



## Muscle protein turnover in broiler chickens: effects of high ambient temperatures and dietary protein intake

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**Muscle protein turnover in broiler chickens: effects of high ambient temperatures and dietary protein intake.**

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The growth of broiler chickens is considerably decreased under high ambient temperatures, especially during the finishing period. This growth depression is associated with decreased protein retention efficiency and reduced protein gain. Providing high protein diets seems to be beneficial in hot conditions since it tends to improve the growth of heat-exposed chickens. We therefore studied the effect of chronic heat exposure (32 versus 22 °C) and dietary crude protein (25 versus 20 %) on muscle protein turnover in 5- to 6-week-old chicks. Protein synthesis was measured *in vivo* in the pectoralis major, gastrocnemius and sartorius muscles by a flooding dose of [<sup>3</sup>H]-Phe. In the same muscles, protein breakdown was estimated as the difference between protein synthesis and deposition. Data were compared by two-way ANOVA analysis.

Protein synthesis was deeply decreased by chronic heat exposure whatever the muscle ( $P < 0.01$ ). This was principally related to a reduced capacity for protein synthesis (about -20 %;  $P < 0.001$ ) since the translational efficiency was not significantly modified. Protein breakdown was also lower in the pectoralis major and sartorius muscles; this effect was not observed in the gastrocnemius muscle. Protein turnover was slower in hot conditions irrespective of muscle. Protein synthesis was more affected than protein breakdown, resulting in a lower protein deposition, especially in the pectoralis major and gastrocnemius muscles.

At 32 °C, the high protein diet did not significantly change either protein synthesis, ribosomal capacity or translational

efficiency. However, it decreased proteolysis, resulting in a higher protein deposition ( $P < 0.001$ , for the gastrocnemius and sartorius muscles; tendency for the pectoralis major muscle).

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**A daily protein pulse improves the fed state protein gain in elderly women.**

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Can the daily protein feeding pattern modulate the fed state protein anabolism? Sixteen young ( $25.7 \pm 1.1$  year old) and 14 elderly ( $67.6 \pm 1.2$  year old) women were given a 1.6 g protein.kg lean body mass (LBM)<sup>-1</sup>.d<sup>-1</sup> diet, for 15 days. This diet was fed in either four similar isoproteic meals (spread protein intake groups, seven old or eight young adult women), or in three meals with 80 % of the daily protein intake at lunch (pulse protein intake groups, seven old or eight young adult women). On day 16, an 8-h infusion of <sup>13</sup>C leucine made it possible to measure the leucine flux variations between post-absorptive state (16 h fasting) and fed state (14 meals fed every 20 min providing 0.7 g protein per kg LBM). Results were analysed by a two-way variance.

- 1) The stimulation of leucine oxidation flux in the fed state was greater in the elderly ( $+220 \pm 19$  %) than in the young women ( $+156 \pm 13$  %,  $P = 0.009$ ).
- 2) In the fed state, the endogenous flux of leucine (proteolysis) decreased less in the elderly ( $-23.4 \pm 2.7$  %) than in the young women ( $-37.6 \pm 3.0$  %,  $P = 0.002$ ).
- 3) The non-oxidative leucine flux (protein syn-