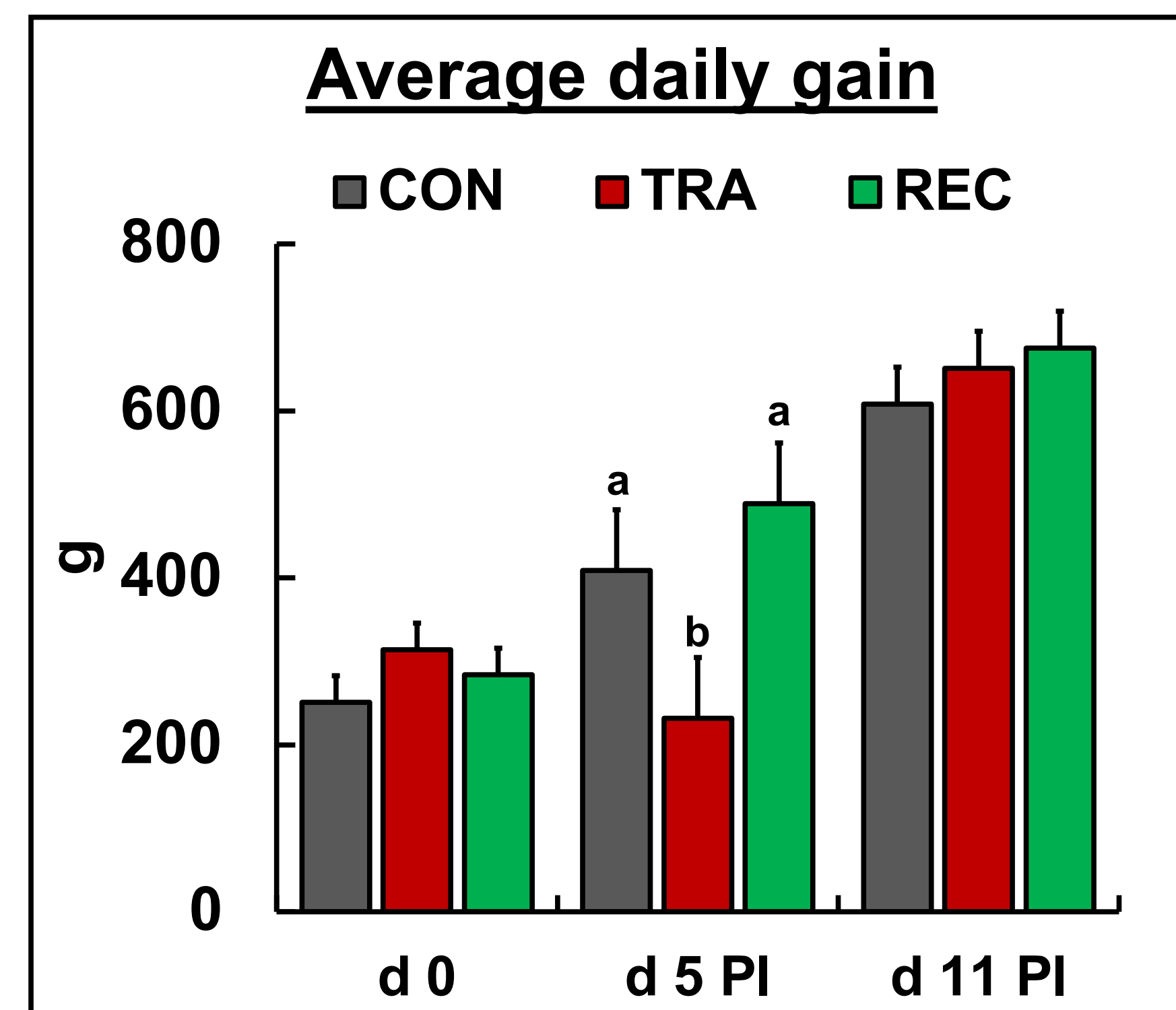
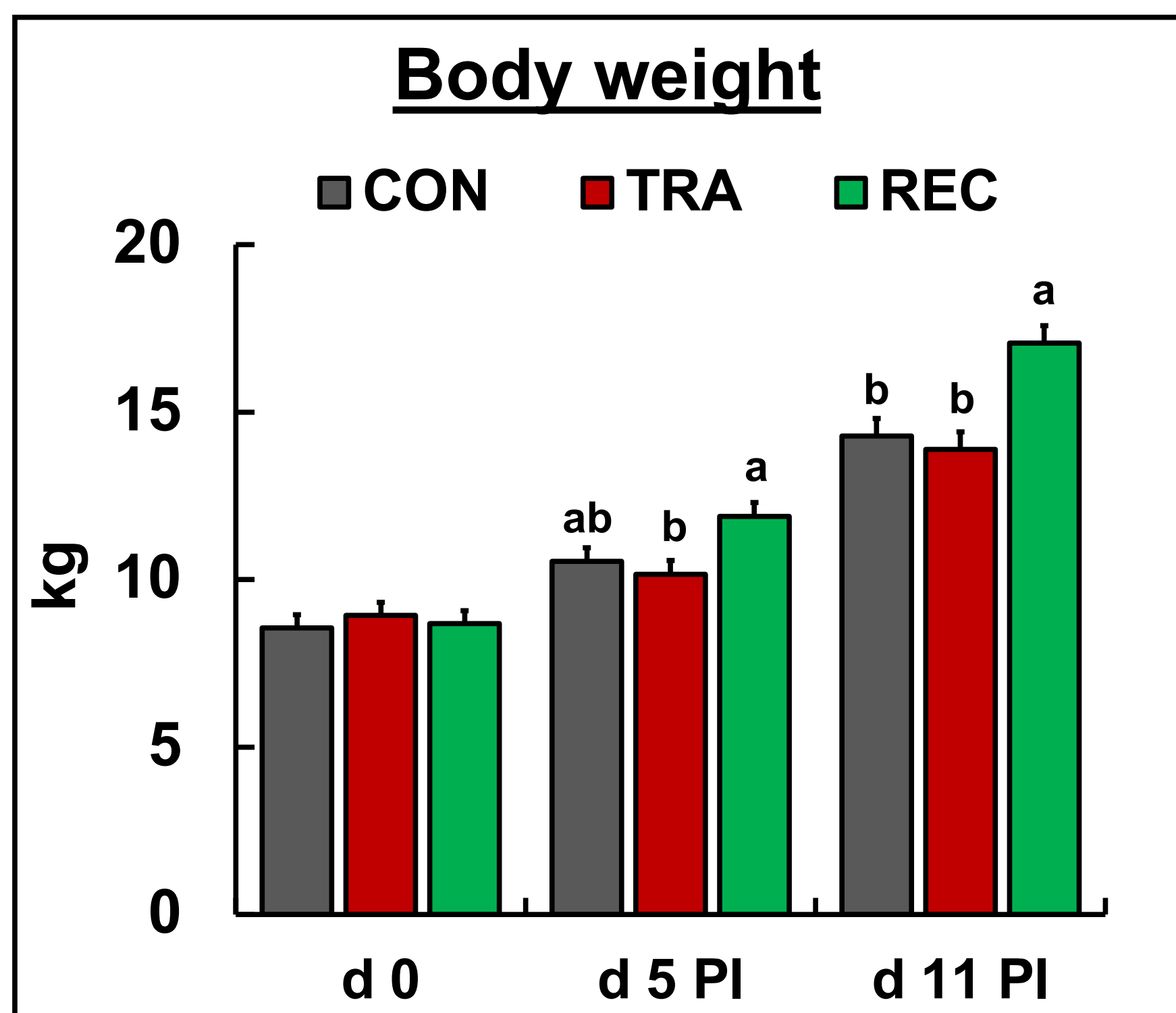
- All data were analyzed by ANOVA using the PROC MIXED of SAS. Significant difference at $P < 0.05$

Data collection



- Growth performance
 - Diarrhea severity (score 1=normal to 5=severe diarrhea)
 - β -hemolytic coliforms in feces
 - Blood sample
 - Total and differential blood cell count
 - Serum inflammatory mediators
- *PI=post-inoculation

Results



Conclusions

- Pigs supplemented with trace amounts of antibiotic exacerbated the severity of diarrhea and delayed recovery from ETEC infection compared with pigs without antibiotic supplementation.
- The worsening of disease was likely due to the increased severity of systemic inflammation of pigs in the trace amounts of antibiotic group; therefore, more nutrients were used for immune responses instead of supporting animal growth.

References

Marshall, B. M., and S. B. Levy. 2011. Food animals and antimicrobials: impacts on human health. *Clin. Microbiol. Rev.* 24:718-733
 Jayalakshmi, K., M. Paramasivam, M. Sasikala, and A. Sumithra. 2017. Review on antibiotic residues in animal products and its impact on environments and human health. *J. Entomol. Zool. Stud.* 5:1446-1451