CORRELATION BETWEEN CHANGES IN NON-ESTERIFIED FATTY ACID ENTRY RATE AND BODY FATNESS IN GOATS

F.R. DUNSHEA*, T.E. TRIGG**, K.D. CHANDLER* AND A.W. BELL*

Plasma concentrations of non-esterified fatty acids (NEFA) were negatively correlated with estimated energy balance in non-lactating pregnant and non-pregnant beef cattle (Holmes and Lambourne 1971; Russel and Wright 1983). The aim of this study was to determine whether plasma NEFA concentrations and/or entry rates could be used to accurately predict changes in body fat during chronic undernutrition in goats.

Five non-lactating, non-pregnant Saanen does of varying size (range 39-67 kg) and body composition (24-36% estimated fat) were housed indoors and fed continuously an estimated maintenance ration for at least 1 month before initial measurements. Catheters were inserted into both jugular veins and 2 d later a mixture of [1-^{14}C]- palmitic, - stearic and - oleic acids, complexed in caprine plasma, was infused I.V. for 4 h. At least 5 blood samples were withdrawn during the last 2 h. These samples were analyzed for plasma NEFA and glycerol concentrations and NEFA specific radioactivity (SRA). Immediately after the infusion, feed and water were removed, and 18 h later a bolus of tritiated water (TOH) was given I.V. Tritiated water dilution was determined by measuring the water SRA of a blood sample taken 6 h after TOH injection (Searle, 1970). Animals were then given a ration that provided half the calculated energy maintenance requirement for periods ranging from 2 to 6 weeks. The above procedures were then repeated.

Restricted feeding resulted in appreciable but statistically non-significant increases in plasma NEFA concentration (149±24 v. 228±27 μmol/l; mean ± sem; P = 0.06) and entry rate (125±22 v. 172±24 μmol/h/kg; P = 0.07). There was little change in mean glycerol concentrations (23.1±3.2 v. 26.6±3.4 μmol/l), suggesting that clear increases in NEFA entry rate observed in some goats were due more to decreased fatty acid re-esterification than to increased lipolysis in adipose tissue.

Changes in body fat (ΔFAT, g/d), as estimated by a regression of body fat on live weight and TOH space, were highly correlated with changes in NEFA entry rate (ΔNEFA, g/d); this relationship was described by the equation:

$$\Delta FAT = 3.10 + 1.21\ (\pm 0.13)\ \Delta NEFA\ (R^2 = 0.92,\ P < 0.01)$$

The predictive utility of this approach to estimating fat loss is indicated by the high correlation, the proximity of the regression constant to zero and the small deviation of the coefficient from unity in the above equation.

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* School of Agriculture, La Trobe University, Bundoora, Vic. 3083
** Department of Agriculture and Rural Affairs, Animal and Irrigated Pastures Research Institute, Kyabram, Vic. 3620