MUSCLE PROTEIN TURNOVER AND GROWTH IN SELECTED LINES OF BROILER CHICKENS

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Growth, or net accumulation of protein, is a function of the relative rates of synthetic and degradative processes. Metabolic "efficiency" is enhanced if an increase in protein accumulation is achieved by a fall in the rate of breakdown, rather than an increase in the rate of synthesis. Identifying the factors responsible for differences in efficiency which occur naturally may lead to means for manipulation of the utilization of nutrients for growth. This is of interest not only for animal production, where there is a need to efficiently grow leaner animals, but also to nutritionists and clinicians concerned with retarded growth (eg premature infants) and muscle wasting conditions in humans.

We have previously reported that chickens selected over many generations for rapid growth (RG) or a low food conversion ration (LFCR) (ie low food intake/body weight gain) have lower rates of N$^{\tau}$-methylhistidine (N$^{\tau}$-MH) excretion than those selected for high food intake (HFI) or at random (controls) (Tomas et al, 1984). The data pointed to lower rates of both protein breakdown and synthesis in these strains. In a subsequent experiment using the same line of chickens we have used direct measurements of muscle protein synthesis rates in addition to the N$^{\tau}$-MH excretion technique.

N$^{\tau}$-MH excretion rates and protein synthesis rates (k_s) in thigh and breast muscle were measured at 6 weeks of age. Muscle protein k_s was measured using the phenylalanine flooding dose method of Garlick et al (1980). Data for thigh muscle protein k_s are not yet available.

Growth characteristics, N$^{\tau}$-MH excretion and protein synthesis rates in breast muscle for 4 strains of 6 week old male broiler chickens. Values are means ± SEM of 4 replicates of 6-10 grouped cockerels per line except for k_s (8 cockerels per line).

	Line			
	Control	RG	HFI	LFCR
Final body wt (g)	906±29	1301±27	1135±32	1074±27
Fractional growth rate (%/d)	3.5±0.08	4.0±0.05	3.9±0.26	3.9±0.06
FCR (g/g BW gain)	3.4±0.05	2.8±0.20	3.8±0.34	2.5±0.11
Breast Muscle k_s (%/d)	9.5±0.22	9.5±0.33	8.4±0.45	9.6±0.26
N$^{\tau}$-MH excretion (μmol/mol carcass-N/d)	3.4±0.11	3.0±0.25	3.8±0.18	2.7±0.03

These data show that the traits for rapid growth and low FCR are interrelated. In each of these "efficient" strains the rate of N$^{\tau}$-MH excretion was lower than in either the controls or the strain selected for high FI. Paradoxically, breast muscle k_s values are lower for the HFI strain, rather than higher, as would be expected from N$^{\tau}$-MH and growth data. This may be due to intermuscle variation or to the limitation of the measurement taken at a single time point. The thigh muscle protein k_s values to be obtained will aid in the interpretation of these data.

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