Proc. Nutr. Soc. Aust. (1978) 3: 74.

EFFECT OF METHIONINE INFUSION ON OVINE METHIONINE AND CYSTINE METABOLISM

by

P.F. FENNESSY*, A.R. EGAN and B.C. RADCLIFFE

Waite Agricultural Research Institute, The University of Adelaide, Glen Osmond, South Australia, 5064.

When sheep are fed low quality roughage diets, methionine appears to be the essential amino acid first limiting for N retention. Despite this, provision of as little as double the estimated methionine requirement by abomasal infusion can have adverse effects. Feed intake is reduced, N retention falls, plasma methionine concentration rises steeply (Fennessy, 1976) and activity of hepatic methionine adenosyltransferase (EC 2.4.2.13) is decreased (Radcliffe and Egan, 1978). Data presented are from an experiment to examine the effect of level of methionine infusion on the sites, pathways and rates of methionine catabolism and of cystine production. Six Dorset x Merino wethers were fed chopped wheaten hay : barley straw (2:1) which provided 0.14 to 0.20 mmole methionine/hr at the duodenum and were given L-methionine by abomasal infusion at rates up to 1.5 mmole/hr for 6 days. Using ^{35}S-methionine and ^{3}H-cystine infused per jugular vein for 15 hours, irreversible loss (IL) of methionine and cystine, and the contribution from methionine to cystine were calculated from plasma plateau specific activities. Sheep were sacrificed on completion of the experiments and specific activities of free methionine (^{35}S) and cystine (^{3}H and ^{35}S) in tissues were compared with specific actvities of the metabolites in the plasma. Data for liver only are presented here.

Met. infused (mmole/ hr)	Plasma conc. (mmole/ litre)	Met.IL (mmole/ hr)	Cys.IL (mmole/ hr;½cys)	Cys.from Met. (mmole/ hr;½cys)	Specific Activity Ratios (Liver/plasma) Met(^{35}S)		Cys. (^{35}S)	Cyst. (^{3}H)
0	43.9	0.56	0.15	0.03	0.12	0.34	0.57	0.04
0	29.0	0.57	0.22	0.03	0.10	0.28	0.78	0.06
0.37	82.0	1.11	0.17	0.08	0.22	0.68	1.1	0.05
0.50	246.0	1.27	0.33	0.06	0.27	0.56	1.1	0.05
1.14	1050.0	1.92	0.36	0.07	0.68	1.0	0.71	0.04
1.47	1880.0	3.56	0.35	0.12	0.80	1.0	0.56	0.02

Cystine IL increased with increasing methionine supply, but while methionine IL increased 6-fold, there was only a 2-to 4-fold increase in the contribution of methionine-S to cystine-S. Plasma cystine appeared to contribute very little to the liver free cystine pool, relative to the intracellular contribution from methionine and from protein turnover. As methionine load increased, the proportional contribution of methionine from plasma to the enlarged tissue methionine pool in liver increased; the contribution of cystine from the plasma to the tissue cystine pool decreased; and the proportion of the tissue cystine pool derived from methionine appeared to increase at low methionine infusion rates but to decrease at higher rates. The efficiency of mixing between the plasma and the hepatic tissue compartments of the methionine and of the cystine pools may alter as methionine load increases, implying differential effects on hepatic intracellular compartments of cystine.

REFERENCES

FENNESSY, P.F. (1976). Ph.D. Thesis, Univ. Adelaide, South Australia.

RADCLIFFE, B.C. and EGAN, A.R. (1978). Aust. J. biol. Sci. 31.

*Present address: c/o. Invermay Res. Centre, Mosgiel, New Zealand.