

Feed intake, growth and carcass composition of weaned piglets receiving varying levels of valine and leucine in their diets

by

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Submitted in partial fulfilment of the
requirements for the degree of

Magister Scientiae Agriculturae – MSc (Agric)
Animal Science: Animal Nutrition

In the Faculty of Natural and Agricultural Sciences
Department of Animal and Wildlife Sciences
University of Pretoria
Pretoria

2011

ACKNOWLEDGEMENTS

I would like to acknowledge the following people and express my gratefulness to them for their incalculable efforts and contributions they offered me throughout the study.

To Rob Gous, since the first day I met him, I could see how passionate and enthusiastic he is about the nutrition field and that his knowledge thereof is invaluable. As my mentor and advisor he made the trial look very simple and straight forward. I want to express my greatest appreciation to him for his supervision and guidance throughout the study and that he trusted my ability to carry out such a trial. He encouraged me to believe that I could be much better than I ever thought I could be. I truly am honoured to have been able to work with a scientist of the highest ranks.

This project would not exist if it was not for the willingness and trust of the South African Pork Producers Organisation (SAPPO). I sincerely thank them for the funding of this trial and also for personal funding.

I am very grateful for the personal funding by the Protein Research Foundation. Making ends meet as a student has certainly been simplified.

I want to thank all the staff at Ukulinga Research Farm for their generosity, kindness and assistance throughout the trial. In particular Wiseman Manqele who assisted me throughout the trial with his experience. He certainly has made an enormous contribution by ensuring that the trial runs smoothly and effectively. I will always be grateful for his hard work. I also want to thank Anne Kinsey and Alet for all their efforts and arrangements they made. A special thanks to Sphamandla Ntshangase and John Kambula for their work during the weighing of pigs and feed and also during the slaughtering and mincing of the pigs.

I would also like to thank the technical staff in the Animal and Poultry Science Department, particularly Deborah Davies, Marianne Hundley and Philemon for carrying out the analyses of feeds and carcasses.

I want to thank my supervisor at the University of Pretoria, Christine Jansen van Rensburg, for allowing me the opportunity to go to Pietermaritzburg to carry out this project and for all her support and ideas throughout the preparation of the trial and while writing my thesis.

On a more personal note, I would also like to thank my parents for making all this possible from the start and for allowing me to take this once in a lifetime opportunity. Also to the rest of my family and all my friends, particularly those who stood by me throughout all these years. I would also like to thank all the people who made me feel so comfortable and at home in Wartburg during the trial period. Thank you for being there for me. I really am blessed to have so many wonderful people in my life.

Lastly, I want to thank my almighty God for giving me the knowledge, ability and possibility to complete this project and finish my masters degree.

ABSTRACT

The objective of this experiment was to determine the response of weaned piglets to dietary valine and to quantify antagonistic effects of excess dietary leucine on this response. 72 Large White x Landrace entire male piglets at 13.46 ± 1.18 (mean $\pm$ SD) kg were assigned to one of six dietary valine treatments [11.9 (T1), 10.1 (T2), 8.3 (T3), 6.6 (T4), 4.8 (T5) g/kg and T5 + supplemented valine (T6)] and one of three leucine treatments [standardised ileal digestible (SID) valine: leucine ratio of 0.52, 0.27 and 0.16]. Animals received feed *ad libitum* for a period of 18 days. A dilution technique was used to measure responses in feed intake, growth rate and carcass composition to a series of diets containing different valine and leucine concentrations. The summit diets were formulated to contain all amino acids (AAs) other than valine at 1.3 times the requirement and valine at 1.1 times the requirement. A dilution diet, devoid of protein but similar in all other respects, was used to blend the three summit diets to give three series of decreasing valine concentrations. Summit diet 1 was not supplemented with leucine. Summit diet 2 and summit diet 3 were supplemented with 20 g and 40 g leucine/kg feed respectively to create two diets of moderately and severely imbalanced valine to leucine ratios. Responses in feed intake (FI) and growth rates to varying levels of valine and leucine were observed, but only a response in carcass composition was seen when decreasing dietary valine concentrations were offered to pigs. At normal leucine levels, FI increased as dietary valine concentration decreased. Initially there was an increase in average daily gain (ADG), but as dietary valine concentration dropped, feed conversion efficiency (FCE) decreased and a higher FI did not result in higher ADG. Consequently, body lipid content increased as dietary valine concentration decreased. At moderately excess dietary leucine levels, FI increased initially as dietary valine concentration decreased and dropped sharply as valine content decreased below 8.3 g/kg. ADG initially increased as FI increased, but ADG dropped when FI dropped. FCE dropped and body lipid content increased as dietary valine concentration decreased. At severely excess dietary leucine levels, FI, ADG and FCE dropped and body lipid content increased as dietary valine concentration decreased. In conclusion, leucine did interact with valine and increasing the leucine to valine ratio resulted in poorer growth, but only at low valine concentrations. The depression of FI was not obvious at high valine levels, but the diet with the lowest valine content, which was most severely imbalanced, caused FI and growth to be severely depressed. However, valine supplementation to such an imbalanced diet was found to reverse such a depression of feed intake and growth. This confirms that excess leucine levels, which could often occur in commercial feeds containing

dried distillers grains with solubles (DDGS) and maize gluten, may cause an imbalanced AA pattern which affects growth and feed intake, especially when valine is given in low amounts. When the Reading Model was fitted to the response data for each leucine series, the amount of valine required per kg of body weight for maintenance was found to be 29.4 mg and 67.3 mg per g of protein gain. These coefficients were unaffected by the amount of leucine in the feed. The efficiency of valine utilisation for protein growth was determined to be 73 % and that an intake of around 9 g valine per day will yield maximal protein growth in pigs of the genotype used, and over the period of growth used in this trial.