

Dramatic Declines in Senescence Associated Beta-Galactosidase of Skeletal Muscle after Exercise  
in Men Consuming Rg1 from Ginseng

Chao-Chieh Hsieh<sup>1</sup>, Jinfu Wu<sup>1</sup>, Chia-Hua Kuo<sup>1,\*</sup>

<sup>1</sup>Laboratory of Exercise Biochemistry, University of Taipei, Taipei, Taiwan

\*Corresponding author: Dr. Chia-Hua Kuo, Laboratory of Exercise Biochemistry, University of Taipei, Taipei, Taiwan, No.101, Sec.2, Zhong Cheng Rd., Shinlin District, Taipei City 11153, Taiwan. Phone: +886 228753383; Fax: +886 228753383, Email: kuochiahua@gmail.com

Abstract

**Introduction:** Panax ginseng has been claimed to have ergogenic and anti-aging properties in humans. However, previous studies present mix results. The changing component profiles of ginseng with seasons may undermine scientific observation.

**Methods:** we examined longitudinal changes of senescence associated beta-galactosidase (SABG) in human skeletal muscle before and after exercise (0 h and 3 h) after ginseng-based Rg1 supplementation. Twelve young men were enrolled in this randomized double blind placebo controlled crossover study, under two occasions: Placebo (5mg starch) and Rg1 (5 mg) supplementations 1 h prior to a high-intensity cycling (70%  $\dot{V}O_{2max}$  for 1 h).

**Results:** A substantial decrease (from 1.6% to 0.6%,  $P < 0.05$ ) in SABG positive signal of vastus lateralis muscle below baseline during the Rg1 trial was observed, in particular, 9 out of the 12 individuals showed complete elimination of SABG number to an undetected level, whereas no such change was observed during the Placebo trial. Apoptotic DNA fragmentation (+4% ~ +6%,  $P < 0.01$ ) and macrophage (CD68<sup>+</sup>) infiltration (+2%,  $P < 0.01$ ) increased immediately after 1 h cycling. Increases in iNOS, IL-6, and myogenic factor Myf5 mRNA levels induced by exercise were elevated in the Rg1 trial. During recovery, decreases in apoptotic DNA fragmentation (-4%) occurred 3 h after exercise, only in the Rg1 trial. Cycling time at 80%  $\dot{V}O_{2max}$  significantly increased after Rg1 supplementation compared with Placebo (+12%,  $P < 0.05$ ).

**Conclusions:** Our data suggest the ginseng component Rg1 sensitize phagocytic macrophage and assists senescent cell clearance in human skeletal muscle after exercise.

**Keywords:** Inflammation; Aerobic exercise; Muscle biopsy