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Column Editor

summary

Cordyceps sinensis is a potentially ergogenic herb that gained popularity after the Chinese women's team credited it for their world-record performances at the 1993 World Track and Field Championships. Since then, a few peer-reviewed investigations have been published, but results of these investigations have been equivocal, with two human studies claiming an ergogenic effect and three human studies failing to find an effect. At this time, it is premature to conclude that *Cordyceps sinensis* does or does not possess ergogenic properties.

Cordyceps *sinensis*, a fungus parasite that lives on caterpillars in mountain regions of China, is a

Does *Cordyceps sinensis* Ingestion Aid Athletic Performance?

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potentially ergogenic herb that has been used in Chinese folk medicine for centuries, primarily as a “lung invigorator” (9). *Cordyceps* gained worldwide popularity following the 1993 World Track and Field Championships at which the Chinese women's team broke 3 world records. When accusations of steroid use began to surface, the coach revealed that one source of his team's newfound speed and endurance was an herbal mixture that featured *cordyceps* as its primary ingredient. Since then, studies have identified potential performance-enhancing benefits of *cordyceps*, including improved glucose metabolism (2, 3), increased ventilation capacity (7), vasodilation (9), and increased adenosine triphosphate (ATP) stores (3).

Two human studies have indicated a performance improvement after ingestion of *cordyceps*. Xiao et al. (7) found that 6 weeks of CordyMax (a proprietary, standardized extract of *Cordyceps sinensis*;

Pharmanex Corp., Provo, UT) ingestion significantly increased aerobic capacity in healthy elderly adults. Zhu and Rippe (8) recently completed a similar study and found that 12 weeks of supplementation significantly improved $\dot{V}O_{2\text{peak}}$, work output and time to complete a 1-mile walk. Despite such impressive results, neither of those studies

identified a mechanism by which the substance may improve performance. Additionally, because both studies were published as abstracts only, it is difficult to assess how well controlled their methods were.

In an attempt to identify a potential mechanism, Dai et

al. (3) used ^{31}P nuclear magnetic resonance spectroscopy to evaluate the effects of CordyMax on energy metabolism. Adult mice were given an extract of the substance or placebo for 7 days. Steady-state ATP increased in the livers of mice that received CordyMax (200 or 400 mg/kg per day) by $12.3 \pm 0.8\%$ and $18.4 \pm 0.9\%$, respectively,



compared with placebo controls, suggesting a higher hepatic bioenergy status in treated animals. Dai et al. concluded that CordyMax is effective in improving bioenergy status in the murine liver, which could provide a mechanism for alleviating fatigue and improving physical endurance. However, they did not examine possible changes in other ATP stores, such as in muscle, which would have a greater impact on performance, nor did they test performance directly.

Koh et al. (5) examined swim performance in mice as part of an investigation of the antifatigue and antistress effects of *Cordyceps sinensis*. Mice that were orally administered a hot water fraction of mycelia of *Cordyceps sinensis* prolonged their swim-to-exhaustion time from 75–90 minutes. Also, when the fraction (150 mg·kg·d⁻¹) was given to rats for 8 days, including a 48-hour stress period, weight changes of the adrenal gland, spleen, thymus, and thyroid, which are indices of stress, were suppressed. This supports the notion of cordyceps as a potential adaptogen. In opposition to the finding of Koh et al., a study by Balon et al. (1) did not report a performance improvement in the swim times of rats fed CordyMax at 2 g/kg for 30 days. Interestingly, although they did not find an ergogenic effect, Balon et al. did observe an improvement in insulin sensitivity in the treatment group after 10 days of supplementation. This potential effect of cordyceps on glucose metabolism has been observed by other researchers, but has yet to be explained.

Counter to most studies of cordyceps completed in China, studies performed in the United States have generally not supported an ergogenic effect of *Cordyceps sinensis*. The previously mentioned study by Balon et al. (5) is one example. Another is an investigation by Parcell et al. (6) that explored the effect of CordyMax supplementation on $\dot{V}O_{2peak}$, ven-

tilatory threshold (VT), and performance in trained cyclists. In this study, 22 male cyclists ingested 3 g/d of CordyMax tablets or placebo for 5 weeks. There was no significant change in $\dot{V}O_{2peak}$, VT, or performance of a ~1-hour time-trial between pre- and post-supplementation or between groups. Accordingly, Parcell et al. concluded that 5 weeks of CordyMax supplementation has no effect on aerobic capacity or endurance exercise performance in trained male cyclists. Earnest et al. (4) examined the effects of a commercial herbal-based formula called Optygen (First Endurance, Salt Lake City, UT) in 17 competitive amateur cyclists. Optygen lists *Cordyceps sinensis* and *Rhodiola rosea* (another herb that has been shown in some studies to increase $\dot{V}O_{2peak}$) as its primary ingredients. The treatment group ingested 6 capsules per day (2 g of *Cordyceps sinensis*, 600 mg of *Rhodiola rosea*) for the first 4 days, followed by 3 capsules per day for 11 days per the manufacturer's recommendations. The authors found no differences in $\dot{V}O_{2peak}$, peak heart rate, peak power output, lactate threshold, or VT between or within groups at any time. They concluded that 2 weeks of Optygen supplementation is insufficient to elicit positive changes in cycling performance. However, they did allow that 2 weeks was perhaps not sufficient time to allow the ergogenic effects of the supplement to become evident, particularly in light of the fact that studies showing an ergogenic effect of cordyceps in humans (7, 8) used 6 and 12 weeks of supplementation. A similar study by Colson et al. (2) found no differences in muscle tissue oxygen saturation, $\dot{V}O_{2max}$, VT, or time to exhaustion between or within a group of male cyclists who took Optygen for 7 days versus a placebo group.

Products such as CordyMax, Optygen, and other cordyceps supplements are sold at many commercial herbal outlets despite the equivocal nature of published research. The Natural Medicines Comprehensive Database rates

Cordyceps sinensis as “Possibly Safe,” meaning that reputable references agree the product might be safe when used appropriately, and there are human studies reporting no serious adverse effects. At this time, it is premature to conclude that *Cordyceps sinensis* does or does not possess ergogenic properties, although it does show promise in older adults. However, because scientific literature remains inconclusive as to the potential effects of *Cordyceps sinensis*, future investigations should continue to illuminate the issue. ♦

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