

Meta-analysis of the response of piglets to dietary valine: impact of other branched chain amino acids

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Branched chain amino acids (AACR), valine (Val), isoleucine (Ile) and leucine (Leu) share the same metabolic pathways. A dietary excess of Leu seems to stimulate the catabolism of Val and Ile, leading to a decrease in piglet growth. The objective of this study is to quantify the response of piglets to dietary Val and the impact of Leu and Ile, on this response through a meta-analysis approach. 16 articles published between 2001 and 2018 and including 23 experiments and 126 treatments were used. Multiple regression models were fitted with the MIXED procedure of Minitab software with the random effect of the experiment. The Y variables were Average Daily Gain (ADG), Average Daily Feed Intake (ADFI) and Feed Conversion Ratio (FCR). The main X variable was the standardized ileal Digestible Val (ValSID) and the other ones were standardized ileal Digestible Leu (LeuSID) and standardized ileal Digestible Ile (IleSID). The response of ADG, ADFI and FCR to ValSID was curvilinear ($P < 0.001$: ADG, $R^2 = 0.93\%$; ADFI, $R^2 = 0.97\%$; FCR, $R^2 = 0.93\%$). Results showed that increasing dietary LeuSID reduced ADG and ADFI ($P < 0.05$) but also that the response of piglets to ValSID was higher in high LeuSID diet (Interaction ValSIDxLeuSID; ADG and ADFI, $P < 0.05$). Based on these models, increasing dietary ValSID from 7 to 8.5g/kg generates in wheat-based diets (10 g /kg of LeuSID) an improvement of ADG of 4.7% and ADFI of 2.5% compared to 7.4% for ADG and 5.2% for ADFI in corn-based diets (14 g/ kg of LeuSID). The response of ADG, ADFI and FCR to ValSID was not modified by IleSID (No interaction). This study showed that ADG and ADFI increases with increasing digestible Val and this effect was modulated by other BCAAs except for FCR. Results support that Leu was the most important regulator of BCAAs catabolism.

Key words: Piglets, ADG, ADFI, valine, leucine