



# Australasian Pork Research Institute Ltd APRIL

## PROJECT SUMMARY

**Project Number and Title:** A1-101- *Novel approaches for reducing antimicrobial resistant and pathogenic Gram-negative bacteria in the porcine gut.*

**Project Leader:** Professor Sam Abraham

**Project Participants:** Murdoch University; Feedworks.

### Aims and Objectives:

1. Evaluate the effect of specialised dried yeast ferments and specialised dried lactobacillus ferments in reducing the severity of enterotoxigenic *E. coli* (ETEC) infections in post-weaned pigs.
2. Evaluate the effect of specialised dried yeast ferments and specialised dried lactobacillus ferments in reducing antimicrobial resistant bacteria, focusing on CIAs, in the gastrointestinal tract of the post-weaned pig.
3. Evaluate the impact of specialised dried yeast ferments and specialised dried lactobacillus ferments on overall performance and indices of 'gut health' in post-weaned pigs.

### Methodology:

Three experiments were conducted to:

1. Examine the production and microbiological effects of postbiotics, in the form of *Lactobacillus acidophilus* fermentation products (LFP) and *Saccharomyces cerevisiae* fermentation products (SFP), on weaner pigs challenged with an F4 ETEC strain.
2. Explore the effects of LFP or SFP, alone or in combination, on the carriage of ESC (extended-spectrum cephalosporin)-resistant *E. coli* using an ESC-resistant *E. coli* challenge model.
3. Study the dynamics of antibiotic-resistant *E. coli* carriage in weaner pigs on a commercial farm using the Robotics Antimicrobial Susceptibility Platform (RASP), to quantify the effects of postbiotics' supplementation on ESC-, ciprofloxacin- and tetracycline-resistant *E. coli* and on production.

### Key Findings:

- Dietary supplementation with *Lactobacillus acidophilus* fermentation products (LFP) and *Saccharomyces cerevisiae* fermentation products (SFP) improved growth performance in pigs challenged with ETEC and positively influenced the faecal microbiota. This suggests that these postbiotics may have a role in managing porcine ETEC.
- An experimental model was successfully used to analyse strategies against extended-spectrum cephalosporin (ESC)-resistant *E. coli*. The model can be employed for other intervention studies aimed at decolonising resistant bacteria.
- In the established *in vivo* model, successful colonisation of ESC-resistant *E. coli* was detected in weaner pigs, but there was a reduction in shedding over time. However, the postbiotics had no significant effect on this reduction rate or on the growth performance of pigs.

- In a commercial nursery, high levels of tetracycline, ciprofloxacin, and ESC-resistant *E. coli* were found at weaning but naturally declined over four weeks following weaning. The postbiotic supplementation had no significant effect on the reduction rate or on growth performance.

**Applications to Industry:**

- Despite continued bacterial shedding, the use of postbiotic products in ETEC-inoculated post-weaned pigs showed promising benefits in terms of average daily growth and faecal health scores. This may be attributed to the increase in the diversity of intestinal microbiota in pigs with postbiotic-supplemented diets.
- Methods to remove CIA-resistant bacteria, once established in a herd, are needed. A combination approach of decolonisation, using competitive excluding clones, target-specific bacteriophages, nutritional additives, and/or removal of co-selection pressure, is worthy of consideration.