

# Exercise Performance

## Creatine & Carnitine



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# Creatine Outline

- Creatine
- Marketing claims
- Relevant Research
- Efficiency
- Safety
- Questions!

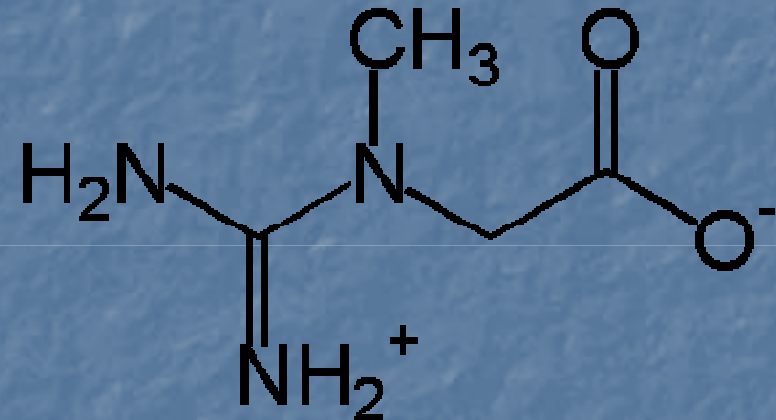


# Pump You Up!

- Nitrogenous Organic acid found in skeletal muscle
- Supplies energy to muscle and nerve cells
- Increase availability of cellular ATP
- Can also be found in meat and fish



# Creatine



- Recommended Dosage:
  - Loading Phase: 5g 4x a day
  - Maintenance Phase: 1 teaspoon 3x a day
- Excess Creatine Excreted in Urine
- Encouraged to be taken with Carbohydrates to be absorbed faster

# "Nature's Muscle Builder"



- Creatine Monohydrate
- Creatine Phosphate
- Creatine Citrate
- Increase Muscle Strength and Delay Fatigue

- Creatine Overload
- 750% more effective than regular Creatine
- "Help build muscle at the genetic level triggering protein synthesis"



# Effects of Creatine Loading and Depletion on Rat Skeletal Muscle Contractions

**Objective:** To see the effects of creatine feeding on the contractile properties of the sternohyoid muscle and on the extensor digitorum longus for the purpose of comparing.

**Study:** Rats were fed a standard diet of creatine for 10 days and beta-guanidinopropionate (which depletes muscle creatine) for 7 days. The contractile properties were measured.

**Results:** Creatine had no specific effect on twitch and tetanic tension, contractile kinetics, twitch/tetanus tension ratio, the tension-frequency relationship or fatigue in both muscles. Creatine depletion increases fatigue, creatine loading had no effect on the extensor digitorum longus and sternohyoid.

# Oral Creatine Supplementation decreases plasma markers of adenine nucleotide degradation during a 1-h cycle test

**Objective:** The effect of oral creatine supplementation on metabolism during a 1 hour cycling performance trial

**Study:** Placebo controlled , double-blind laboratory experiment. The study was ran on 20 male endurance cyclist who could bike 40 km within an hour. One group was given 10 packages of Creatine Monohydrate that was sufficient for a 7 day loading. Each subject performed a PPO . Then within the following days the subjects had to do a wind-braked cycle ergometer. Only thing that the subject was aware of was time that they had been cycling. Then the subjects muscle was biopsies

**Results:** Intramuscular creatine storage was enhanced by supplementation. It was not associated with improved cycling performance.

# Studies vs. Claims

- The supplements state that it will help you perform to the best of your ability
- Tests show that Creatine may help, but it does not make you go faster, harder, or longer
- There could be a reason why this supplement is allowed to be taken by professional athletes and Olympians
- It does build Creatine storage in the muscles

Really?





# *Safety*



- People under the age of 18 should not be taking Creatine supplements
- If you choose to use it look for 100% Creatine Monohydrate
- Long term usage not suggested for effect on Liver and Kidneys
- Could give you diarrhea, dizziness, muscle cramps and nausea
- Because you retain water could lead to high blood pressure

# References

M Gagnon , M Maguire, M MacDermott and A Bradford. "Effects of Creatine Loading and Depletion on Rat Skeletal Muscle Contraction." Clinical and Experimental Pharmacology and Physiology 292002 885-890. 25 Mar 2008

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# Carnitine Outline

- 1) Overview of Carnitine
- 2) Marketing & Media Claims
- 3) Research Articles
- 4) Media Claims & Efficacy
- 5) Safety Claims

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# Carnitine-Overview

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- Carnitine is derived from amino acids and is found in almost all the cells of the body.
- Its main role in the body is energy production.
- Produced in the body mainly in the skeletal and cardiac muscles.
- Found in foods such as animal products. L- Carnitine is the main type found in food.
- Doses of 2 to 6 g/day are recommended.
- There are 2 main types of carnitine: D and L. Only L is active in the body.

# Media & Marketing Claims

Claims made about carnitine include:

- Enhances endurance
- Increase fat metabolism
- Lower cholesterol & triglyceride
- Cardio protective affects

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# Research Article # 1: Carnitine & Aerobic Training

- Method: Randomized double-blind study. 28 males tested in 4 groups for 6 weeks. The groups who exercise used was 40 minutes on a bicycle 5 times per week. The supplementation used was 4 g/day of L-carnitine. The goal of the test was to determine whether carnitine interacts with FABPc, when combined with exercise. Muscle samples were obtained to test results.
- Results: The concentration of NEC was increased only in the CET. The ASAC concentration was increased in CS & CT. No significant changes in AIAC concentration. The content of FABPc was unchanged. No significant increase in beta-HAD activity was recorded.
- Conclusion: Although carnitine may have an effect on phenotypic expression & muscle fiber size, it does not appear to have an effect on fat metabolism, when combined with exercise. It has also not been proven to enhance exercise performance.

## Research Article # 2: Carnitine & Metabolism

- Methods: 7 males tested in 2 exercise sessions. The second session included carnitine supplementation. The main purpose of the study was to test if L-carnitine supplementation affected FFA during exercise. The first session included 120 minutes of bicycle exercise. This was performed for 1-2 months, then the second session began. This included consumption of 5 g/d. Plasma FFA & glucose were studied, as well as expired O<sub>2</sub> & CO<sub>2</sub>.
- Results: Heart rate was significantly lower during carnitine loading. Resting glucose levels were slightly lower. Total FFA concentrations increased. Plasma FFA levels were increased during the second exercise session. Muscle levels of carnitine were maintained during exercise.
- Conclusion: In healthy subjects, carnitine supplementation does not influence muscle substrate utilization either at rest or during exercise.

# Media Claims & Efficacy

Based on studies done, several media claims have been proven to be inaccurate.

Research has showed that carnitine does not increase fat metabolism, or enhance exercise endurance. The other claims made are not supported by research.

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# Safety of Supplementation

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Carnitine may lead to vomiting, cramps, diarrhea,  
and other mild symptoms.

Carnitine can interact with antibiotics used to treat  
urinary tract infections.

Most dosage between 2 & 6 g/d has shown no  
adverse effects.

# References

- Bjorkman, O. Cederblad, G. Hagenfeldt, L. Soop, M. Wahren, J. "Influence of carnitine supplementation on muscle substrate and carnitine metabolism during exercise." American Physiological Society. 0161-7567. 1988.
- Cha, Y. Kim, C. Lee, J. Park, H. Yoon, C. "Effects of L-carnitine supplementation and aerobic training on FABPc content and B-HAD activity in human skeletal system." Europe Journal of Applied Physiology. 193-199. 2007.

# Questions?

1. What foods have the highest amounts of carnitine?
2. What is the main role of carnitine in the body?
3. What improvements should be made to the studies done on carnitine to improve their efficacy?
4. Who are the main users of creatine supplements?
5. What is the main claim made about creatine supplementation?
6. Which age group is suggested not to take creatine supplements?

# Discussion Questions

1. Why do you think meats contain the highest amount of carnitine?
2. Why would supplementation be banned to people under the age of 18?

