HYDROLYSIS AND ABSORPTION OF HMB OLIGOMERS ARE COMPLETE IN THE CHICKEN INTESTINE

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Methionine is the first limiting amino acid in poultry nutrition. A synthetic supplement is usually supplied either as DL-methionine (DLM) or as DL-HMB (hydroxy analogue, 2-hydroxy-(4-methylthio) butanoic acid). In both cases, D-methionine and DL-HMB have to be converted into L-methionine to be functional in chickens. Moreover, in solution, HMB forms oligomers that have to be hydrolyzed prior to conversion. The first study investigated both the capacity of the intestine to hydrolyze HMB oligomers as well as the absorption of HMB along the chicken small intestine. The second study determined the capacity of the chicken intestine to convert HMB to methionine and to use it as a substrate for taurine and cysteine synthesis.

The capacity of the intestine to hydrolyse HMB oligomers and the regional profile of monomer uptake along the chicken small intestine were compared with an HMB-product containing only monomer. In vivo HMB perfusion of the jejunum shows that the intestine hydrolyses the oligomers efficiently, and there were no significant differences between the two hydroxy analogue sources in monomer disappearance from the intestinal lumen or in plasma concentration. The results obtained in everted sacs showed that there were no statistical differences between the two substrates tested in monomer serosal appearance or tissue accumulation, and that a higher uptake for the jejunum and ileum than for the duodenum, but no significant regional differences in oligomer hydrolysis. Due to the high hydrolytic activity detected in the small intestine, it can be concluded that HMB oligomer hydrolysis is not limiting in the supply of methionine from this source.

In order to evaluate the efficacy of the conversion of HMB into methionine, the synthesis of taurine and cysteine was also evaluated. Conversion of HMB into L-methionine starts by a two step-mediated process which begins in the intestine for D-HMB. The concentration of these sulphur-containing amino acids was quantified in the serosal compartment of everted sacs from the chicken small intestine (D, duodenum, J, jejunum and I, ileum) incubated in the presence of 7 mM HMB or L-methionine on the mucosal side at two pH conditions (5.5 and 7.4). The results showed that, as previously described, HMB transport capacity is higher at pH 5.5 than at pH 7.4 (pH 5.5 vs 7.4: D, P<0.05 and, J and I, P<0.05 1.6- and 1.3-fold, respectively). Methionine and taurine appearing in the serosal compartment showed a similar pH profile to HMB transport, whereas no pH effect was detected for cysteine (methionine pH 5.5 vs 7.4: D and I, P<0.05 1.7- and 1.6-fold and J, P>0.05 and, taurine pH 5.5 vs 7.4: D, P>0.05 and, J and I, P<0.05 1.8- and 1.7-fold). Regional comparisons showed that the jejunum and ileum had a higher HMB transport capacity than the duodenum (P < 0.05), but this behaviour is not reflected in the analysis of sulphur-containing amino acids. Taurine reached similar levels (P>0.05) in HMB and L-methionine incubated sacs and cysteine had significantly higher values at pH 5.5, in HMB than in L-Met sacs (D, J and I, P<0.05 2-, 2.1- and 2.5-fold, respectively). We concluded that taurine and cysteine production are similar from both sources of methionine. Moreover, the ability of the chicken intestine to convert HMB to sulphur-containing amino acids is related to its capacity to transport this substrate.

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