RESEARCH ABSTRACT

ANIMAL SCIENCE

Title: Optimizing nutritional strategies to improve the lifetime performance of healthy compromised pigs **– NPB #18-119**

Investigator: Dr. Nicholas Gabler

Institution: Iowa State University

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Scientific Abstract: The amino acid (AA) requirements and g standardized ileal digestible Lys per Mcal metabolizable energy (SID Lys:ME) for optimum performance is poorly understood in disease-challenged growing pigs. However, it has been reported that increasing g SID Lys:ME above requirement can help mitigate the reduction in growth performance due to viral challenge such as porcine reproductive and respiratory syndrome (PRRS) or Mycoplasma hyopneumoniae (MHP). Therefore, in three experiments, the objective of this study was to evaluate whether increasing the dietary ratio of SID Lys to metabolizable energy (ME) 120% above the requirement of healthy pigs could enhance growth performance in grow-finish pigs challenged with PRRSV and MHP. Experiment #1 used PRRS vaccinated (vac+; modified live vaccine [MLV] Ingelvac PRRS®) and non-vaccinated (vac-; no vaccine for PRRS) grower pigs that were subject to a PRRSV challenge. In addition, we evaluated if the dietary formulation approach to achieve a 120% ratio was significant by comparing increasing Lys relative to energy to diluting energy in relation to Lys. Within vaccine status, 195 mixed sex pigs, vac+ (35.2 ± 0.60 kg BW) and vac- (35.2 ± 0.65 kg BW) were randomly allotted to one of three dietary treatments (2.67, 3.23, and 3.22 g SID Lys:ME) for a 42 d PRRS virus challenge study representing 100, 120 (increased Lys) and 120% (dilution of ME via dietary inclusion of sand) of requirement respectively. The pigs were randomly allotted across two barns, each containing 24 pens with 7-10 pigs per pen (8 pens/diet/vaccine status). On dpi 0, both barns were intramuscularly inoculated with live virulent PRRSV and started on experimental diets. Over the 42 d challenge period, within vaccine status PRRS viremia and serology, BW, ADG, ADFI and G:F were determined weekly. Within vaccine status, diet did not influence PRRS viremia or antibody response. In both vac+ ($P < 0.05$) and vac- ($P < 0.05$) pigs, the 120% and 120S% diets increased end BW and overall ADG compared to pigs fed the 100% diet. Overall, ADFI increased by 20% in the 120S% vac+ pigs ($P = 0.003$) and by 17% in vac- pigs ($P = 0.001$) compared to pigs fed 100% treatment. The 120% vac+ pigs had the greatest G:F compared to the 100% and 120S% pigs (0.438 versus 0.394 and 0.391 kg/kg respectively; $P < 0.01$). In summary, increasing g SID Lys:ME to 120% by either

increasing Lys or decreasing ME improved growth performance of PRRSV challenged grower pigs. Furthermore, PRRSV challenged pigs ate to their energy needs as marked by the increase in ADFI in the 120S% pigs when energy was diluted. In both PRRS vac+ and vac- pigs subsequently challenged with PRRS virus, formulating diets with increased SID Lys:ME enhanced overall pig growth performance. In Exp. 2, vaccinated (vac+; mucosal killed autogenous PRRS vaccine) and non-vaccinated (vac-; no PRRS vaccine) grower pigs were subject to a PRRSV challenge. Then, in late finishing pigs were subsequently challenged with MHP (Exp. 3). In Exp. 2, a total of 464 mixed sex pigs (PRRSV vaccinated 33.6 ± 1.44 kg BW; non-vaccinated 34.7.2 ± 1.43 kg BW) were allotted to one of three dietary treatments: 1) a control diet formulated to contain 2.98 g SID Lys:ME (representing 100% of requirement), a diet containing 3.57 g SID Lys:ME achieved by increasing Lys (120% of requirement, HL) and a diet containing 3.57 g SID Lys:ME achieved by a reduction in dietary energy and increased Lys (120% of requirement, HF). Pigs were randomly allotted across two barns, each containing 24 pens with 9-10 pigs per pen (16 pens/diet and 24 pens/vaccine status). In Exp. 2, on day post inoculation (dpi) 0, all pigs were intranasally inoculated with live PRRSV and started on experimental diets. Weekly and overall challenge period pig performance were assessed. Overall, vaccination did not have an effect on overall ADG and ADFI; however, a tendency for non-vaccinated pigs to have an increase in overall G:F compared to vaccinated pigs was observed ($P < 0.10$). A tendency was also observed for HL pigs to have the greatest ADG (0.878 kg), control pigs to be intermediate (0.856 kg) and HF pigs the lowest ADG (0.830; $P < 0.10$). Overall ADFI was increased 8.6% and 3.6% in HF and HL pigs respectively compared to control ($P < 0.05$). An increase in overall G:F was observed in pigs fed control and HL diet compared to HF, 3.3% and 11.2%, respectively ($P < 0.05$). End BW did not differ between dietary treatment or vaccination status ($P > 0.05$). Eight days following the conclusion of the PRRSV challenge, Exp. 3 began with a total of 464 mixed sex pigs (79.57. ± 8.97 kg BW) allotted to one of two dietary treatments (1.95 and 2.34 g SID Lys:ME, representing 100% and 120% of requirement respectively) for a 40 d MHP challenge study with 9-10 pig per pen (12 pens/diet/MHP status). On dpi 0, one barn was inoculated with MHP, while the other barn was not inoculated (control), all pigs were started on experimental diets. Control pigs had no differences in overall ADG, ADFI, G:F or end BW due to dietary treatment ($P > 0.05$). The MHP infected pigs also had no difference in overall ADG, ADFI, G:F or end BW in response to dietary treatment ($P > 0.05$). In summary, PRRSV challenged grower pigs had increased in ADFI when energy was diluted in the (HF) diet, compared to control pigs improving growth performance. Regardless of vaccination status, pigs fed 120% Lys:ME diets had slightly improved overall growth performance in response to a PRRSV challenge. In the event of a late finishing bacterial MHP challenge in MHP vaccinated pigs, increasing the Lys:ME had no effect on growth performance or end BW.