



# Australasian Pork Research Institute Ltd APRIL

## PROJECT SUMMARY

### Project Number and Title:

**A3B-105: EFFECTS OF NEGATIVE DCAD (DIETARY CATION-ANION DIFFERENCE) AND VITAMIN D IN SOW TRANSITION DIETS TO INCREASE PIGLET WEANING NUMBERS, IMPROVE PIGLET WEANING WEIGHT, AND MINIMISE SOW CONDITION LOSS DURING LACTATION**

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### Aims and Objectives:

The general aim of this project was to investigate the use of sow transition diets that delivered acidogenic feeds and a vitamin D metabolite, calcidiol, to improve the health, well being and production of pigs. Transition diets were compared to an industry standard practice of feeding a lactation diet, and were compared for optimal performance within transition diets.

This project addressed three research questions:

1. Will feeding a negative dietary anion cation difference (DCAD) transition diet from late in gestation to early lactation improve production outcomes?
2. Is there evidence that skeleton regulates energy metabolism in the pig as it does in other species as indicated by changes in blood metabolites?
3. Is there a positive interaction of both DCAD and the inclusion of calcidiol in a transition diet?

### Experimental design:

There were two studies within this investigation. One study compared feeding a lactation diet which was positive in DCAD to four different transition diets. These were designed to provide a comparison between negative DCAD with a basal level of cholecalciferol or with added calcidiol to positive DCAD diets, also with a basal level of cholecalciferol or with added calcidiol.

These diets i.e., negative DCAD with a basal level of cholecalciferol or with added calcidiol and positive DCAD diets, also with a basal level of cholecalciferol or with added calcidiol, were compared as a classical 2 by 2 factorial design of treatments. The studies were randomised controlled studies with sows allocated to treatments within blocks. A standard sow lactation diet was used as a comparison.

This study used 413 purebred Large White and Landrace primiparous and multiparous sows (parity 1 to 8; Myora Genetics) allocated to receive either a control diet (dry sow ration until entry to farrowing house then a lactating sow ration until weaning,  $n = 85$ ), or one of four transition diets fed from day 103 of gestation until day three post-farrow 1) Negative DCAD,  $n = 84$ , 2) Negative DCAD + calcidiol,  $n = 84$ , 3) Positive DCAD,  $n = 81$ , or 4) Positive DCAD + calcidiol,  $n = 79$ .

**Key Findings:**

- A significant reduction in stillbirths was observed in the negative DCAD + calcidiol and positive DCAD treatment groups compared to control sows (lactating sow ration).
- There was a significant reduction in mortality (↓ 4%) to day 120 of piglets offered the negative DCAD + calcidiol diet compared to piglets offered the control or positive DCAD + calcidiol diets.
- There was a (statistical) tendency for more than 0.9 additional piglets to be born in the subsequent litter for the negative DCAD and both positive DCAD groups compared to control sows.
- Urinary pH responses of sows to diets formulated to provide a positive DCAD diet indicated that there was acidification occurring in both positive and negative DCAD treatments. It is possible that the rapidly available starch in barley and wheat, that comprised approximately 50% of the diets, generated enough volatile fatty acids to reduce urinary pH.
- There were minimal differences in sow body condition during the experiment. However, negative DCAD + calcidiol-fed sows lost significantly less backfat during lactation than control-, negative DCAD- and positive DCAD + calcidiol-fed sows.
- Milk fat and protein, piglet weight and the number of piglets weaned was statistically similar for all five treatment groups. The lack of a significant effect on number of piglets weaned despite reductions in stillbirths and piglet mortalities was likely influenced by fostering.
- There were statistical differences reflected in blood gas, mineral and metabolite concentrations that are consistent with feeding of a negative DCAD diet, providing more evidence that negative DCAD diets may influence energy metabolism.

**Applications to Industry:**

- A separate transition diet for sows that incorporates increased fibre content and an ability to induce metabolic acidification is recommended for Australian pork producers.
- Further research is required to define the optimal period of transition feeding, investigate the effects in gilts, determine the optimal urine pH to target for outcomes, and characterise the effects of carbohydrate fractions in the diet on urinary pH and metabolic acidification.