

## Preventive effects of *Spirulina platensis* on skeletal muscle damage under exercise-induced oxidative stress

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Accepted: 28 June 2006 / Published online: 30 August 2006  
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**Abstract** The effects of spirulina supplementation on preventing skeletal muscle damage on untrained human beings were examined. Sixteen students volunteered to take *Spirulina platensis* in addition to their normal diet for 3-weeks. Blood samples were taken after finishing the Bruce incremental treadmill exercise before and after treatment. The results showed that plasma concentrations of malondialdehyde (MDA) were significantly decreased after supplementation with spirulina ( $P < 0.05$ ). The activity of blood superoxide dismutase (SOD) was significantly raised after supplementation with spirulina or soy protein ( $P < 0.05$ ). Both of the blood glutathione peroxidases ( $GP_x$ ) and lactate dehydrogenase (LDH) levels were significantly different between spirulina and soy protein supplementation by an ANCOVA analysis ( $P < 0.05$ ). In addition, the lactate (LA) concentration was higher and the time to exhaustion (TE) was significantly extended in the spirulina trail ( $P < 0.05$ ). These results suggest that ingestion of *S. platensis* showed preventive effect of the skeletal muscle damage and that

probably led to postponement of the time of exhaustion during the all-out exercise.

**Keywords** Algae · Antioxidant · Lactate dehydrogenase · Fatigue · Malondialdehyde

### Introduction

We are interested in the reason why in Nagpur, India athletes at an orphanage have been eating spirulina, a blue-green alga or cyanobacterium, regularly while training for track and field events (Fox 1996). The Chinese and the Cuban Olympic teams eat spirulina daily during their training and before competition (Huang et al. 2000). It is probably due to the aspect of having the effect on promoting health and/or on exercise performance by using spirulina as dietary supplement. However, there is still no evidence on the exercise-related advantages of supplementing spirulina in humans.

*Spirulina platensis*, along with its related species (*Spirulina maxima*), is well known as a protein-rich food for dietary supplement (Vonshak 1997). This species and many other mass-cultivated or harvested species for food (Fox 1996), feed (Belay et al. 1996), or fine chemical (Tanticharoen et al. 1994) sources, are actually classified into the Genus *Arthrospira*. However, the term spirulina, even representing another taxonomic group, is still being used to name these organisms, traditionally mass-cultivated and sold in the market. Due to the lack of cellulose cell wall, spirulina has a better digestibility than *Chlorella*, another well-known group of algal species. Except the character of high-nutritive quality in protein content, essential amino acid composition, gamma-linolenic acid content, and branch chain amino acid (BCAA) content,

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