

# Effects of *Bacillus subtilis* probiotics on growth performance, diarrhea, and intestinal health of weaned pigs experimentally infected with an enterotoxigenic *Escherichia coli*

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## Introduction

- ❑ Enterotoxigenic *E. coli* (ETEC) are the most common type of *E. coli* that cause diarrhea in post-weaning piglets.
- ❑ Supplementation of *Bacillus spp.* probiotics reduces incidence of diarrhea and improves growth performance of post-weaning pigs. (Bhandari et al., 2008; Pan et al., 2017)
- ❑ Probiotics can reduce incidence of diarrhea, improve gut barrier integrity, and reduce systemic inflammation. (Bhandari et al., 2008; Yang et al., 2016)

## Objective

- ❑ To investigate the effects of supplementation of *Bacillus spp.* probiotics on the growth performance, diarrhea, and intestinal health of weaned pigs experimentally infected with a enterotoxigenic F-18 *E. coli*

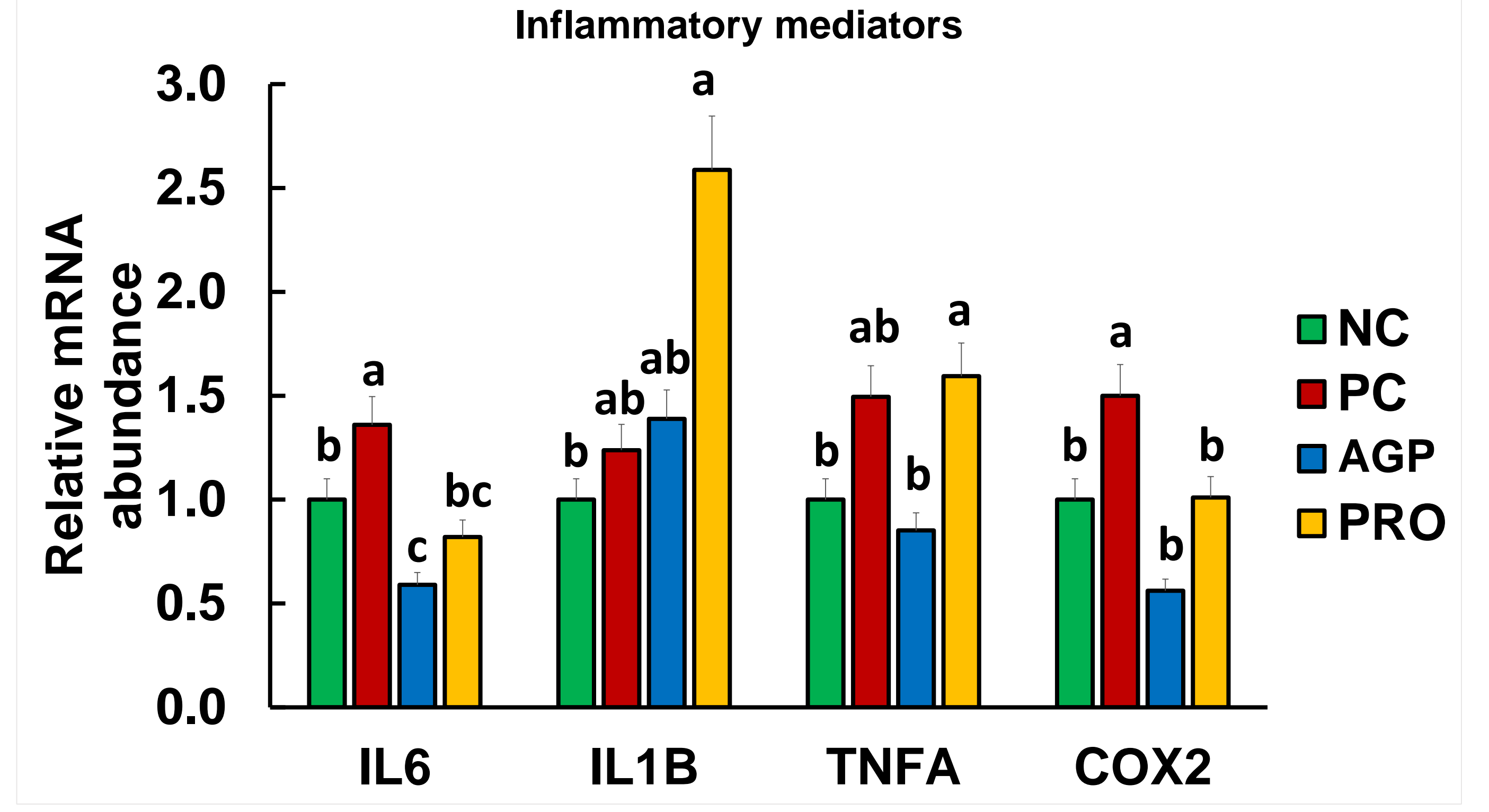
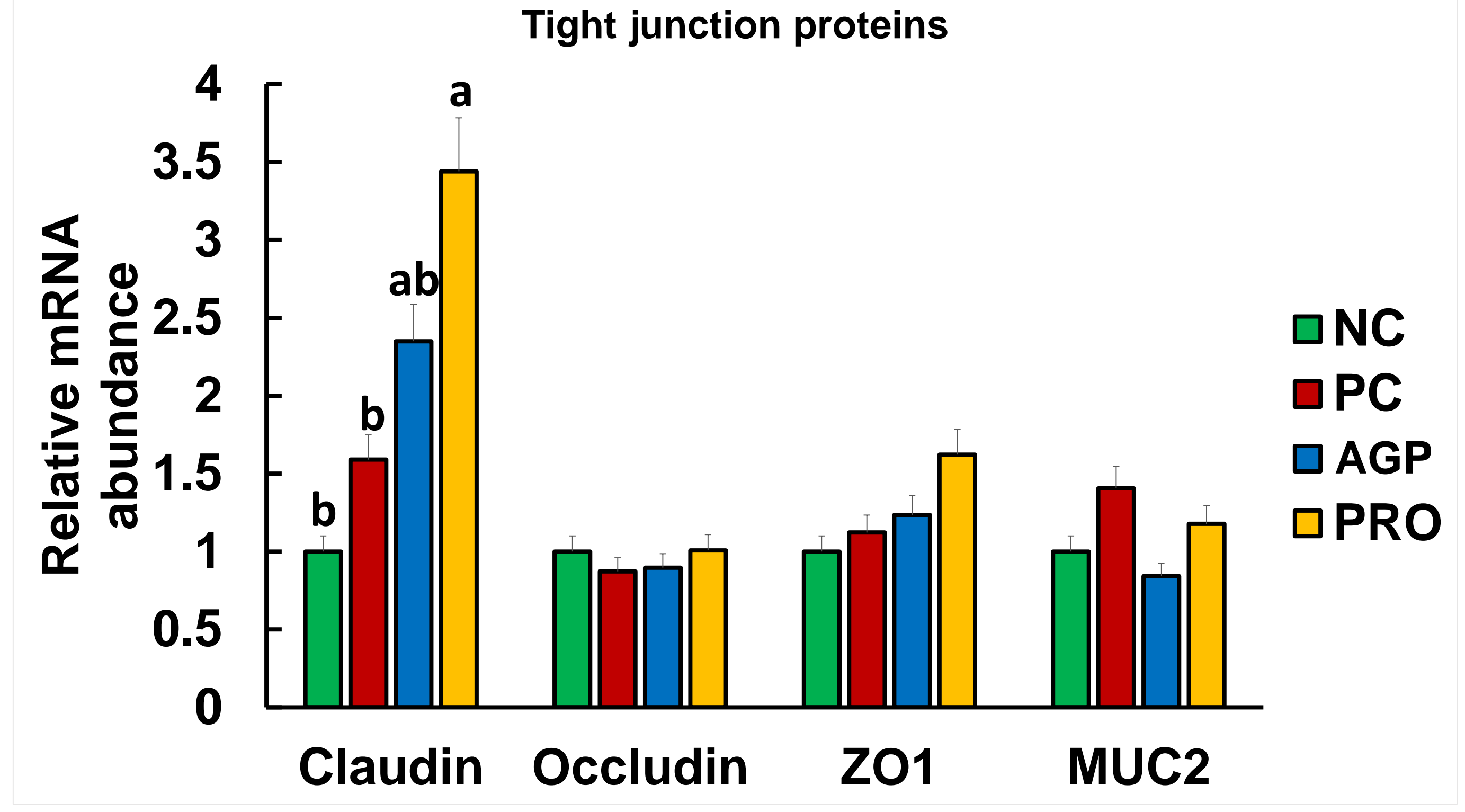
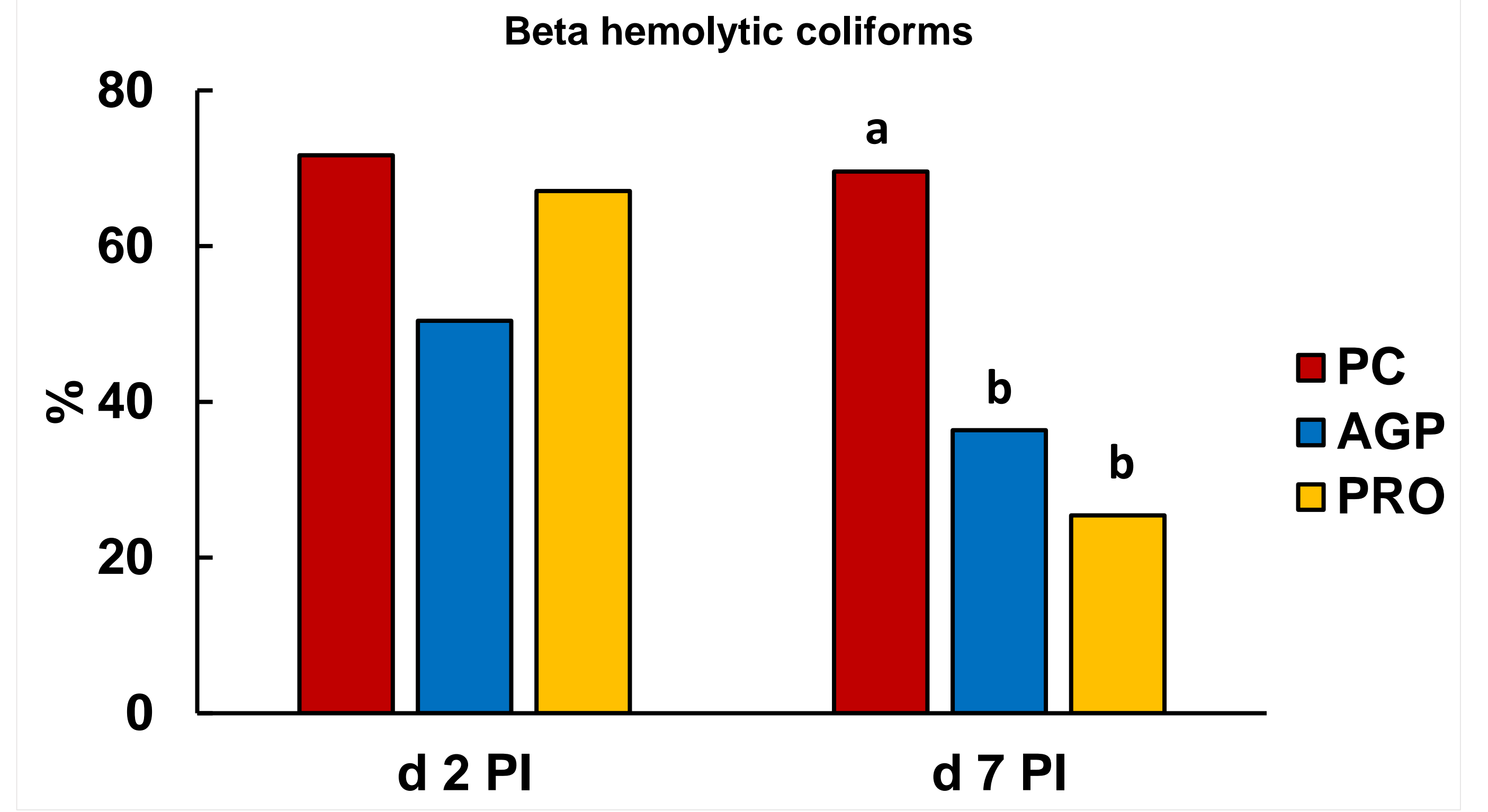
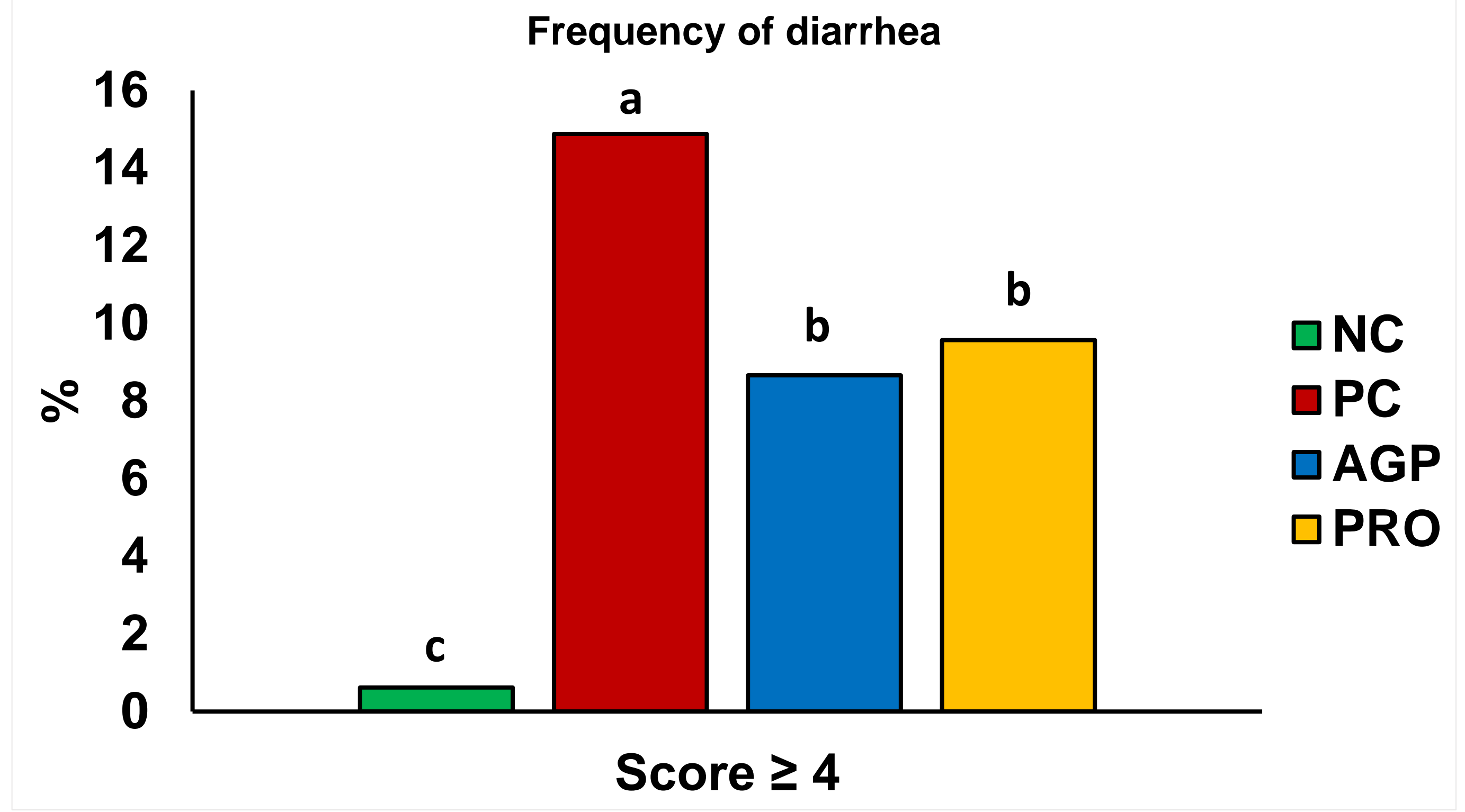
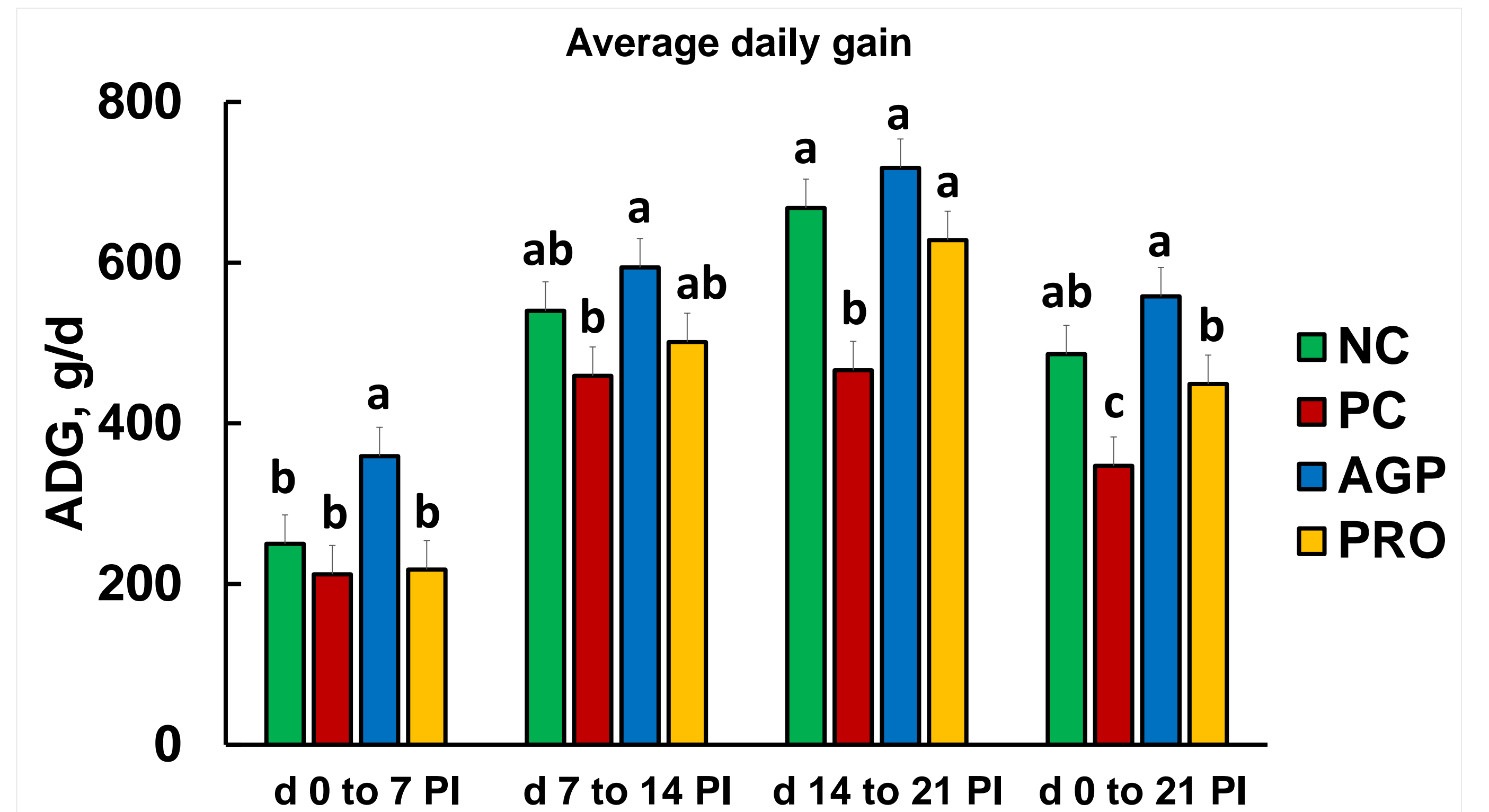
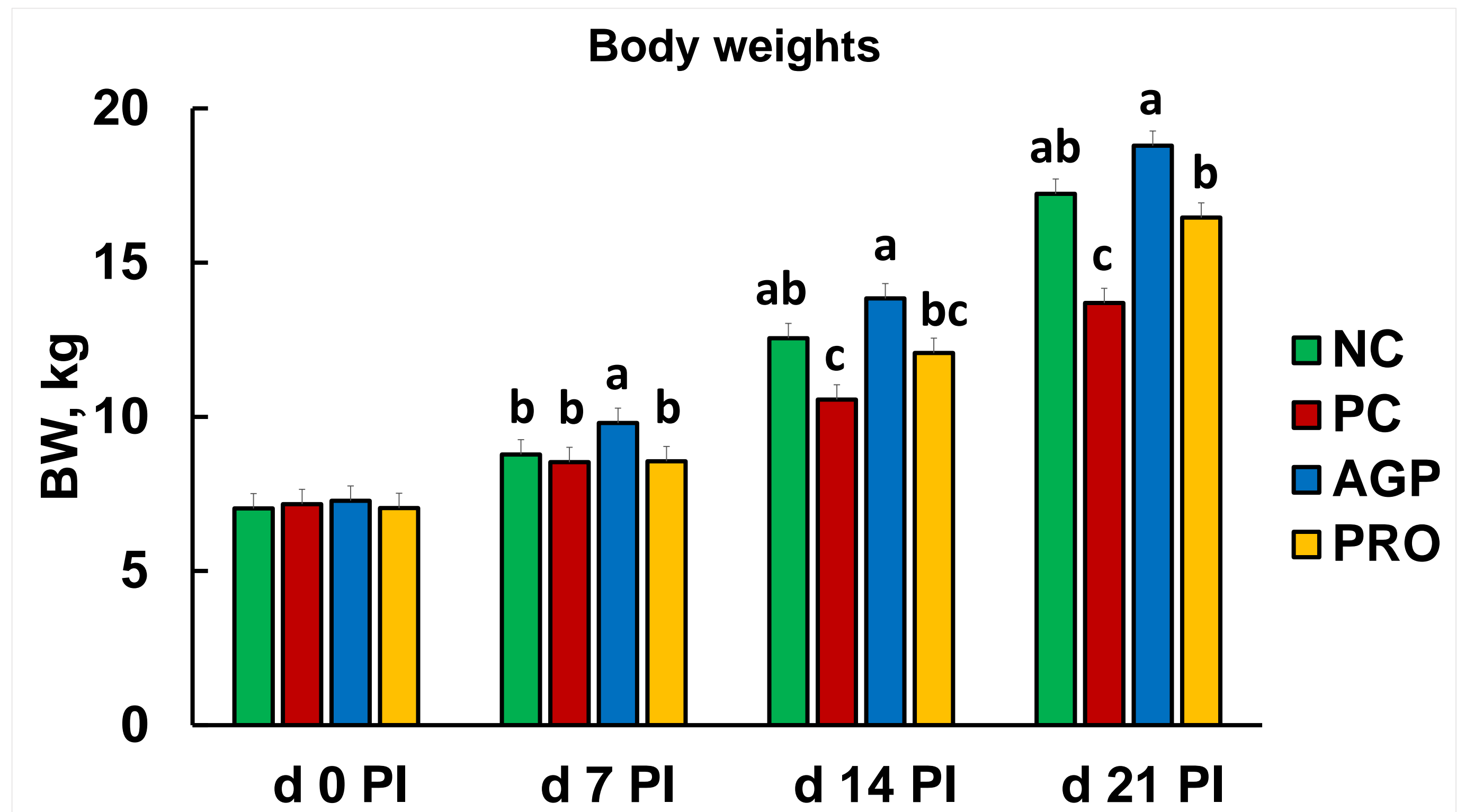
## Materials and Methods

- ❑ Animals and facility
  - ❖ 48 weanling pigs (6.17 ± 0.40 kg)
  - ❖ Weaned at 21 d of age into 3 confinement nursery rooms
- ❑ F18 *E. coli* challenge
  - ❖ Enterotoxigenic F18 *E.coli* (LT, STb, SLT-2)
  - ❖ Oral inoculation, 10<sup>10</sup> cfu/dose with 3 doses
- ❑ Experimental design
  - ❖ Randomized Complete Block Design
  - ❖ Blocking factors: body weight x gender
- ❑ Dietary treatments: 12 pigs/treatment
  - ❖ Nursery basal diet without *E. coli* challenge (NC)
  - ❖ Nursery basal diet with *E. coli* challenge (PC)
  - ❖ PC + 50 mg/kg carbadox (AGP)
  - ❖ PC + 500 mg/kg *Bacillus spp.* (PRO)
- ❑ Data collection
  - ❖ Growth performance: Body weight (BW), Average Daily Gain (ADG), Average Daily Feed intake (ADFI) and Feed to Gain ratio (F:G)
  - ❖ Fecal sampling: d 0 before inoculation and d 3, 7, 14, and 21 post-inoculation (PI)

## Materials and Methods (Cont.)

- ❖ Daily diarrhea score: ranging from 1 to 5 (1, normal feces and 5, watery diarrhea)
- ❖ Tight junction proteins/proinflammatory cytokines mRNA expression in Jejunal and ileal mucosa
- ❑ Data analysis
  - ❖ PROC MIXED of SAS (SAS Institute Inc., Cary, NC)
  - ❖ Individual pig used as the experimental unit
  - ❖ Diet as the main effect and block as random effect

## Results



## Conclusions

- ❑ Compared to pigs without PRO supplementation, supplementation of PRO
  - ❖ Improved growth performance (BW and ADG)
  - ❖ Alleviated diarrhea and enhanced gut barrier function