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# 2A-105 : *Reducing the risk of post-weaning* E. coli *diarrhoea using a potentially innovative feeding ingredient, lupin hulls*

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## Aims and Objectives

This project comprised three studies aimed at determining the impacts that feeding non-starch polysaccharides (NSP) have on aspects of gastrointestinal tract structure and function, production, post-weaning diarrhoea and circulating measures of physiology and immune function.

1. *Virulence testing and serotyping of an enterotoxigenic E. coli (ETEC) isolate*, was directed at confirming the nature of the *E. coli* isolate used at Murdoch University in controlled infection studies.
2. *Determining the insoluble fibre requirement of weaner pigs when fed a diet containing either a low or high level of soluble fibre*, examined the effects of soluble and insoluble fibre on post-weaning diarrhoea (PWD), production, and physiological responses.
3. *Reducing the risk of E. coli by establishing a fibre recommendation after weaning*, was a commercial validation study conducted at CHM Westbrook based on the findings from Experiment 2.

## Key Findings

Experiment 1 clearly demonstrated that the toxin and serotype profile of the ETEC isolate used at Murdoch University for controlled infection studies is representative of those found in field cases of PWD.

Experiment 2 examined different ratios of insoluble NSP (iNSP) (as Opticell®) and soluble NSP (sNSP; as purified or semi-purified sources) in the diets under conditions of ETEC infection. Results suggested that using an iNSP source for weaner pigs in antimicrobial-free diets with lower sNSP levels had some beneficial effects on measures related to GIT structure and function, expression of PWD, and production in the 2 weeks after weaning, however in the third week after weaning, beneficial effects of higher sNSP levels were noted. Furthermore, and as measured by expression of tight-junction protein gene expression in the small intestinal epithelium, increasing the dietary iNSP content when there was minimum inclusion of sNSP enhanced intestinal barrier function. Diminished barrier function is a key aspect associated with weaning, so even in the absence of clinical disease/inclusion of antimicrobial compounds in feed/water, higher levels of dietary insoluble NSP could be considered to assist in the restoration of barrier function in the post-weaning period.

In contrast to Experiment 2, Experiment 3, which examined the inclusion of Opticell® (albeit at lower levels than used in Experiment 2) or sugar beet pulp (SBP), failed to improve the performance of pigs in the post-weaning period. Pigs in this study received medications that most likely contributed to the lack of effects, suggesting that the concomitant use of medications is likely to reduce any beneficial effects of feeding iNSP.

## Application to Industry

The type and level of NSP play important roles for pig growth, GIT structure and function, expression of diarrhoea, and aspects of physiology of weaner pigs.

Under conditions of higher pathogenic bacterial load and antimicrobial-free production, increasing the iNSP content in the diet and trying to minimise sNSP levels for weaner pigs immediately after weaning should be considered.

Data from the commercial validation study suggest, however, that the effects of including antimicrobial compounds need to be considered when evaluating the potential efficacy of manipulation of fibre types and content of the diet to reduce PWD and improve production indices.