

Sports and Spirulina- Facts for Trainers

Spirulina, also known as Arthrospira, is a species of microscopic spiral cyanobacteria, hence its name, and its characteristic blue-green color.

In recent years, there has been growing research evidence linking the efficacy of **Spirulina** to improve athletic performance among both professional athletes and amateurs.

It is well known that routine exercise has many health benefits, from strengthening the immune system and improving mental state, as well as reducing the risk of chronic morbidity, such as diabetes and cardiovascular disease.

Alongside there's a paradox in which physical activity increases the level of reactive oxidants and free radicals in our body, which can cause extensive health damage, starts with increasing muscle fatigue to increasing risk of cancer.

Antioxidants in our diet (vitamins E, C, and beta carotene, for example) "know" how to bind and neutralize them.

In this context, spirulina has a dual advantage; while it is rich in those antioxidant nutrients- spirulina also has its unique, powerful and significant anti-oxidant called **Phycocyanin (CPC)**.

This article is a review of clinical studies from the past two decades, all of which focused on the benefits of spirulina intake when exercising at different intensities and among different populations. An updated review article from the last year noted that the quality criteria of studies in the field of physical activity and spirulina were high, and their rigidity was emphasized by the authors.

In 2006, 16 untrained students volunteered to take either 7.5g/d *Spirulina platensis* (treatment group) or 7.5g/d of soy protein (control group) for 3 weeks. Throughout the treatment, they did not change their eating habits and took spirulina or soy protein before meals.

The aim of the study was to examine whether the supplement could prevent muscle damage. The results showed that the spirulina group significantly increased antioxidant enzymes, as well as improved time to fatigue in a stress test they underwent (Bruce incremental treadmill exercise). The researchers concluded that spirulina may be used to prevent oxidative damage to muscles and to assess the time of performance with increased effort.

Exactly 10 years later a study was conducted at the University of Ohio, whose results showed an anti-fatigue effect with short- and long-term Arthrospira intake among men consuming 3 g/day of spirulina . After only 1 week, this dose produced a significant increase in exercise output.

In between, six additional clinical studies have been published and have further enhanced the benefits of Spirulina among trained and untrained humans.

In 2009, a study from Greece and the UK examined the effect of spirulina platensis as an antioxidant and ergogenic product among 9 relatively trained men who consumed 6 g / day of spirulina or placebo for 4 weeks. Their exercise performance,

substrate metabolism, and blood redox status both at rest and after exercise were examined.

At the beginning, they were asked to run for two hours on a treadmill at an intensity corresponding to 70%–75% of their $\dot{V}O_2\text{max}$ for 2 h and then at 95% $\dot{V}O_2\text{max}$ to exhaustion. The researchers measured their exercise performance and respiratory quotient and took some blood tests several times along the process to assess the changes in antioxidant enzymes in their bodies. The results of this study also showed that the time to fatigue was longer after consuming spirulina. Furthermore, it was observed that there was a 10.3% decrease in carbohydrate burning and a 10.9% increase in fat burning thanks to ingestion of spirulina. In addition, the level of antioxidant GSH increased.

The authors' final conclusion was that spirulina's intake had a significant and beneficial effect on exercise performance, increased fat and carbohydrate burning and increased antioxidant activity.

Another Indian study from 2010, which examined the effect of spirulina intake on increased isometric muscle strength and muscle endurance among 40 trained and untrained men and women, showed that the group consumed spirulina had an increased isometric muscle capacity and decreased fatigue index. This group received only 2g/d of spirulina for 8 weeks.

Two studies published in 2010 and 2012 in Brazil and India respectively showed an effect of spirulina intake on the improvement of oxidative stress. In the Brazilian study, which examined the effect on 18 athletic men, a trend was observed in favor of the Spirulina group consumed 7.5g/day of spirulina for 4 weeks (although there were no significant results). The Indian study also showed an increase in the body's antioxidant capacity among 30 men who consumed 3g/d of spirulina for 2 months, and the researchers concluded that spirulina (as well as an antioxidant tested with it) could be helpful in improving the body's ability to prevent oxidation due to physical activity.

Two very interesting studies of spirulina intake among runners were published in India (2008) and Mexico (2012). 8 marathon runners (men) were given 4g/d of spirulina, combined with an antioxidant-enriched drink, for the two weeks preceding a marathon competition. Blood tests and markers of oxidative stress were taken before and after the marathon. The results showed a remarkable improvement in hematologic parameters, such as hemoglobin, and a significant reduction in MDA marker, whose high levels are indicative of oxidative stress, due to supplemental consumption. The researchers concluded that "antioxidant supplementation combats oxidative stress; improves hematological status and performance in runners".

In summary, Spirulina is definitely an excellent natural nutritional support for the exercisers, in terms of improves recovery, improves immune function, and protects musculoskeletal system from oxidative damage and inflammation. Along with high-quality, high-availability protein, spirulina also contains a variety of essential nutrients and micronutrients such as vitamins and minerals; iron, vitamins E, C, A, B9- with their powerful antioxidant activity making it a winning choice for dietary integration among trainees.

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