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Urinary Output of N⁺-Methylhistidine and Hydroxyproline in Mature and Old Male Rats Fed an Adequate Diet

The relationship between aging and the rate of whole body and muscle protein metabolism has been studied by many workers (8). A reduction in the rate of both muscle protein synthesis and breakdown has been reported both in humans (6) and animals (5, 2) as a consequence of getting older.

The purpose of this communication is to report the effect of aging on the rate of both myofibrillar protein and collagen breakdown in male rats fed an adequate diet. The urinary output of N⁺-methylhistidine (3-methylhistidine: 3-Mehis) and total hydroxyproline (OHproline) will be evaluated as indexes of myofibrillar protein and collagen catabolism respectively. The rationale and validation of these approaches have been discussed elsewhere (3, 9).

Intact Sprague Dawley male rats (Charles River Breeding Laboratories, Wilmington, Mass., USA) of 20 days of age, and weighing about 70-80 g, were divided in three groups of five animals each. When the rats reached the ages of 25, 115 and, approximately, 265 days, they were transferred to individual metabolic cages. Urine collection then began and was continued for 5 days. Rats were fed *ad libitum* a purified diet containing 18 % lactalbumin. Individual collections were daily pooled

within each experimental group, and then prepared for 3-Mehis (1) and OHproline (7) determinations. Body weight changes were recorded weekly. Diet composition, procedure of feeding, urine collection, etc. were carried out as previously described (4).

Results of the experiment are summarized in table I. It was found that as compared to the youngest animals, the reduced rate of growth that accompanies the aging process, was followed by a significant ($p < 0.01$) reduction in the urinary ex-

Table I. *Body weight changes and urinary output of 3-methylhistidine (3-Mehis) and total hydroxyproline (OHproline) of male rats aged 30, 120 and 360 days.*

Urine samples were taken in individual rats, and then pooled within each group, five days before the rats reached the ages indicated. Entries are, therefore mean values ($\pm$ SEM) from five rats in each group of these five-day pooled samples.

Group (age in days)	Body weight gain g/day	3-Mehis μ moles/100 g body weight	OHproline μ g/100 g body weight
30	7.8 $\pm$ 0.4	0.90 $\pm$ 0.01	464 $\pm$ 20
120	2.6 $\pm$ 0.5 ^a	0.83 $\pm$ 0.01 ^a	219 $\pm$ 17 ^a
360	1.9 $\pm$ 0.7 ^a	0.69 $\pm$ 0.01 ^a	68 $\pm$ 10 ^a

^a $p < 0.01$, as compared to the 30-day old rats (Anova).

cretion of both 3-Mehis and OHproline in the 120- and one-year old rats. These reductions were more pronounced in the old than in the mature animals.

From these observations it may be concluded that aging in rats brings about a marked reduction in the rates of myofibrillar protein and collagen degradation.

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