

# The response of growing pigs to amino acids as influenced by environmental temperature: tryptophan

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## Abstract

*An experiment was performed to measure the response of young pigs to dietary tryptophan (TRP) concentrations and environmental temperatures. Seventy-two entire male Large White × Landrace pigs were assigned to one of six dietary treatments (2.90 (T1), 2.46 (T2), 2.01 (T3), 1.57 (T4), 1.12 (T5) g/kg and T5 + supplemented TRP (T6)) and one of three temperature treatments (20, 25 and 30°C) at a mean starting live weight of 14.38 (s.e. 0.201) kg. Animals were given ad libitum access to food until a final weight of 26.42 (s.e. 0.479) kg. There were no significant interactions between temperature and dietary TRP on any production variable. There was a significant ( $P < 0.05$ ) quadratic improvement in the rate of live-weight growth (ADG) as the concentration of dietary TRP increased and as the temperature decreased. However, the response to increasing dietary TRP was independent of the environmental temperature. Maximum ADG was attained on T2 (0.498 (s.e. 0.023) kg/day) and at 20°C (0.412 (s.e. 0.024) kg/day). Final live weight was a significant ( $P < 0.001$ ) covariate for ADG and food intake (FI) responses. With TRP as a precursor for serotonin, a neurotransmitter that regulates appetite, it was anticipated that food intake would be affected with decreasing dietary TRP levels. However, there was no response in daily food intake to decreasing TRP concentration. This lack of response in appetite to dietary TRP may have been a result of an increasing TRP to large neutral amino acid ratio, which is known to correlate with an increase in serotonin synthesis. Total heat loss followed a similar response to FI. The gain per unit of food consumed was significantly ( $P < 0.001$ ) reduced as the TRP content of the diet was decreased. The most efficient treatments were T1 (506 (s.e. 19.0) g gain per kg food) and T2 (495 (s.e. 23.2) g gain per kg food) while the worst was T5 (237 (s.e. 22.3) g gain per kg food). There were significant quadratic responses to dietary TRP in protein content of the empty body ( $P < 0.05$ ) and the rate of protein retention (PR) ( $P < 0.01$ ) but only PR was affected by temperature ( $P < 0.01$ ). Both temperature ( $P < 0.05$ ) and dietary TRP ( $P < 0.001$ ) had a significant effect on the lipid content of the body but only temperature affected the rate of lipid retention, with a significantly ( $P < 0.001$ ) lower rate at 30 °C. The efficiency of TRP utilization improved with increasing temperature. It was lowest at 20°C (0.60 g TRP per kg protein) and highest at 30°C (0.86 g/kg), while the mean efficiency for pigs between 14 and 26 kg live weight, at thermoneutrality (25°C), was close to 0.71 g/kg.*

**Keywords:** heat loss, pigs, temperature, tryptophan.