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BODY WATER AND FAT CONTENT IN THE REDBACK VOLE

ZAWARTOŚĆ WODY I TŁUSZCZU U NORNICY,
CLETHRIONOMYS GAPPERI LORINGI (BAILEY, 1897)

It is generally accepted that the metabolic rates of mammals are a function of their body weight (Brody, 1945). Recent literature however, has questioned the use of total body weight on the grounds that certain components of the body do not correlate directly with the metabolic rate. Muldowney (1961) found that body fat contributed very little to the BMR of mammals, and Hayward (1964) working with *Peromyscus* demonstrated a consistent relationship between metabolic rate and body water content. Neither of these components is known for many wild mammals. The authors have had a special interest in the redback vole, *Clethrionomys gapperi loringi* (Bailey, 1897), a prominent species in the bog ecosystems that they are studying, and felt such measurements would be useful in interpreting energy transfers in this species.

Accordingly, 14 *C. gapperi* captured in the Whiteshell Provincial Park of southeastern Manitoba, Canada, and held in rearing on an artificial diet¹ for a period of 3 months were analysed for body water and fat following standard procedures (A.O.A.C. 1955). The specimens were killed and weighed, then desiccated for a week to constant weight in an oven at 90°C. under partial vacuum. The water content was then the difference in weight before and after treatment. The fats were then extracted in ether (b.h. 30°—60°C) in a Soxhlet apparatus for 16 hours at which time constant weight had again been reached. The fat content was then the difference in weight before and after extraction.

¹ Free water 12.7%, crude protein 18.1%, crude fat 40.0%, crude fiber 3.0%, salt 0.45%, calcium 0.85%, phosphorus 0.65%, zinc 0.008%, nitrate trace, Vitamine A 4000 I.U./lb., Vitamine D 600 I.U./lb., Caloric value 4.47 Kcal./g. dry wt.

Water and fat combined comprised 76% of the total body weight of *C. gapperi*, and there was little difference between the sexes (76% for females, 75% for males). Only slight differences were recorded for these two components. Female yielded 67% water and 9% fat, whereas males yielded 68% and 7% respectively. Relationships between body weight and both water and fat components were erratic, and no consistent trends could be demonstrated. The body fat content was however shown to be negatively correlated with body water content: $r = -0.817$; all values significant at the 99% level. This is contrary to the opinion of several authors, that total body water is independent of body fat (Babineau & Page, 1955; Pace & Rathbun, 1945; Pitts, 1962). Because many authors agree that body water provides a reliable reference base for metabolic comparisons and body fat does not contribute significantly to metabolic activity, water and other body components have recently been expressed as a percentage of the fat free body weight, *FFBW* (Muldoney, 1961). The water content of *C. gapperi* expressed as % *FFBW* fell within the limits of other small mammals, averaging 74% for females and 73% for males. The water content is a relatively stable

Table 1

Variability in body fat and water content in the redback vole, *Clethrionomys gapperi loringi*.

Sex		Percentage of fat by <i>FFBW</i> *	Percentage of water by <i>FFBW</i> *
Female	1	2.2	75.2
	2	5.7	74.1
	3	6.5	72.1
	4	8.1	72.8
	5	9.7	74.9
	6	16.6	73.7
	7	22.9	73.5
Male	1	1.1	73.8
	2	2.6	72.7
	3	4.4	74.0
	4	6.5	65.6
	5	10.6	74.2
	6	14.9	72.4
	7	20.3	71.5

* *FFBW* — fat-free body weight.

component of the body, whereas the fat component varies widely (Table 1). On the average, females exhibit a somewhat higher fat composition than do males (10% and 8% *FFBW* respectively). In terms of metabolic standards, water as a percentage *FFBW* is likely the most useful base, but as we have demonstrated an inverse relationship between body water and body fat, this should be treated with caution, especially where obese individuals are involved.

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