

Strength training increases insulin action in healthy 50- to 65-yr-old men

J. P. Miller, R. E. Pratley, A. P. Goldberg, P. Gordon, M. Rubin, M. S. Treuth, A. S. Ryan and B. F. Hurley

Department of Medicine, University of Maryland at Baltimore.

The insulin resistance associated with aging may be due, in part, to reduced levels of physical activity in the elderly. We hypothesized that strength training increases insulin action in older individuals. To test this hypothesis, 11 healthy men 50-63 yr old [mean 58 +/- 1 (SE) yr] underwent a two-step hyperinsulinemic-euglycemic glucose clamp with concurrent indirect calorimetry and an oral glucose tolerance test (OGTT) before and after 16 wk of strength training. The training program increased overall strength by 47% ($P < 0.001$). Fat-free mass (FFM; measured by hydrodensitometry) increased (62.4 +/- 2.1 vs. 63.6 +/- 2.1 kg; $P < 0.05$) and body fat decreased (27.2 +/- 1.8 vs. 25.6 +/- 1.9%; $P < 0.001$) with training. Fasting plasma glucose levels and glucose levels during the OGTT were not significantly lower after training. In contrast, fasting plasma insulin levels decreased (85 +/- 25 vs. 55 +/- 10 pmol/l; $P < 0.05$) and insulin levels decreased ($P < 0.05$, analysis of variance) during the OGTT. Glucose infusion rates during the hyperinsulinemic-euglycemic glucose clamp increased 24% (13.5 +/- 1.7 vs. 16.7 +/- 2.2 $\mu\text{mol}\cdot\text{kg FFM}\cdot\text{min}^{-1}$; $P < 0.05$) during the low (20 mU $\cdot\text{m}^{-2}\cdot\text{min}^{-1}$) insulin infusion and increased 22% (55.7 +/- 3.3 vs. 67.7 +/- 3.9 $\mu\text{mol}\cdot\text{kg FFM}\cdot\text{min}^{-1}$; $P < 0.05$) during the high (100 mU $\cdot\text{m}^{-2}\cdot\text{min}^{-1}$) insulin infusion. These increases were accompanied by a 40% increase ($n = 7$; $P < 0.08$) in nonoxidative glucose metabolism during the high insulin infusion. These results demonstrate that strength training increases insulin action and lowers plasma insulin levels in middle-aged and older men.

Journal of Applied Physiology, Vol 77, Issue 3 1122-1127, Copyright © 1994 by American Physiological Society

J Appl Physiol 77: 1122-1127, 1994;
8750-7587/94 \$5.00

<http://jap.physiology.org/cgi/content/abstract/77/3/1122>