

Uses and Safety Considerations of Cordyceps Supplementation

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Introduction

If you visit a grocery store in the United States, you will likely find a supplement section marketed to various consumer needs. Supplements are concentrated nutrients found in the form of powders, capsules, and liquids. The constituents in supplements may include– but are not limited to– vitamins, minerals, amino acids, probiotics, enzymes, herbs, and blends of multiple ingredients. In the United States, supplements are not evaluated for safety or effectiveness prior to becoming available to consumers, yet it is known that key vitamins, minerals, and nutritional constituents can result in toxicities when consumed in excess amounts. With this in mind, the supplement industry has grown substantially in the last 20 years. It is expected to almost double in value from the years 2021 to 2028 to an estimated USD 300 billion.¹ As the market continues to develop and grow, “Due to the scale of supplement use, it is prudent to investigate whether and to what extent nutrient supplementation has beneficial effects and whether it lowers the risk of developing modern diseases.”²

Historically, herbs have been utilized around the world as a supplement for health, as they can contain a myriad of vitamins, minerals, and other biologically active compounds considered to be medicinal. Traditional use of herbs as supplements date back thousands of years. *Cordyceps*, a genus of over 400 species, is a type of medicinal mushroom that grows parasitically out of caterpillars and insects, and is often found as a supplement in health food stores.³⁻⁹ The name *Cordyceps* comes from the Latin words for club and head, describing its unique shape.^{3,7,9} This medicinal mushroom has been cultivated across Asia for centuries, and is also widely distributed across most geographical regions.³⁻⁹ As the use of medicinal mushrooms increases around the world, cultivating *Cordyceps* in the wild has led to overharvesting, creating an industry interest in artificial cultivation to meet demands.^{3,5-8} The focus of this review will be on

two prominent species of *Cordyceps* found in supplements within the United States, *Cordyceps sinensis*—renamed to *Ophiocordyceps sinensis*—and *Cordyceps militaris*. In order to enhance consumer understanding of over-the-counter supplements, this literature review will analyze current uses and safety considerations of *Cordyceps sinensis* and *Cordyceps militaris*.

Cordyceps Uses and Formulations

Cordyceps has been used in Traditional Chinese Medicine as an adaptogenic tonic for millennia. Adaptogens support the body's resistance to stress, while tonics support the strengthening of organs and body systems. In Asia—especially within the mountainous terrain of China, Tibet, Nepal, and India—the *Cordyceps* genus has been traditionally utilized to help inhabitants adapt to the conditions of high altitudes like reduced environmental temperature, reduced oxygen availability, and increased atmospheric pressure.⁶ *Cordyceps sinensis* is the species more traditionally used. It has been found to treat respiratory disorders, strengthen the kidneys, bolster sexual function, reduce fatigue, and claims to treat cardiovascular disease, diarrhea, headache, rheumatism, disorders of inhibited immune function, and more.³⁻⁸ *C. sinensis* is so commercially and medicinally prized, it is even revered as gold in mushroom form.^{3,6} However, as worldwide demand for *Cordyceps* increases and the *C. sinensis* species proves difficult to cultivate artificially and costly to harvest from nature, the *C. militaris* species is being utilized as an alternative in modern day supplementation.^{3,5-9}

Research shows that both species of *Cordyceps* contain the same bioactive substances,⁶⁻⁷ which are the compounds within the mushroom that are utilized for medicinal and supplemental purposes. *C. militaris* is able to be cultivated artificially, and in fact, research has found this species to be higher in *Cordycepin*—a bioactive compound that supports healthy cell replication and other molecular processes—than *C. sinensis*.^{3,6-8} Numerous studies analyzing *Cordyceps*

militaris and *Cordyceps sinensis* in both animal and human models have found the medicinal mushroom genus to provide a broad-spectrum of biological benefits.³⁻¹⁰ These species have been found to protect the immune system, inhibit cancer cell growth and proliferation, protect the kidneys, lungs, liver, and brain, and be anti-inflammatory with antioxidant properties.³⁻¹⁰ *Cordyceps* is also being studied to support endurance.^{3,5-8} The various reported benefits of *Cordyceps* were not unified in formulation, though. Studies utilized different formulation procedures which produced different beneficial outcomes and varying levels of bioactive compounds. Reported formulations include but are not limited to, water extracts, alcohol extracts, powders, ferments of powders and liquids, and extracts of the main bioactive compound in *Cordyceps*- *Cordycepin*.³⁻¹⁰ *Cordyceps* appears to live up to its classification as an adaptogen and tonic, due to its far-reaching supportive implications within the body.

Cordyceps Dosage and Safety Considerations

Cordyceps consumption is generally considered to be safe in the scope of the current research, but further research needs to be conducted to assess safety considerations. In animal studies, the maximum tolerance dose of cordycepin, the main bioactive substance in *Cordyceps*—especially high in *C. militaris*—, is 3600 mg/kg/day for mice.^{6,8} Across four different human studies, there were no adverse reactions reported in participants supplementing with dosages of 1.5g, 3g, or 4g of *C. militaris* per day.⁶ It is suggested to avoid use of Cordyceps in those who are diagnosed with autoimmune diseases and in women who are pregnant and lactating.³ Furthermore, some study participants experienced gastrointestinal disturbances, dry mouth, and indigestion from *Cordyceps* consumption, though the dosages that induce these side effects are not clearly defined and may range from 1-12g per day.^{3,6} *Cordyceps* are also associated with reports of heavy metal poisoning and toxicity. One study reported lead poisoning in patients

taking supplemental *Cordyceps* powder,³ while a different study reported high levels of arsenic and cadmium in wild-growing *Cordyceps militaris*.⁷

Conclusion

In summary, *Cordyceps* is a genus of medicinal mushrooms that have been utilized traditionally as an adaptogenic tonic to support the body in adapting to stress-inducing conditions, as well as providing reinforcing support to body organs and systems within.³⁻¹⁰ Studies to analyze its traditional uses have found it supportive of a range of uses, from bolstering body functions to inhibiting cancer cell growth and proliferation.³⁻¹⁰ This literature review focuses on two prominent forms of *Cordyceps* on the market today, *Cordyceps sinensis* and *Cordyceps militaris*. *Cordyceps* may be found as powders, capsules, and extracts, with the dry, whole form mushroom being less commonly found as a supplement in the United States. Each formulation of *Cordyceps* seems to provide varying levels of reported benefits,³⁻¹⁰ and further research could be conducted to establish more uniform results. Since *Cordyceps sinensis* is difficult to culture artificially and expensive to cultivate from the wild, *Cordyceps militaris* may be more commonly found on the market.⁷

Currently, there are no established dosage guidelines for *Cordyceps* supplementation and there is further need for research on dosage in humans that induce gastrointestinal side effects. To reiterate, research shows that *Cordyceps* dosages of 1-4g per day may be consumed without adverse events, but people who have autoimmune conditions or who are pregnant and lactating are advised to avoid *Cordyceps* supplementation.⁶ It also is important to consider the risk of heavy metal exposure from supplemental *Cordyceps*.^{3,7}

Cordyceps supplements, like other supplements on the market, are not FDA approved for safety and efficacy prior to being sold to consumers. Due to these lack of current regulations, it

is important for the consumer to be aware of supplement benefits, risks, and safety considerations when choosing to incorporate supplements into daily habits.

References

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