

# CordyMax Cs-4 improves cardiovascular and metabolic capacity during exercise in highly-fit athletes

K.J. Nicodemus, R.D. Hagen (FACSM), J.-S. Zhu

Fit Stop Human Performance Laboratory, Encinitas, CA, and Pharmanex, Provo, UT



## Abstract

Previous studies indicated CordyMax Cs-4 (Cs), a mycelial fermentation product of *Cordyceps sinensis*, improved aerobic capacity in older humans and bio-energy metabolism in animals (Med Sci Sports Exerc 1999; 31:S174&S120). We tested the effect of Cs (4.5 g/day) on cardiovascular and metabolic capacity during peak (IWR) & submaximal (CWR: 60 min at 70% VO<sub>2</sub>peak) treadmill exercise. Male, highly-fit athletes (age 32 ± 4 yrs; VO<sub>2</sub>peak 63 ± 8 ml/kg/min) were randomized to a Cs or a placebo group (n=15 each; double-blind). O<sub>2</sub> uptake, CO<sub>2</sub> output, and heart rate (HR) were measured throughout IWR test; they and blood lactate (LA) were examined every 15th min during the CWR test. Six weeks of Cs prevented physical training-induced increases in peak HR, increased peak O<sub>2</sub> pulse (+7%, p=0.04) during IWR, and reduced HR (-2.2%, p=0.056) during CWR exercise. Cs lowered basal blood glucose (-7%, p<0.01), and reduced RER (-3%, p=0.059) and LA (-11%, p=0.03) during CWR exercise. These findings indicated CordyMax improved cardiovascular and metabolic functions of the highly-fit athletes during exercise, favoring more robust physical conditions.

## Introduction

- CordyMax™ Cs-4 improves aerobic capability (↑ VO<sub>2</sub>max, ↑ anaerobic threshold, ↑ maximal ventilation) in older humans (*Chinese J. Gerontology* 20(4): 297-298, 2001).
- CordyMax™ Cs-4 improves steady-state hepatic bio-energy status (*J. Alternative Complimentary Med.* 7(3): 231-240, 2001).
- CordyMax™ Cs-4 improves glucose metabolism (↓ fasting blood glucose and insulin, improving oral glucose tolerance and facilitates insulin recovery, ↑ insulin sensitivity) (*FASEB J.* 2001; 15(5, Part II): A753; *J. Alternative Complimentary Med.* 8(3), 2002 accepted).



*Cordyceps sinensis* (Berk.) Sacc. 冬虫夏草  
(Collected from Qinghai-Tibetan plateau of China)

### Isolation

**Cs-4** (A *Paecilomyces hepiali* Chen mycelial Cs-4 strain)

### Industrial Fermentation

**CordyMax™ Cs-4**



## Experimental Design

Randomized Double-Blind

Placebo Controlled (n=15) (4.5 g/day)  
CordyMax™ group (n=15) (4.5 g/day)

0 (weeks) ↑ 6 ↑

### Sub-Max Exercise-Metabolism Testing

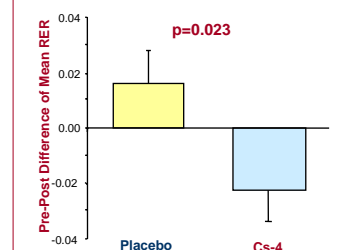
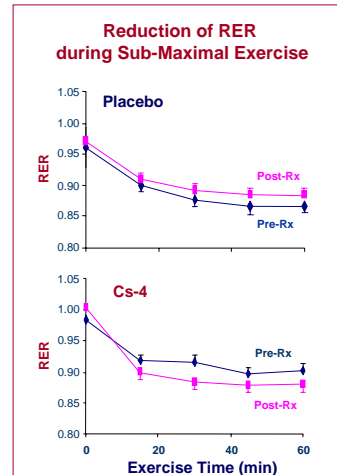
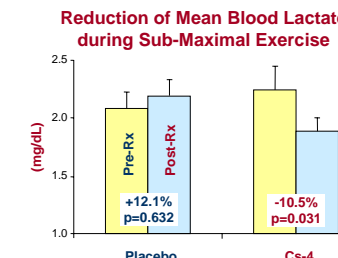
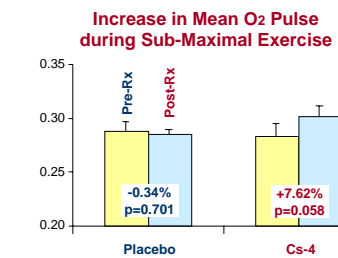
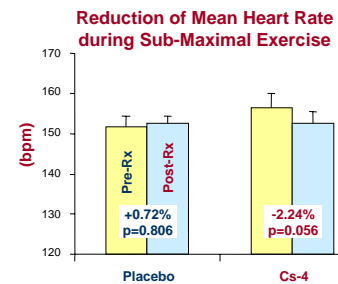
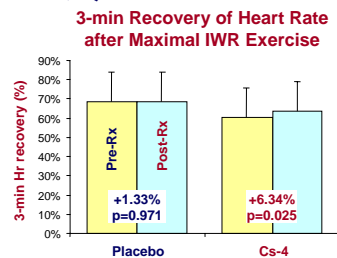
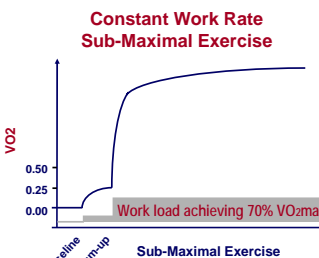
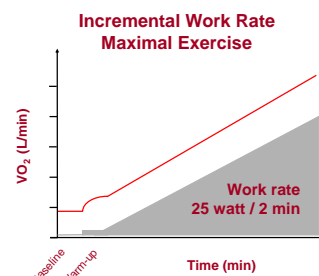
### Inclusion Criteria:

Healthy, highly fit, male endurance athletes under the age of 40 years

Training Background	Training Vol. Hours/week	Number of Subjects
Adventure Racers	11 ± 7	9
Pro/Competitive Triathletes	15 ± 7	10
Active Military (Reco/SEALs)	11 ± 1	3
Olympic Rower/Kayak	10	1
Ultra-distance runner	14	1
High Fit Multi-sport	9 ± 4	6

### Baseline characteristics of subjects at randomization

	Placebo	Cs-4	p value
Age (yr)	32.0 ± 1.05	31.7 ± 0.97	0.855
Body Weight (kg)	78.8 ± 1.96	80.3 ± 1.85	0.582
Height (cm)	179.7 ± 1.7	180.5 ± 1.4	0.727
Peak VO <sub>2</sub> (ml/kg/min)	62.5 ± 1.61	63.2 ± 1.86	0.787
VT VO <sub>2</sub> (ml/kg/min)	46.7 ± 1.19	48.8 ± 1.28	0.249
Peak Heart Rate (bpm)	182.6 ± 2.21	183.8 ± 2.36	0.706



## Summary

Six weeks of CordyMax Cs-4 Treatment on highly fit male athletes:

- ↑ Heart rate recovery after IWR maximal exercise;
- ↓ Heart rate during prolonged sub-maximal exercise ;
- ↑ Oxygen pulse during prolonged sub-maximal exercise;
- ↓ RER and lactic acid during prolonged sub-maximal exercise;

## Conclusion

Our findings suggest that 6 weeks of Cs-4 improved cardiac functions and metabolic capacities during IWR maximal and prolonged sub-maximal exercises in highly-fit humans.