

PHENYLALANINE AS A MARKER OF MUSCLE PROTEIN SYNTHESIS

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When leucine (Leu) is used to measure protein synthesis by label exchange across muscle tissue it is necessary to account for appearance of its keto acid, 4-methyl-2-oxopentanoic acid (KIC), and CO₂. Phenylalanine (Phe) is not metabolised in muscle, and is accordingly simpler to use. Here we have compared Phe with Leu to ascertain if Phe is suitable for measurement of protein synthesis using label exchange across hind limb muscle of sheep.

Five adult sheep (40 - 45 kg) were used. Indwelling catheters were placed in a carotid artery, jugular vein and both femoral veins (Oddy and Lindsay 1986). A continuous infusion of L-[1,14C] Leu and L-[4,3H] Phe was made into the jugular vein for 6 h, during which samples of blood were taken from the carotid artery and both deep femoral veins at hourly intervals. Blood flow was measured during the last hour of the infusion, and the animals were then killed and muscles sampled. Sampling, preparation and analysis of tissues and blood were as previously reported (Oddy and Lindsay 1986), except that amino acids were quantified by fluorimetric detection of their o-phthalaldehyde derivatives. Fractional synthetic rate (FSR, %/d) of muscle protein was calculated from tissue analysis (Garlick et al. 1973), and from label exchange across the hind limb (Barrett et al. 1987) with Leu exchange corrected for net KIC balance.

Leu and Phe gave similar estimates of FSR whether calculated from label exchange or tissue analysis. FSR calculated using the specific activity of intracellular Phe and Leu appeared to be greater than that calculated using all other methods, with FSR calculated from label exchange intermediate between that obtained using the possible precursor pools and tissue analysis.

	Tissue analysis				Label exchange across tissue		
	calculated using specific activity in :				based on analysis of :		
	Intracellular water	Plasma		Blood		Plasma	Blood
	Artery	Vein	Artery	Vein			
FSR (%/d)							
Phe	3.50	1.60	1.81	1.46	1.63	2.25	1.83
Leu	3.60	1.84	2.16	1.65	1.86	2.52	1.96
average							
sd	1.14	0.29	0.33	0.47	0.52	0.91	0.68

FSR, calculated from label exchange, was always greater when based on plasma rather than blood amino acid specific activity, indicating that, in sheep, plasma is the major carrier of amino acids for protein synthesis in hind limb muscle. Similar results were obtained with both labelled amino acids, but the simplicity of use of phenylalanine makes it the more attractive.

BARRETT, E.J., REVKIN, J.H., YOUNG, L.H., ZARET, B.L., JACOB, F. and GELFAND, R.A. (1987). *Biochem. J.* **245**: 223.

GARLICK, P.J., MILLWARD, D.J. and JAMES, W.P. (1973). *Biochem. J.* **136**: 935.

ODDY, V.H. and LINDSAY, D.B. (1986). *Biochem. J.* **233**: 417.