# Impacts of *Saccharomyces* yeast postbiotics on intestinal response and growth of nursery pigs

**Sung Woo Kim and Marcos Elias Duarte**

*Department of Animal Science*
*North Carolina State University, Raleigh, NC*

# The jejunum: dietary challenge upon weaning

- The jejunum: target location of intestinal challenges upon weaning
  - Allergens, antigens, toxins, pathogens, anti-nutritional compounds
  - Mucosal immune reaction
  - Inflammatory and oxidative damages: loss of villi
  - Mucosal repair
- *Saccharomyces* yeast postbiotics:
  - Non-living or parts of a non-living *Saccharomyces* spp.
  - Promote proliferation of beneficial microbial populations in the intestines
  - Cell wall fragments have exhibited immunoregulatory properties
  - mTOR activation for crypt cell proliferation

# The jejunum: dietary challenge upon weaning

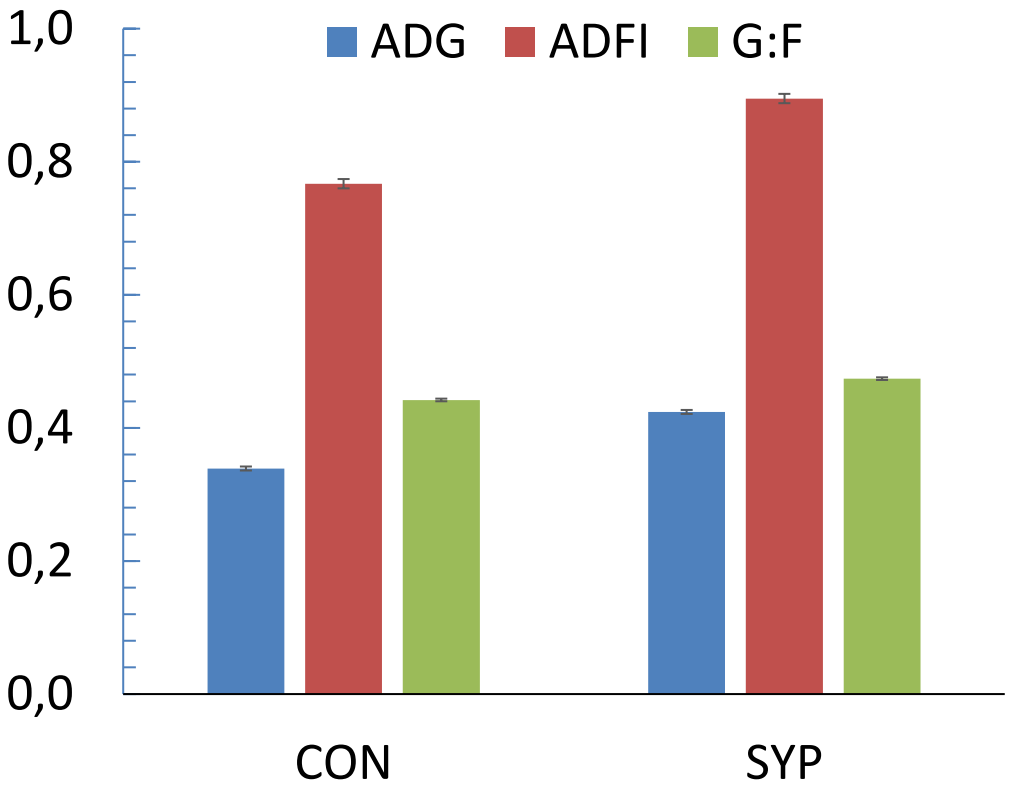
- *Saccharomyces* yeast postbiotics at 175 g/ton of feed improved growth performance of nursery pigs (6 weeks period upon weaning)
  - ADG by 25%
  - ADFI by 16%
  - G:F by 7%

Open Access
Anim Biosci
Vol. 37, No. 8:1463-1473 August 2024
https://doi.org/10.5713/ab.23.0467
pISSN 2765-0189 eISSN 2765-0235

ANIMAL BIOSCIENCE

**_Saccharomyces_ yeast postbiotics supplemented in feeds for sows and growing pigs for its impact on growth performance of offspring and growing pigs in commercial farm environments**

Sung Woo Kim[1,*] and Marcos Elias Duarte[1]



# Hypothesis and objective

- Hypothesis
  - A *Saccharomyces* yeast postbiotic reduce jejunal inflammation and oxidative stress related to dietary challenges upon weaning improving overall intestinal health and thus growth performance of newly weaned pigs.
- Objective
  - To investigate the effects of a *Saccharomyces* yeast postbiotic on the mucosal immune responses and structural health in the jejunum, and growth performance of newly weaned pigs.

# Materials and methods

- Thirty-two newly weaned pigs (16 barrows and 16 gilts)
  - 6.1 ± 0.2 kg BW weaned at d 21
  - RCBD (IBW and sex as blocks)
  - Phase 1 (10 d), phase 2 (9 d), phase 3 (16 d)
- Two dietary treatments (n = 16) fed for 35 d
  - CON: pigs fed a basal diet meeting the nutrient requirements on NRC (2012)
  - YPB: pigs fed a CON diet supplemented with *Saccharomyces* yeast postbiotic
- *Saccharomyces* yeast postbiotics: celluTEIN, Puretein Bioscience (Minneapolis, MN, USA)
- Growth performance (each phase), fecal score bi-day from d 3, and pigs euthanized
  - Jejunal mucosa for immune status and oxidative stress
  - Jejunal tissue for gene expression (intestinal barrier markers, cell proliferation, and apoptosis)
- Data were analyzed using SAS 9.4.

# Composition of basal diets

## Composition of basal diets

| Feedstuffs, % | P1 | P2 | P3 |
|---|---|---|---|
| Corn, yellow | 41.96 | 49.52 | 60.57 |
| Whey permeate | 19.00 | 13.00 | 6.00 |
| Soybean meal | 18.50 | 23.50 | 28.50 |
| Poultry meal | 9.00 | 5.00 | 0.00 |
| Fish meal | 5.00 | 3.00 | 0.00 |
| HP300 | 3.00 | 1.50 | 0.00 |
| L-Lys HCl | 0.58 | 0.47 | 0.46 |
| Others | 2.96 | 4.01 | 4.47 |

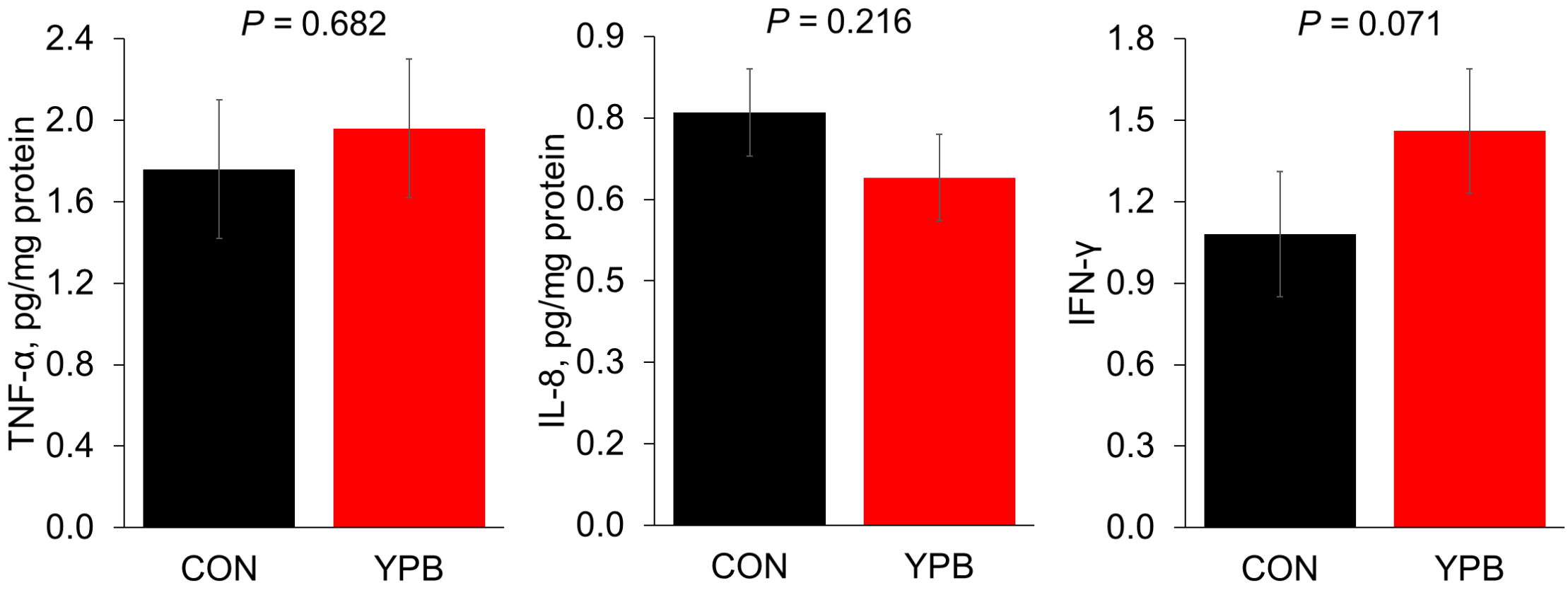
[1] Others include L-Met, L-Thr, L-Trp, L-Val, dicalcium phosphate, limestone, vitamin and mineral premix, and salt.

## Calculated nutrient composition

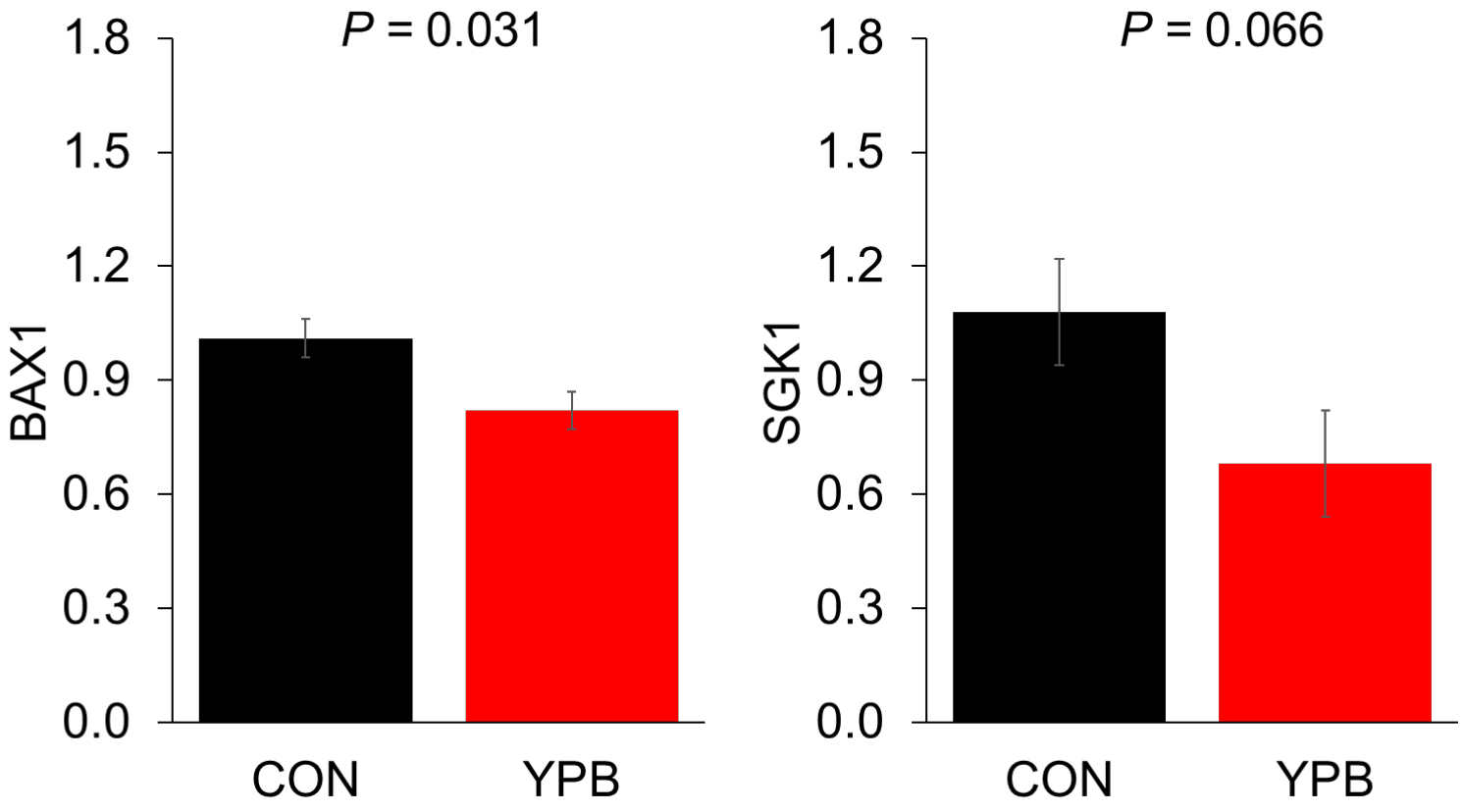
| Composition | P1 | P2 | P3 |
|---|---|---|---|
| ME, kcal/kg | 3,400 | 3,400 | 3,350 |
| SID Lys, % | 1.50 | 1.35 | 1.23 |
| Ca, % | 0.85 | 0.80 | 0.70 |
| STTD[4] P, % | 0.45 | 0.40 | 0.33 |

(NRC, 2012)

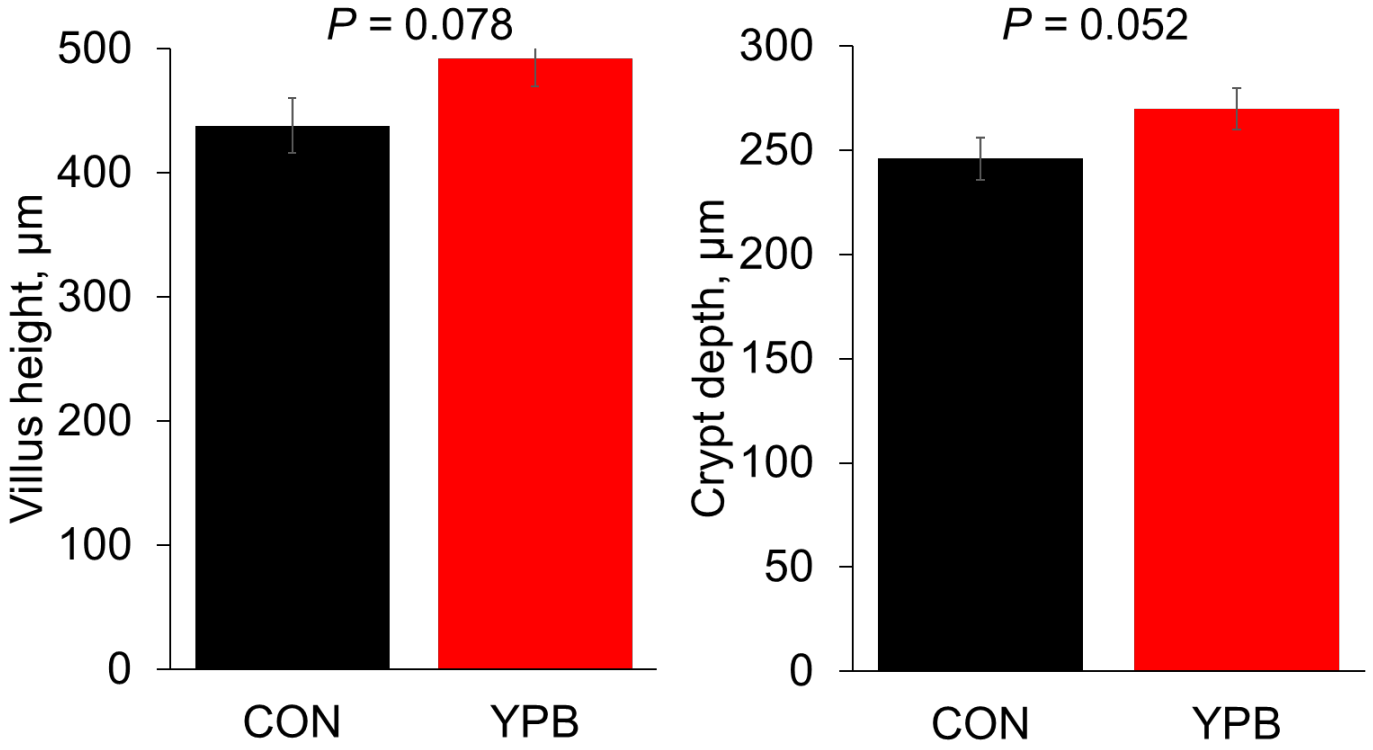
# Results: jejunal inflammatory response



# Results: jejunal barrier function

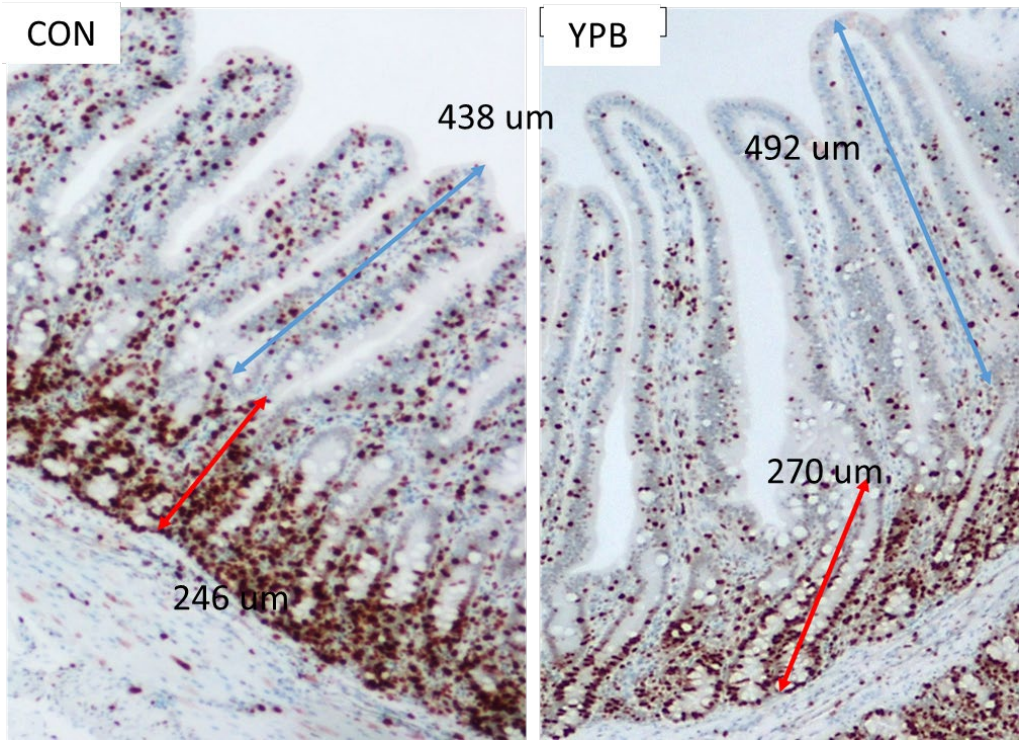


# Results: jejunal morphology

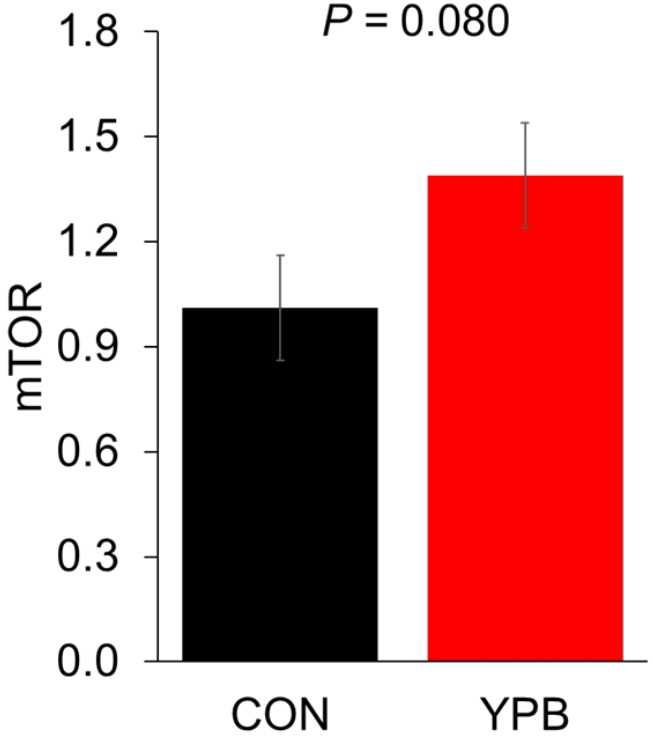


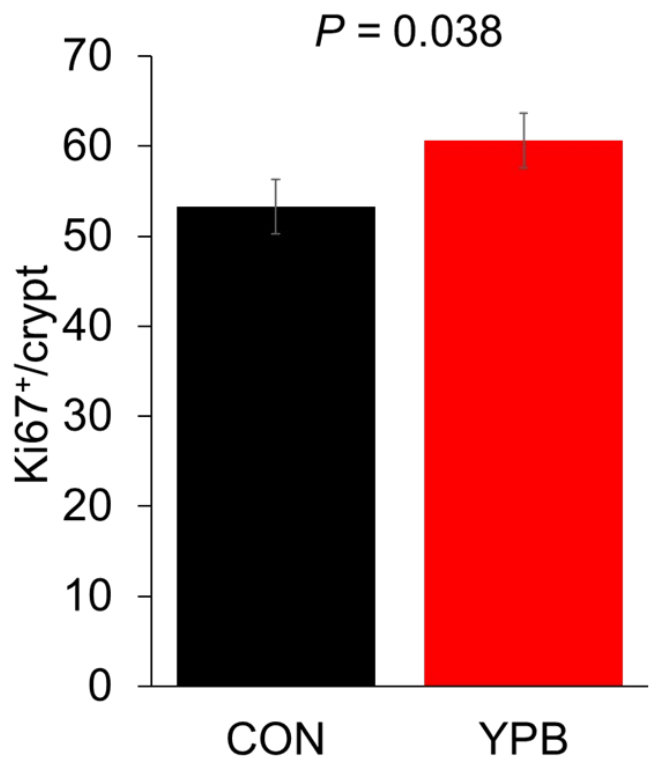


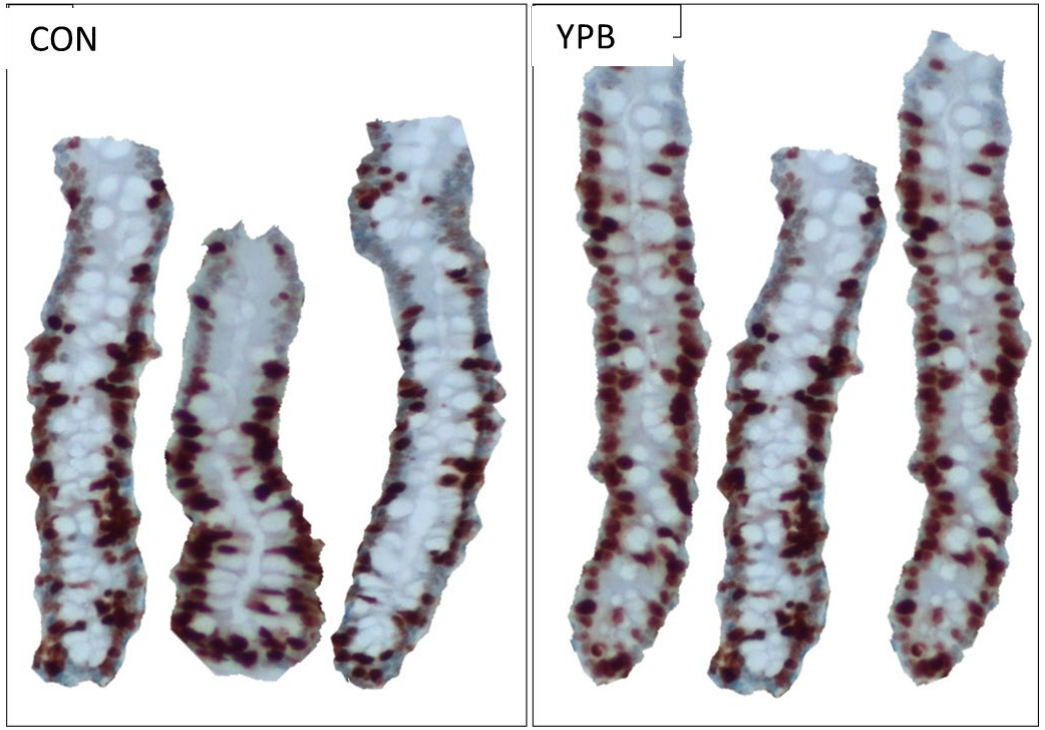




# Results: jejunal stem cell proliferation



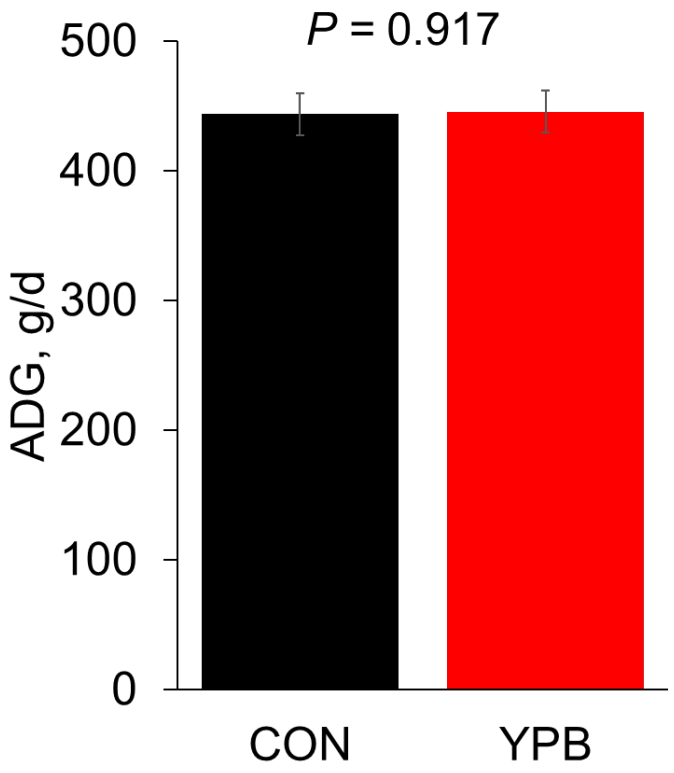



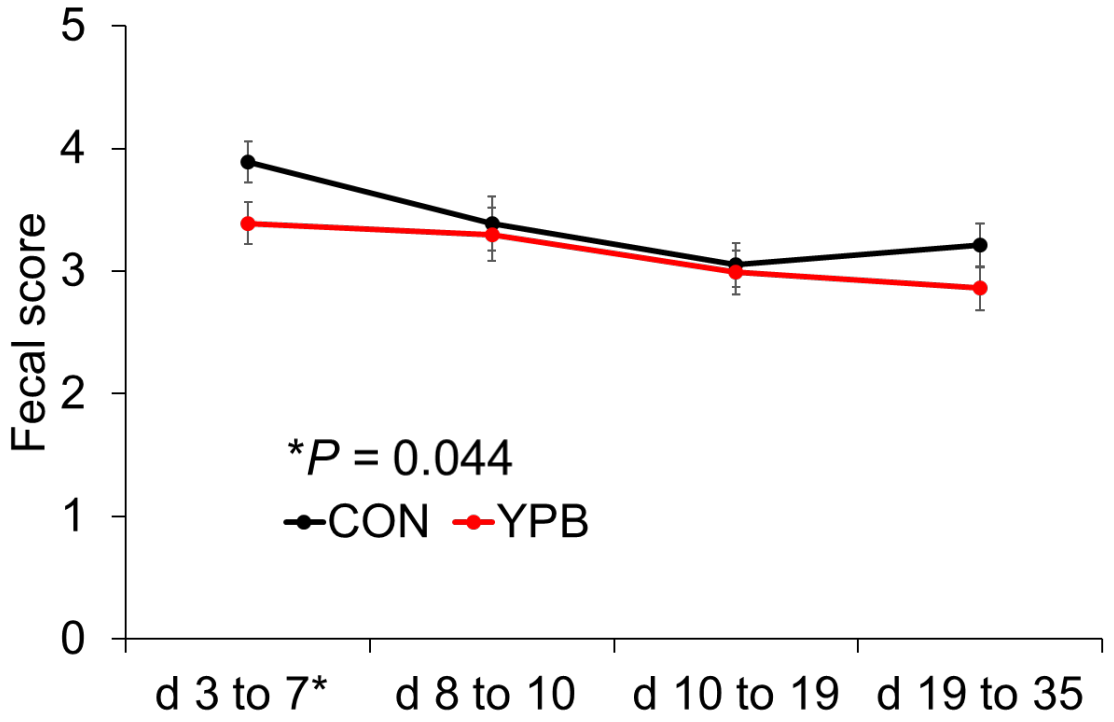




53.3 cells/crypt

60.6 cells/crypt

# Results: growth performance and fecal score



# Conclusion

- The supplementation of *Saccharomyces* yeast postbiotics (celluTEIN) at 175 g/ton of feed in nursery diets
  - Reduced diarrhea within the first week after weaning
  - Provided protection to the villi in the jejunum by enhancing the immunocompetence of nursery pigs
  - Promoted cell proliferation in the jejunum
  - Reduced the expression of genes associated with apoptosis without affecting inflammatory and oxidative stress in the jejunum and the growth performance of the nursery pigs.

# Thank you!

## Thoughts? Questions?

Acknowledgement:

PURETEIN Bioactive Protein Technologies

NC STATE UNIVERSITY

NC Agricultural Foundation

Contact:

Sung Woo Kim, Professor
sungwoo_kim@ncsu.edu
https://g.co/kgs/cWAqqS