

### **Supplementation of amino acids at requirements for optimal growth largely counteracts the negative effects of low protein diets on tail biting in pigs, while extra enrichment is less effective**

Ilaria Minussi<sup>1,2,3,\*</sup>, Walter J. J. Gerrits<sup>2</sup>, Alfons J. M. Jansman<sup>3</sup>, Rosemarijn Gerritsen<sup>4</sup>, Johan J. Zonderland<sup>5</sup>, William Lambert<sup>6</sup>, J. Elizabeth Bolhuis<sup>1</sup>

<sup>1</sup> *Adaptation Physiology Group, Wageningen University, Wageningen, 6708 WD, the Netherlands*

<sup>2</sup> *Animal Nutrition Group, Wageningen University, Wageningen, 6708 WD, the Netherlands*

<sup>3</sup> *Wageningen UR, Livestock Research, Wageningen, 6708 WD, the Netherlands*

<sup>4</sup> *ForFarmers Nederland B.V., Lochem, 7241 CW, the Netherlands*

<sup>5</sup> *De Heus Animal Nutrition, Ede, 6717 VE, the Netherlands*

<sup>6</sup> *METEX NØØVISTAGO, 32 rue Guersant, 75017 Paris, France*

\* *Presenting author: ilaria.minussi@wur.nl*

Dietary crude protein (CP) content is often lowered to reduce ammonia emissions, but may increase damaging behaviours in pigs. To investigate the potential of essential amino acid (EAA) supplementation to counterbalance the expected deleterious effects of low CP diets on tail biting, 576 undocked pigs (n=48 groups of 12, two batches) were observed from 10/11 (trial week 0) to 23/24 weeks of age on a commercial farm. Pens contained a chain, jute sack and tube with straw bricket. Pigs had ad libitum access to either a normal CP diet (NP; 175, 159, 143g/kg for starter, grower, finisher phase), a low CP diet (LP; -20% CP compared to NP), a LP diet with supplemented EAA (LP<sup>+</sup>; EAA at the same level as NP diet), or a LP diet with additional pen enrichment (LP-E<sup>+</sup>; wooden beam, rope, 350g of straw daily). Behaviour (6x10- min behaviour sampling/week), activity (12x10-min scan sampling/week), and tail damage (0- 5 score) were recorded in week 2 (starter phase), 4, 6 (grower phase), 8, 11, and 13 (finisher phase) of the trial. Fixed effects of treatment, phase and their interaction, and random effects of pen and batch were analysed with (generalized) mixed models. In case of tail biting outbreaks a stepwise 'safety protocol' was followed including extra enrichment and removal of biter and/or victim. Throughout all phases, LP and LP-E<sup>+</sup> were more active than NP and LP<sup>+</sup> pigs (P≤0.001). LP-E<sup>+</sup> showed most enrichment interaction, followed by LP, and then LP<sup>+</sup> and NP pigs (P≤0.001). Tail biting frequency was higher for LP compared to the other treatments in the starter phase (P≤0.001), and tended to be higher for LP than for NP and LP<sup>+</sup> in the finisher phase, with LP-E<sup>+</sup> in between (P<0.1). Over all phases, LP pigs had the highest tail damage scores and NP the lowest (P<0.05), with LP-E<sup>+</sup> in between LP<sup>+</sup> and LP, and LP<sup>+</sup> in between NP and LP-E<sup>+</sup>. Tail damage in LP-E<sup>+</sup> tended to increase after the starter phase (P<0.1). The proportion of days the 'safety protocol' interventions were necessary was higher for LP and LP-E<sup>+</sup> than for NP and LP<sup>+</sup> pigs (P<0.01), which may have led to an underestimation of the negative effects of the LP diet. In conclusion, supplementation of EAA at requirement for optimal growth appeared to largely counteract the negative effects of LP diet on tail biting across phases, while additional enrichment seemed to be effective only during the starter phase.