

A TWO-POOL MODEL OF TRITIATED WATER KINETICS TO PREDICT
BODY COMPOSITION IN LACTATING GOATS

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In order to determine the contribution that adipose tissue stores make towards milk production, it is necessary to be able to measure body composition in the same animal at different stages of lactation. Techniques based on the close relationship that exists between empty body water (EBW) and empty body fat (EBF) are numerous. However, almost all treat total body water (TBW) as a single pool. Gut-water can comprise a considerable proportion of TBW and in an attempt to eliminate variability in gut-fill (GF), ruminants are generally fasted for long periods before estimation of TBW. This is unacceptable in trials involving lactating animals.

Byers (1979) proposed a two-pool model for estimating EBW and TBW based on tritiated water (TOH) kinetics in growing steers. More recently, Odwongo et al. (1984) suggested that a three-pool model best describes deuterium oxide kinetics in dairy calves and cows. The aim of this study was to determine whether an appropriate model of TOH kinetics could be used to estimate TBW, EBW and EBF in well-fed goats in early lactation.

Seventeen lactating Saanen goats were slaughtered between 4 and 11 weeks after parturition. Twenty-four h before slaughter, the goats were injected with 300 uCi of TOH via an indwelling jugular catheter. Fifteen min was allowed for equilibration of TOH with EBW before taking the first blood sample. In all, 15 blood samples were obtained at increasing intervals over the next 24 h.

A two-pool open model was found to fit the TOH kinetic data better than a three-pool model over the period 15 min to 24 h. The relationships between measured body composition and TOH pools (all values in kg) are given below.

TBW = 0.30 + 0.89 (Pool A + Pool B)	R = 0.987
GF = 3.1 + 0.67 (Pool B)	R = 0.885
EBW = - 0.10 + 0.93 (Pool A)	R = 0.982
EB weight = live weight - GF	R = 0.987
EBF = 2.0 + 1.0 (EB weight) - 1.3 (Pool A)	R = 0.941

It is evident that TBW and EBW can be accurately predicted in lactating goats using a two-pool model to describe TOH kinetics. The high correlation coefficient for the indirect estimation of EBF demonstrates that this technique is a useful tool for studying fat mobilization during early lactation in dairy goats.

BYERS, F.M. (1979). In "Ohio Beef Cattle Research Progress Report", Ser. 79-1, p. 36 (Ohio Agricultural Research Development Centre, Wooster, Ohio).

ODWONGO, W.O., CONRAD, H.R. and STAUBUS, A.E. (1984). J. Nutr. 114:2127.

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