Let's Excel Together

CANADIAN ACADEMY OF SPORTS NUTRITION

Lecture 45:

Sports Supplementation

Part 2

Copyright Protection:

Supplements to Discuss:

- **Conjugated Linoleic Acid (CLA).**
- **Creatine Monohydrate.**
- **HMB (beta-Hydroxy beta-Methylbutyrate).**

Conjugated Linoleic Acid (CLA):

Conjugated linoleic acid (CLA) is an essential fatty acid related to linoleic acid.

Natural Sources:

- **Dairy products and red meats are excellent sources of CLA.**

- **It could be found in eggs, chicken, corn oil, and safflower oil as well.**

Athletic Benefits of CLA:

- The rising popularity of CLA among athletes results from its ability to reduce body fat.
- Recently, it has been marketed as the "belly fat buster".

- **Potential athletic benefits are:**

- **a) Changes body composition.**
- **b) May help decrease body fat.**
- **c) May improve immune function.**

Non – Athletic Benefits of CLA:

- a) May have a protective effect against cancers, especially colon and rectal cancers.
- b) Weight loss. Being used as a weight loss accelerator, CLA does not have the same effects on everybody and may exhibit different results.
- Better results could be achieved if CLA combined with an exercise program.

Abazar`s Classification for CLA Consumers:

	Responsiveness	Comments
CLA Positive	70%	They respond to CLA and the results vary: decreasing body fat, losing some weight, or decreasing waist size.
CLA Negative	20%	They do not respond to CLA at all.
CLA Paradox	10%	They get opposite result, which means they gain weight or their waistlines increase.

- **The exact mechanism by which CLA paradox happens is not clear. However, it has been postulated that CLA paradox stems from developing insulin resistance.**

Dosage, Side Effects, and Interactions:

- **Recommended dose:** 3000 – 4000 mg per day.
- For an optimal absorption, it is better taken with foods.
- CLA may cause stomach upset, nausea, soft stools, and fatigue. It may aggravate inflammation.

CLA is not recommended in the following conditions:

- a) Diabetes.
- b) People with schizophrenia taking anti-psychotic medications.
- c) Along with medications for mania.

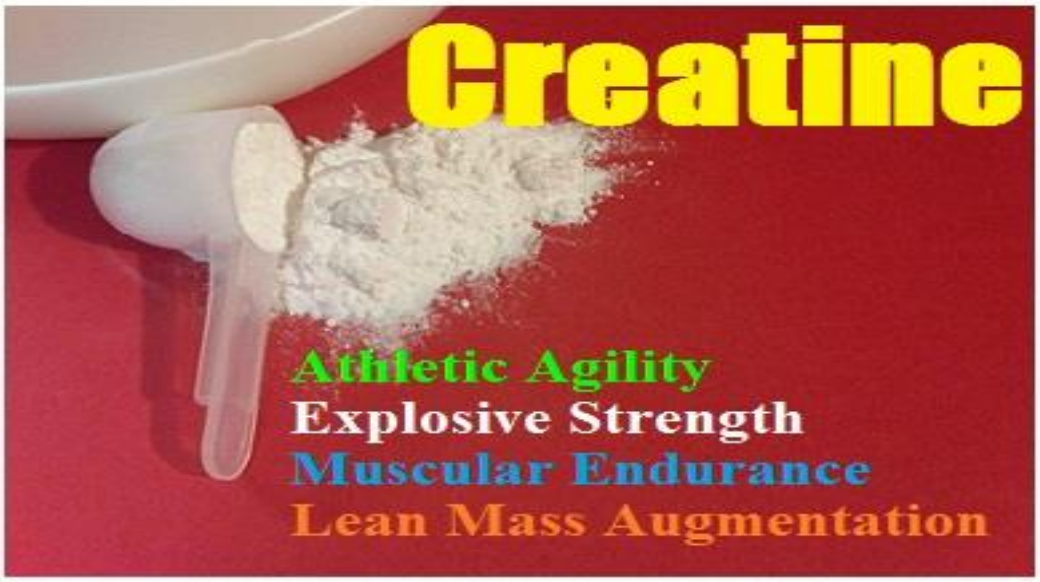
Creatine Monohydrate:

- **A naturally occurring compound and manufactured in the body during protein metabolism, especially break down of the amino acids arginine, glycine, and methionine.**

- **Normally, creatine is stored in the muscles in the form of creatine phosphate (CP) along with adenosine triphosphate (ATP).**

- **The body uses CP to resynthesize ATP from ADP (adenosine diphosphate).**

- **In other words, CP is the phosphate donor to ADP to make ATP.**



- ATP + Water ⟶ ADP + Phosphate + Energy

- ADP + PCr ⟶ ATP + creatine + energy

ADP + PCr ⟶ ATP + creatine + energy

water

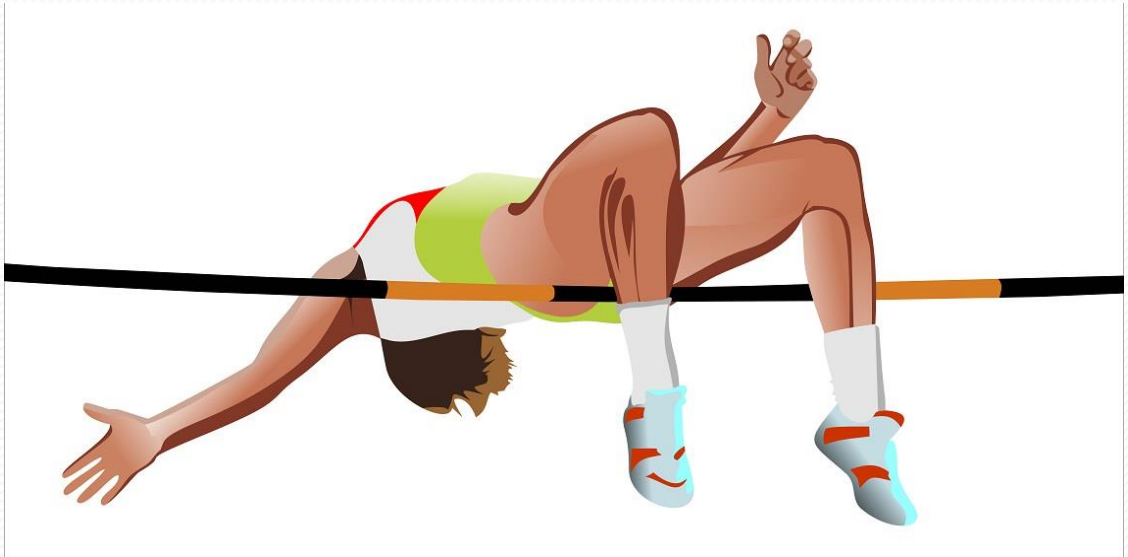
Energy

- PCr in the muscles comes from three sources:

1) PCr made from creatine in the liver

2) PCr made from creatine in the muscles

3) PCr made from ATP in the muscles.



Natural Sources:

- Creatine is naturally produced in the body mainly by the liver and kidneys and a small amount by the pancreas.
- Then it is transported to the muscles to be consumed.
- About 95% of creatine in the body is found in the skeletal muscles.
- The remaining 5% of creatine can be found in the heart, brain, and testicles.

- **The main food sources of creatine are fish and red meats.**

Source	Amount of creatine (grams per one pound)
Herring	3.8
Pork	2.3
Salmon	2.1
Beef	2
Tuna	1.8
Cod	1.5

Athletic Benefits of Creatine:

- **One of the most popular supplements in sports.**
- **Mostly effective in those activities that require short, intense bursts of energy, for example, weight lifting, wrestling, body building, martial arts, sprinting, and boxing.**
- **In fact, the energy required to perform a brief explosive exercise lasting 1 -15 seconds largely depends on the amount of creatine phosphate (CP) stored in the muscles.**

- **Creatine is stored in the muscles in two forms:**
- **1) CP: 70%**
- **2) Free creatine: 30%**

- **The more the body stores CP in the muscles, the better the muscles can perform during explosive exercise and short duration – high intensity events.**

- **During explosive exercise, the body needs quick synthesis and resynthesis of ATP, which primarily relies on stored CP in the muscles.**

- **If you do not have enough CP stored in the muscles to resynthesize ATP at the required rate, CP stores become depleted during explosive exercise and athletic performance deteriorates.**

Boxing. *Image: Copyright©Depositphotos.com/José Manuel Gelpi Díaz*

Potential Athletic Benefits of Creatine:

- **a) Increases muscle strength.**
- **b) Augments lean body mass.**
- **c) Improves athletic performance during exercise or competitions that require short, intense bursts of energy.**
- **d) Enhances athletic agility.**

- **e) May help increase anaerobic threshold.**
- **f) Delays muscle fatigue by decreasing lactic acid buildup.**
- **g) Accelerates energy recovery between bouts of short duration - high intensity exercise.**
- **h) Improves training intensity.**

Potential Benefits of Creatine in Sports:

Maximum Benefits	Moderate Benefits	Minimum Benefits
Bodybuilding	Badminton	Cross-county cycling
Dash 100	Basketball	Downhill skiing
Dash 200	Field hockey	Half marathon
Discus throw	Football (American)	Marathon
Long jump	Ice hockey	Track cycling: endurance events
Hammer throw	Long distance running	
High jump	Middle distance running	
Javelin throw	Rowing	
Pole vault	Rugby	
Power lifting	Soccer	
Shot put	Swim events: 100 M & over	
Swimming 50 M free style	Tennis	
Triple jump	Track cycling: sprint events	
Weight lifting	Triathlon	
60 meters hurdles	Volleyball	
100 meters hurdles	Wrestling	
	110 meters hurdles	
	400 meters hurdles	
	3000 M steeplechase	
	4 X 100 relay	
	4 X 400 relay	

Non – Athletic Benefits of Creatine:

Creatine monohydrate may show potential benefits in the following conditions:

- **a) Heart diseases:**
- **1) Heart arrhythmias**
- **2) Congestive heart failure.**
- **b) High cholesterol and triglyceride levels.**
- **c) Rheumatoid arthritis**

- **d) McArdle's disease.**
- **e) Neuromuscular diseases:**
- **1) Muscular dystrophy.**
- **2) Myopathies.**
- **3) Huntington`s diseases.**
- **4) Amyotrophic lateral sclerosis (ALS).**
- **5) Parkinson`s disease.**

How to Take Creatine:

About creating supplementation, there are few protocols:

- **a) Loading - Maintaining Protocol.**
- **b) Non – Loading Protocol.**
- **c) High Dose – on – Training Protocol.**

Loading – Maintaining Protocol:

This is the most common way of creatine supplementation among athletes, and actually generates better results than others.

Loading Phase:

- **5 – 7 consecutive days**
- **0.3 gr/kg/day (15 – 25 grams a day).**

Maintaining Phase:

- **3 – 5 grams daily for 6 – 8 weeks.**
- **If you stop maintenance dosage for 5 days or more, you should start from the beginning.**

Non – Loading Protocol:

- **This protocol does not include loading phase, and creatine supplementation starts with 5 – 7 grams a day for 6 – 8 weeks.**

High Dose – on – Training Protocol:

- **When following this protocol, creatine is taken only on training days with the dosage of 0.3 gr/kg/day (15 – 25 grams).**

Absorption and Metabolism of Creatine:

CP in the muscles comes from three sources:

1) **CP made from creatine in the liver.**
2) **CP made from creatine in the muscles,.**
3) **CP made from ATP in the muscles.**

- **The amount of creatine provided to the body through external sources does not affect the natural production of creatine in the body.**

- **In other words, oral creatine intake does not have a negative feedback on the internal production of creatine.**

- **The more the muscles pick up creatine from the blood, the more storages of CP would be available in the muscles.**

- **Creatine uptake into the muscles depends on sodium and is mediated by insulin. This means that taking creatine along with large amounts of glucose enhances creatine uptake.**

- **Taking creatine along with insulin mimickers (alpha-lipoic acid, chromium picolinate, and vanadium) may enhance creatine uptake in the muscles.**

- **Since insulin increases creatine uptake, one of the best ways to maintain creatine stores in the muscles is to take creatine with a high GI carbohydrate after exercise during the anabolic window.**

- **Another best time to ingest creatine is approximately 30 – 40 minutes before exercise.**

- **Betaine (trimethyl glycine), a phytonutrient found in significant amounts in beetroot, can enhance the formation of creatine in the body.**

- **It acts as a methyl donor to glycocyamine, a metabolite of glycine, to produce creatine.**

- **When supplementing with creatine, you need to drink more water:**

- **First of all, the main purpose of taking creatine is to produce ATP more and fast. And ATP requires water to generate energy.**

- **Secondly, creatine increases intracellular osmotic pressure. This leads to moving water from extracellular compartment to intracellular compartment (water retention).**

Creatine Cycling:

- **Creatine cycling means that creatine is taken for few weeks followed by a complete cessation of taking it.**

- **Even though experts still debate the pros and cons of creatine cycling, we strongly suggest that you cycle your creatine intake as 2 – 1 – 2 – 1, which means you take creatine for 2 moths (8 weeks) and then stop consuming it for one month (4 weeks). Then you could start again**

- **The primary purpose of creatine cycling is to remove pressure and workload from the kidneys that are responsible for excreting creatinine, the end product of creatine, from the body.**

Image: Copyright©Depositphotos.com/Moreno Novello

- **Continuous consumption of creatine may interfere with normal function of the kidneys especially if there are underlying predisposing factors for kidney damages.**

- **Insulin is degraded by the kidneys. So, poor kidney function alters the metabolism of insulin, leading to insulin resistance and impaired function of insulin and subsequently diminishing efficiency of creatine.**

- **Creatine is unstable in a solution.**

- **This is why it is highly recommended that you consume your creatine within 15 – 30 minutes after dissolving in water or juice, and do not keep your creatine solution for more than 6 hours.**

Side Effects:

- **The most common side effect of creatine that has been consistently reported is water retention.**
- **Some creatine users may experience abdominal cramps, dehydration, stomach distress, or bloating.**

Interactions and Contraindications:

You should exercise caution when taking creatine in the following conditions:

- **a) Along with large amounts of caffeine, as it may negate the effectiveness of creatine.**
- **b) During warm weather, as it may predispose to dehydration.**
- **c) When traveling to high altitudes, as it may trigger or aggravate mountain sickness in susceptible individuals.**

Creatine should be avoided in the following conditions:

- **a) Athletes with previous history of rhabdomyolysis.**
- **b) Athletes who have survived a second impact syndrome (SIS).**
- **c) Allergy to creatine, which shows itself as asthmatic reactions after ingesting.**
- **d) Liver diseases.**

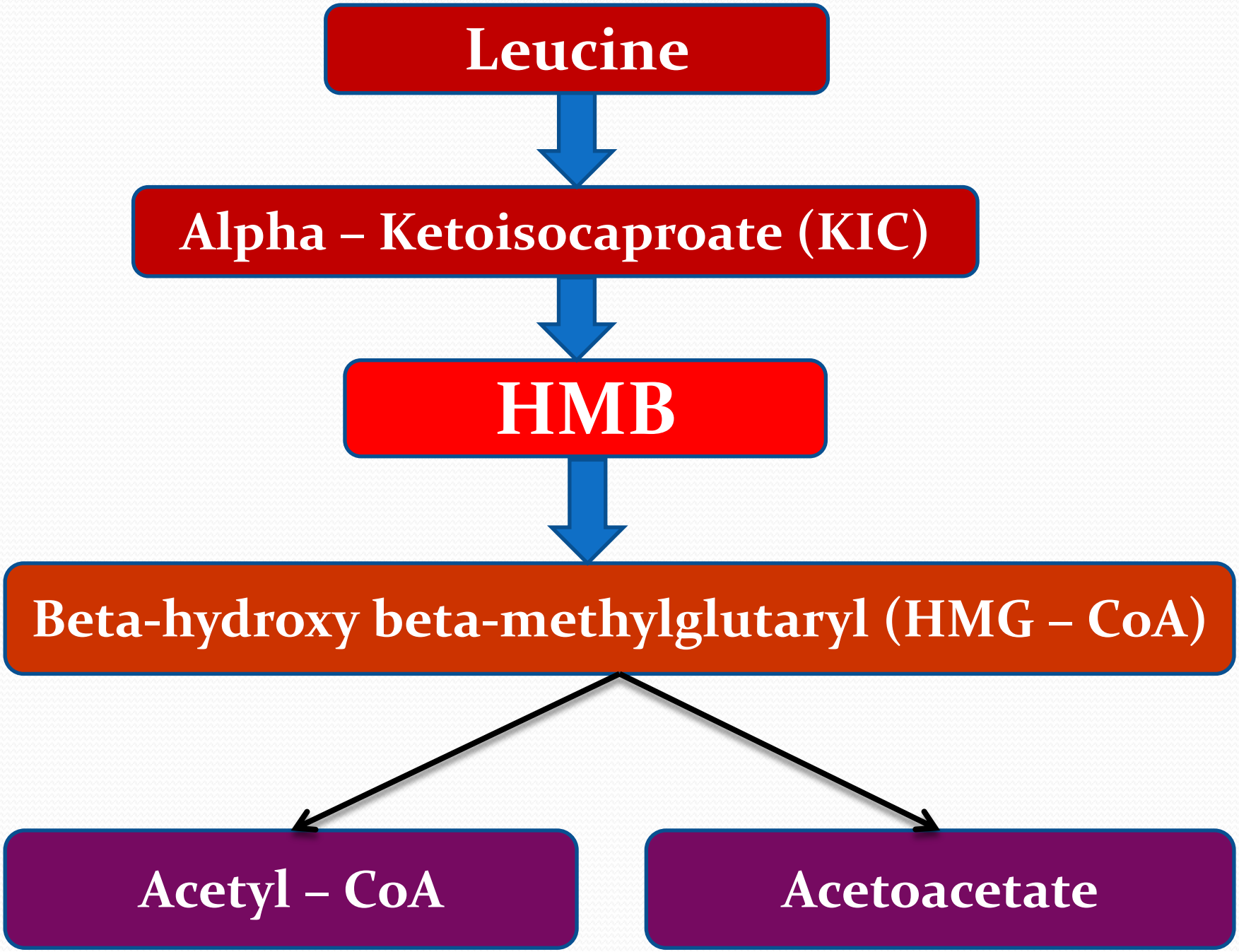
- **e) Kidney diseases.**
- **f) Diabetes.**
- **g) Kidney transplant recipients.**
- **h) Systemic Lupus Erthematosus (SLE).**
- **i) People with mania who take lithium.**
- **j) People with hypertension who take ACE inhibitors.**

- **k) Along with nephrotoxic medications:**
- **1) Aminoglycosides.**
- **2) Non-steroidal anti-inflammatory drugs (NSAIDs), such as Advil, Motrin, diclofenac, and sulindac.**
- **3) Cyclosporine.**
- **4) Cyclophosphamide.**
- **5) Beta- blockers.**
- **6) Amphotericin B.**
- **7) Cisplatin.**

HMB
(beta-Hydroxy beta-Methylbutyrate):

- **HMB is the metabolite of the essential amino acid leucine, one of the BCAAs.**

- **It has recently gained popularity among athletes because of its anabolic activity, which means it promotes protein synthesis and gaining lean muscle mass.**


Leucine
Alpha – Ketoisocaproate (KIC)
HMB
Beta-hydroxy beta-methylglutaryl (HMG – CoA)
Acetyl – CoA
Acetoacetate

Natural Sources:

- **Normally, HMB is produced in the body.**
- **Also, small amounts of HMB can be found in grapefruit, catfish, and alfalfa.**

Grapefruit: *Copyright©Depositphotos.com/Serhiy Shullye*

Athletic Benefits of HMB:

- a) Increases muscle mass.
- b) Helps recuperate faster from intense exercise.
- c) Supports recovery.
- d) May help prevent from rhabdomyolysis when combined with L – carnitine.
- e) Shows significant ergogenic effect when combined with creatine monohydrate.
- f) Reduces protein break down during intense exercise (anti-catabolic activity).
- g) May protect against overtraining syndrome.

Non - Athletic Benefits of HMB:

- a) High cholesterol.
- b) HIV support (when combined with glutamine and arginine).
- c) Catabolic states:
- 1) Severe burns.
- 2) Major surgeries.
- 3) Cancers.

Dosage:

- **HMB is taken 3000 – 4000 mg daily in divided doses.**
- **The best time to take HMB is approximately 30 minutes before exercise or competition and immediately after exercise within anabolic window.**

Homework:

- 1) Describe Abazar`s classification for CLA.
- 2) Describe potential athletic benefits of creatine.