Session 6 Nutrition Dietary functional components: effects on animal performance, health and environment

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Dietary hydroxy methionine supply in pigs: associated changes in muscle biological processes

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Methionine (Met) is an essential amino acid (AA) in pigs and the third limiting AA in cereal based diets. Met supplementation improves animal's performance and protein gain. Besides, Met is considered as an important factor in the control of oxidative status with potential benefits on health and meat quality. This study aimed at investigating the effects of dietary Met provided in excess relative to growth requirements on muscle metabolism in finishing pigs. During the last 14 days before slaughter, crossbred pigs were individually fed diets (13.6% protein, 5.8% fat, 10.8 MJ/kg Net energy, 0.73% Lys) supplemented (Met++) or not (CONT) with OH-Met (n=15 pigs/diet). Dietary Met content was 0.22% and 1.1% in CONT and Met++ diets, respectively. Growth rate, carcass lean meat content and Longissimus muscle (LM) weight at slaughter did not differ between the two groups. In LM, the free AA profile was modified ($P<0.05$) towards greater Lys, Pro, 3-methylHis and α-aminobutyric acid concentrations and lower Gln content in the Met++ pigs compared with CONT pigs, whereas Met and taurine contents did not significantly differ between the two groups. Glutathione content, the major non-enzymatic intracellular antioxidant synthetized from Met and Cys, was increased ($P<0.001$) in LM of Met++ pigs, but the ratio of oxidized to reduced glutathione forms did not differ between the two groups. Hexokinase and lactate dehydrogenase, two enzymes involved in glycolysis, displayed similar activities in the two groups. On the opposite, the activity of citrate synthase involved in oxidative metabolism was lower ($P=0.02$) in LM of Met++ pigs compared with CONT pigs. The expression of genes involved in protein synthesis, protein catabolism, energy metabolism, and autophagy, a process tuned by oxidation/redox signaling, was studied. Altogether, the results suggest an extensive utilization of the Met in excess for glutathione synthesis. A short-term extra dietary Met supply in finishing pigs altered muscle AA and energy metabolisms, which could in turn modify post-mortem biochemical processes of muscle transformation into meat and affect pork quality traits.