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THE DECLINE IN METABOLIC RATE OF MAN WITH INCREASING AGE

Kim Alexander*, T.M. Sutherland* and D.J. Farrell*

Basal metabolic rate has been studied in man for over a century. It is still unclear whether the decline in metabolic rate as man ages is simply a reflection of increased body fat content with a comparatively low metabolic activity, or to the ageing process per se.

Measurements of basal metabolic rate were made in a respiration chamber (see Farrell 1979) on 91 male subjects aged from 18 to 67 years, and weighing 58 to 120 kg. Subjects fasted overnight and measurements of gaseous exchange were made from 0900 or 1030 h for 60 min following 15 min of adjustment to the chamber. Sixty seven subjects were measured on two occasions. Skinfold thickness was measured on all subjects and bodywater space, using D_2O, on 38 subjects.

The mean fasting metabolic rate of the 67 repeated subjects was the same (5.25 ± 0.06 kJ min^{-1}) for both occasions. Metabolic rate (MR, kJ d^{-1}) was related to bodyweight (W, kg) by the relationship.

$$MR = 369\ W^{0.70} \quad (1)$$

and declined ($P<0.01$) with increasing age (A),

$$MR = 0.565\ (\pm 0.08)\ A + 121.3\ (\pm 3.04), \quad r^2 = 0.24,\ n = 158 \quad (2)$$

The fat-free body is normally composed of 73% water, it was therefore possible to calculate bodyfat from bodywater space for the 38 subjects. A general relationship was then established to predict for all 91 subjects dry lean tissue (DLT) from bodyweight (W) and skinfold thickness (SF),

$$DLT\ (kg) = 0.268\ W - 0.089W^{0.70}.SF + 1.73, \quad r^2 = 0.82 \quad (3)$$

It was then possible to determine whether the observed decrease in metabolic rate with increasing age (equation 2) was due to increasing amounts of body fat. If this were so, MR expressed per kg DLT would be constant.

A significant ($P<0.01$) relationship

$$\frac{MR}{DLT}\ (kJ\ kg^{-1} min) = 0.001\ (\pm 0.0024)\ A + 0.331\ (\pm 0.009),\ r^2 = 0.17 \quad (4)$$

was obtained indicating that metabolic rate declined per unit LDT with increasing age, perhaps due to the observed decrease in rate of protein turnover as man ages (Young et al. 1975).

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*Department of Biochemistry & Nutrition, University of New England, Armidale, N.S.W. 2351.