

Sustainable Livestock Production LINK Programme

Project LK0680: Development of an Acute Phase Protein Index as an objective indicator of sub-clinical disease status in live pigs

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Executive summary report

Background. Sub-clinical disease as a major contributor to sub-optimal pig performance often goes unrecognized due to the absence of a suitable marker. Here, we assessed whether serum acute phase proteins (APP) can be used as objective markers to i) determine the contribution of sub-clinical disease to sub-optimal pig performance, and ii) to detect the presence of sub-clinical disease in pigs.

Approach. Two pilot studies showed that enterotoxigenic *Escherichia coli* (ETEC) and *Listeria monocytogenes* (LM) were appropriate pathogen models for inducing local and systemic challenges, respectively¹. Thus, for the main study, 4-wk old pigs were experimentally challenged with six doses of 10^6 , 10^8 and 10^{10} cfu ETEC or LM over 14 days, or sham-infected (controls). Daily weight gain and feed intake were assessed for 21 days, and serum samples taken before, during and after challenge were analyzed for haptoglobin (Hp), C-reactive protein (CRP), serum amyloid A (SAA), pig major acute phase

protein (pig-MAP), apolipoprotein-A1 (ApoA-I), albumin (Alb) and transthyretin (TT). Multiple linear regression was used to describe variation in feed intake from APP responses, whilst Bayesian modelling was undertaken to identify whether an APP Index could classify pigs as being infected or not.

Results. ETEC and LM challenges resulted in sub-clinical disease and APP responses², with no clinical signs. ETEC trickle challenge resulted in sustained faecal ETEC excretion, but temporarily reduced feed intake and body weight gain at 10¹⁰ cfu only. This was associated with short-lived increased Hp levels only. In contrast, LM trickle challenge resulted in pyrexia but did not reduce pig performance. However, Hp, CRP, SAA and pig-MAP levels increased with infection dose. ETEC and LM did not affect Alb or ApoA-I levels, whilst TT levels were undetectable. A multiple regression formula could describe the relationship between feed intake and selected APP (Hp, Alb and ApoA-I) in ETEC infected pigs through with good agreement between predicted and observed feed intake ($r = 0.69$). Furthermore, Bayesian modelling provided an APP Index with significant predictive power for classifying pigs used as sub-clinically infected or not, with good specificity but relatively poor sensitivity. Whether this predictive power increases through omitting some APP or through using different classifiers requires further study.

Conclusion. This feasibility study has shown that sub-clinical infection in young pigs evokes APP responses, and that an APP Index has the potential to objectively assess the presence and extent of sub-clinical disease in pigs. Further studies are required to verify observed findings under practical conditions, and to further address the relationship between APP responses and feed intake *per se*.

References

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