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The Effects of Age and Adiposity on Casein Digestibility and Tissue Protein Synthesis in Rats

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Objectives: Age and adiposity can impact the digestibility of dietary proteins and the metabolic response to their ingestion. The objective was to evaluate the effects of age and adiposity on casein digestibility and protein synthesis in tissues and organs.

Methods: Wistar rats of 1 month ($n = 15$) and 10 months ($n = 15$) at their arrival were fed *ad libitum* with a standard diet or High Fat diet to obtain rats of normal and high adiposity levels. Four groups were constituted ($n = 7/8$): 2 months/normal adiposity, 2 months/high adiposity, 11 months/normal adiposity and 11 months/high adiposity. At the end of the dietary intervention, they were fed the standard diet for 1 week before the test meal. The rats consumed a 4g meal containing ¹⁵N-labeled casein (Prodiect® 85B). Six hours after meal ingestion, the rats were euthanized. Intravenous injection of a massive dose of ¹³C-valine prior to euthanasia was used to determine protein synthesis rate

in liver, kidneys, skin and muscle. Body composition was evaluated and digestive contents were collected to measure casein digestibility.

Results: No weight difference between rats of the same age was observed. However, a significant difference in adiposity was noted, with a surge in body fat of 3% in young rats and 7% in older rats. Digestibility increased with a higher adiposity level ($P = 0.04$). In young rats, it was $94.1 \pm 1.1\%$ in lean rats and $95.2 \pm 1.7\%$ in fat rats. In older rats, it was $94.5 \pm 2.2\%$ and $95.8 \pm 0.7\%$, in lean and fat rats respectively. Significant effects of age ($P < 0.01$) and adiposity ($P < 0.01$) were observed in the muscle fractional synthesis rate (FSR), with age decreasing it and adiposity increasing it. In young rats, FSR was $10.1 \pm 2.1\%/day$ and $12.0 \pm 3.0\%/day$ in lean and fat rats, respectively, these values being $6.2 \pm 1.5\%/day$ and $10.6 \pm 2.0\%/day$ in older rats. In the skin, younger rats exhibited a higher FSR ($P < 0.01$) as it was $11.1 \pm 2.6\%/day$ and $12.6 \pm 3.7\%/day$ in lean and fat rats respectively, and $8.3 \pm 2.3\%/day$ and $8.2 \pm 2.7\%/day$ in older rats. No differences were found for the liver and kidneys.

Conclusions: Protein synthesis in muscle decreased with age while adiposity increased it. This is consistent with an improvement in ribosomal activity at an intermediate state of obesity. The surge in casein digestibility with higher adiposity, although moderate, could have contributed to the improvement in muscle anabolism response.

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