

Dietary electrolyte balance improves the performance of weaner pigs fed on casein-based purified diets

V Ravindran, K Angkanaporn, M Imbeah, LI Hew, WL Bryden

Department of Animal Science, The University of Sydney, Camden, NSW 2570

Casein is used as a standard protein in purified diets because of its high amino acid digestibility. During a series of studies conducted to determine endogenous amino acid losses in weaner pigs fed diets containing casein, dextrose and vitamin-mineral supplements, it was observed that the feed intake and growth rate were disappointing. Since feed intake and body condition can influence endogenous amino acid output (1), the aim of the present study was to develop a casein-based purified diet that can support acceptable pig performance. It was suspected that this poor performance may be related to (i) the low dietary electrolyte balance (DEB; Na + K - Cl) and/or (ii) the low ratio of tryptophan to lysine (T/L) of the casein diet. The DEB of the casein diet used in our studies was calculated to be zero, whereas diets with 250 meq of DEB/kg have been recommended for optimum growth in pigs (2). The T/L ratio in the casein diets was 0.13, whereas the optimal T/L ratio for weaner pigs has been reported to be 0.18 (3).

Four dietary treatments, arranged as a 2 x 2 factorial design, compared 0 vs 250 meq/kg of DEB and 0.13 vs 0.18 of T/L ratio. The DEB was increased by adding 12 g/kg NaHCO₃ and 15 g/kg KH₂PO₄. The basal diet (dextrose, 650 g/kg; casein, 240 g/kg; vegetable oil, 30 g/kg and supplements, 80 g/kg) contained 215 g/kg crude protein and 18.3 g/kg lysine. Forty eight, 6-wk-old male weaner pigs (mean initial weight, 16.2 kg) were allotted randomly from uniform blocks based on weight and litter. Each diet was fed to two pens of six pigs each for 21 days and, individual pig weights and pen feed intake were recorded at weekly intervals. The data were analysed by the General Linear Models procedure.

There were no significant interactions ($P < 0.05$) between DEB and T/L ratio for any of the parameters. The weight gains and feed intake of weaner pigs were improved ($P < 0.001$) and the feed/gain was lowered ($P < 0.01$) by increasing the DEB. The daily weight gains of pigs fed diets containing 0 and 250 meq DEB/kg were 179 and 584 g, respectively. Corresponding values for daily feed intake and feed/gain were 564 and 965 g; and 3.25 and 1.66, respectively. Increasing the dietary T/L ratio from 0.13 to 0.18 had no influence on the weight gains and feed intake, but tended to lower ($P < 0.10$) the feed/gain. These results suggest that the manipulation of DEB in casein-based purified diets is necessary to optimize pig performance.

1. Sibbald IR. Estimation of bioavailable amino acids in feedingstuffs for poultry and pigs: A review with emphasis on balance experiments. *Can J Anim Sci* 1987;67:221-300.
2. Austic RE, Calvert CC. Nutritional interrelationships of electrolytes and amino acids. *Fed Proc* 1981;40:63-7.
3. Fuller MF, Wang TC. Digestible ileal protein - a measure of dietary protein value. *Pig News and Inform* 1990;11:353-7.