Proceedings of the Nutrition Society (2008), **67 (OCE)**, E200 doi:10.1017/S002966510800832X

Joint meeting of the Société Française de Nutrition and The Nutrition Society, 6–7 December 2007

Chronic leucine supplementation in adult rats did not induce insulin resistance on glucose metabolism

M. Balage[1], C. Sornet[1], P. Denis[1], S. Tesseraud[2], J. Dupont[3] and D. Dardevet[3]
[1]*Unité de Nutrition Humaine, UMR1019, INRA-CRNH d'Auvergne, St Genés Champanelle, France,* [2]*UR83 Recherches Avicoles, INRA, Nouzilly, France and* [3]*UMR6175 Physiologie de la Reproduction et des Comportements, INRA, Nouzilly, France*

Leucine has been described as a potent regulator of muscle protein synthesis. It has previously been shown that dietary leucine supplementation restores the postprandial defect in muscle protein synthesis currently observed in the elderly[1,2], suggesting that long-term utilization of leucine-rich diets may limit muscle protein wasting during aging. Leucine stimulates muscle protein synthesis by activating specific intracellular pathways (e.g. mTOR, S6K) that are also involved in insulin-controlled protein metabolism. Moreover, it has been shown that over-activation of these kinases may inhibit early steps in insulin action and could lead to abnormalities in glucose metabolism.

The aim of the present study was to evaluate whether chronic leucine supplementation (55 g/kg diet) in the rat reduces insulin sensitivity in relation to muscle glucose transport.

Two groups of 4-month-old male rats (twenty-four per group) were fed *ad libitum* with a 150 g protein/kg diet supplemented with either leucine or glycine (control group) for 5 weeks. Body weight and food consumption were monitored. An oral glucose tolerance test was performed before and after the supplementation period by administration of a glucose load (1 g/kg). Plasma glucose and insulin were measured at 0, 15, 30, 60 and 120 min after glucose ingestion. Insulin sensitivity in relation to glucose transport was measured *in vitro* using isolated epitrochlearis muscle from each group incubated with 2-deoxy-D-[^{3}H]glucose and increasing insulin concentrations. Muscles and organs were weighed and the protein content of gastrocnemius muscle was measured.

Food intake and body weight were similar for both groups. Muscle weight and protein content were not significantly changed by leucine supplementation, nor were liver, spleen and kidney weights. On the other hand, peri-renal adipose tissue mass was significantly increased in rats supplemented with leucine (+27 %; $P<0.05$). Glucose tolerance was impaired ($P<0.001$) at the end of the experimental period, but similarly for both groups. Basal glucose transport was not altered by leucine supplementation. By contrast, the maximum insulin response tended to be improved in epitochlearis muscle from leucine-supplemented rats ($0.05<P<0.07$ at 7 and 75 nM-insulin).

Dietary leucine supplementation for 5 weeks in adult rats did not induce insulin resistance in relation to muscle glucose transport. However, the outcome of an increase in adipose tissue mass in rats fed the leucine-enriched diet remains to be established.

This work was supported by Benjamin Delessert Institute.

1. Dardevet D, Sornet C, Bayle G, Prugnaud J, Pouyet C & Grizard J (2002) *J Nutr* **132**, 95–100.
2. Rieu I, Balage M, Sornet C, Giraudet C, Pujos E, Grizard J, Mosoni L & Dardevet D (2006) *J Physiol* **575**, 305–315.

Downloaded from https://www.cambridge.org/core. IP address: 34.236.245.255, on 30 Oct 2020 at 23:20:04, subject to the Cambridge Core terms of use, available at https://www.cambridge.org/core/terms. https://doi.org/10.1017/S002966510800832X