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FATTY ACID METABOLISM IN FASTED PREGNANT EWES

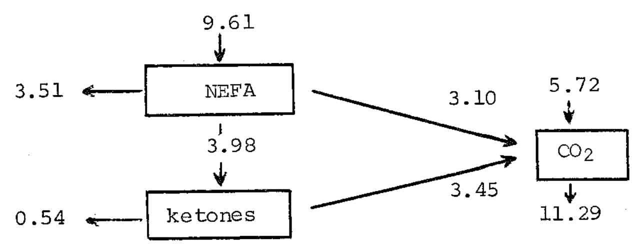
D.W. PETHICK* and D.B. LINDSAY†

The quantitative significance of ketone bodies and nonesterified fatty acids (NEFA) to the energy metabolism of fasted pregnant ewes is poorly understood. Metabolism of specific substrates can be determined in the whole animal by combining the techniques of isotope dilution and open circuit calorimetry (see Linzell and Annison 1975). This report summarises the results obtained from the measurement of NEFA and ketone body metabolism in fasted pregnant ewes.

In this study a total of 17 three-day fasted, 110-130 days pregnant, Clun Forest ewes were placed in an open circuit calorimeter and given an intravenous infusion of 80-150 μCi of ^{14}C radiolabelled metabolite for 5 h. Steady-state arterial metabolite specific radioactivities were used to determine metabolite entry rate while the steady state specific radioactivity of expired CO_2 was used to determine oxidation. The entry rate of total NEFA was similar whether calculated using tracer [1-^{14}C] palmitate (1 sheep), [1-^{14}C] stearate (4 sheep) or [1-^{14}C] oleate (4 sheep). This suggests that in fasted pregnant ewes the individual fatty acids are mobilised and utilised similarly, relative to arterial concentration. Ketone body entry rate and oxidation were determined using tracer [U-^{14}C] D-3-hydroxybutyrate (7 sheep) or [3-^{14}C] acetoacetate (2 sheep) and analysed by a compartmental model to overcome the extensive, but incomplete interconversions of the two ketones (see Barton 1980).

The mean (±S E.) concentrations of plasma NEFA and blood D-3-hydroxy-butyrate and acetoacetate were 1.59±0.20 mM, 2.72±0.46 mM and 0.5±0.05 mM respectively. Carbon flow rates of NEFA, ketones (assuming that ketones are derived totally from NEFA) and CO_2 are shown below.

Carbon flow of NEFA, ketone bodies and CO_2 in fasted pregnant ewes
(mAt. carbon/hr/kg body weight)



Some 58 per cent of the total CO_2 production arose from the oxidation of NEFA. Thus, NEFA must be regarded as a major energy fuel in fasted pregnant ewes. Although some NEFA entered nonoxidative pathways, most of it was oxi-dised (74%) in approximately equal proportions either directly, or via ketones.

BARTON, R.N. (1980). Metabolism 29 : 392.
LINZELL, J.L. and ANNISON, E.F. (1975). In 'Digestion and Metabolism in the Ruminant' p. 306, editors I.W. McDonald and A.C.I. Warner. (Univ. New England Publishing Unit : Armidale).

* School of Veterinary Studies, Murdoch University, Murdoch WA 6150
† Agricultural Research Council, Institute of Animal Physiology, Babraham, Cambridge, CB2 4AT, UK