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## **Ibuprofen or acetaminophen in long-term resistance training increases muscle mass/strength**

Taking daily recommended dosages of ibuprofen and acetaminophen caused a substantially greater increase over placebo in the amount of quadriceps muscle mass and muscle strength gained during three months of regular weight lifting, in a study by physiologists at the Human Performance Laboratory, Ball State University.

Dr. Chad Carroll, a postdoctoral fellow working with Dr. Todd Trappe, reported study results at Experimental Biology 2008 in San Diego on April 6. His presentation was part of the scientific program of the American Physiological Society (APS).

Thirty-six men and women, between 60 and 78 years of age (average age 65), were randomly assigned to daily dosages of either ibuprofen (such as that in Advil), acetaminophen (such as that in Tylenol), or a placebo. The dosages were identical to those recommended by the manufacturers and were selected to most closely mimic what chronic users of these medicines were likely to be taking. Neither the volunteers nor the scientists knew who was receiving which treatment until the end of the study.

All subjects participated in three months of weight training, 15-20 minute sessions conducted in the Human Performance Laboratory three times per week. The researchers knew from their own and other studies that training at this intensity and for this time period would significantly increase muscle mass and strength. They expected the placebo group to show such increases, as its members did, but they were surprised to find that the groups using either ibuprofen or acetaminophen did even better. An earlier study from the laboratory, measuring muscle metabolism (or more precisely, muscle protein synthesis, the mechanism through which new protein is added to muscle), had looked at changes over a 24 hour period. This acute-study found that both ibuprofen and acetaminophen had a negative impact, by blocking a specific enzyme cyclooxygenase, commonly referred to as COX.

But that study looked at only one day. Over three months, says Dr. Trappe, the chronic consumption of ibuprofen or acetaminophen during resistance training appears to have induced intramuscular changes that enhance the metabolic response to resistance exercise, allowing the body to add substantially more new protein to muscle.

The amount of change was measured in quadricep muscles using Magnetic Resonance Imaging (MRI), the gold standard for determining muscle mass. The researchers now are conducting assays of muscle biopsies taken before and after the three-month period of resistance training, in order to understand the metabolic mechanism of the positive effects of ibuprofen and acetaminophen.

One of the foci of Ball State's Human Performance Laboratory is the adaptation of the elderly to exercise. Another is the loss of muscle mass that takes place when astronauts are exposed to long-term weightlessness. This work has implications for both groups, says Dr. Trappe.

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In addition to Dr. Carroll and Dr. Trappe, co-authors of the Experimental Biology presentation are Jared Dickinson, Jennifer Lemoine, Jacob Haus, and Eileen Weinheimer, graduate students working with Dr. Trappe, and study physician Dr. Christopher Hollon.

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