

Protein intake but not feed intake affects dietary net energy measured by calorimetry

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The dietary net energy (NE) is supposed to be independent from feed intake and dietary protein levels. However, levels of feed and protein intake may change the ratio of protein to lipid deposition, which differ in energetic efficiency, and thus may alter the dietary NE content. Dietary protein (amino acids) in excess of requirement may be less energetically efficient.

To study the effects of dietary protein and feeding levels, 12 castrated male pigs each were offered two diets at 2.0 times the energetic maintenance requirement or ad libitum between 55 and 95 kg BW. Within feeding levels, pigs received amino acid adequate, low protein (LP, 12% CP) or high protein (HP, 20% CP) diets of equal SID lysine (0.61%) and DE. After 7 d adaptation, a 7 d balance experiment was conducted, followed by 24-h indirect calorimetry. NE was calculated from carbon-nitrogen balance and heat production, and predicted from digestible nutrient contents. Feed intake was greater for LP than HP when fed ad libitum. Weight gain increased ($P = 0.001$) and gain:feed decreased ($P = 0.001$) with feed intake, but were not affected ($P > 0.2$) by protein level. Increasing feed intake increased the digestibility of organic residue ($P = 0.001$), but not of other nutrients. Increasing protein level increased ($P < 0.05$) protein, fat and ADF digestibility but decreased ($P < 0.01$) digestibility of NDF and organic residue. DE was not affected ($P > 0.5$) by protein or feeding level. Metabolizable energy increased with feed intake ($P = 0.003$), but decreased ($P = 0.005$) with protein level. Heat production increased with feed intake ($P = 0.001$), but was not affected ($P > 0.4$) by protein intake. There was a tendency for an interaction ($P = 0.08$) between protein and feed intake for NE calculated from heat production. NE calculated by C-N balance was not affected by feed intake level ($P > 0.1$) but tended to decrease ($P = 0.09$) with protein intake. NE calculated from DE was not affected ($P > 0.1$) by protein or feed intake.

Implications: Dietary net energy responded little to feed intake, but tended to decrease with increasing protein intake. This indicates that the energetic value of protein may change with dietary protein intake.
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