

2. Effects of Dietary Protein level and Digestibility on Ileal digesta flows and Caecal Fermentation in Broilers

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Highly digestible proteins are expected to become less available for poultry diets in the future, likely resulting in diets containing higher concentrations of undigestible protein. These undigestible proteins flow into the caeca, resulting in protein fermentation (PF). Caecal PF is hypothesized to negatively affect gut health of broilers, due to the metabolites produced. In this study, the effects of both protein level and digestibility were studied. Experimental diets contained either 19% or 23% crude protein and one of three digestibility levels; low (rapeseed meal, RSM), high (rapeseed protein isolate CanolaPRO™, PI) or middle (a 50:50 mixture of RSM and PI). By reducing the protein level of RSM and by replacing RSM for PI, the fibre level of the diet was reduced. Therefore, 3 additional diets were formulated where ground sunflower seed hulls (SFH) were included in the low protein, PI and mixture diets to equalize fibre level over the diets. This resulted in a total of 8 diets, allowing the evaluation of the effect of protein level, protein digestibility and SFH addition. Broilers fed the high protein diets had an improved feed conversion ratio (1.39 vs. 1.46, $P=0.001$), but a lower feed intake (109 vs. 120 g/d, $P<0.001$). Partly replacing RSM protein with PI improved ileal protein digestibility (78.7 vs. 73.3 %, $P=0.006$), but no further improvement was found when PI fully replaced RSM protein. This indicates that other diet constituents impact the protein digestibility of RSM and PI. The digesta flow of soluble nitrogen in the distal ileum was determined as an indicator of protein availability for caecal PF. This digesta flow was, however, unaffected by protein level and digestibility, due to the reduced feed intake. Consequently, little effect of protein level or digestibility was found on PF metabolites in the caeca, except that histamine (5.8 vs. 0.8 nmol/g, $P=0.008$) and tyramine concentrations (19.3 vs. 7.2 nmol/g, $P=0.038$) increased with high protein in RSM diets. SFH addition increased ileal protein digestibility in the RSM diet (77.1 vs. 72.8, $P=0.015$) and in the PI diet (77.7 vs. 73.5, $P=0.019$), but not in the mixture diet. Furthermore, the effect of SFH addition on caecal metabolite concentrations differed between RSM, mixture or PI diets, indicating that the fibre from RSM shows a different fermentation pattern than SFH.