

Supplements: Part 1

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LEARNING OBJECTIVES

- Discuss briefly the history of ergogenic aids.
- Discuss the current “hot” ergogenic substances.
- Provide information for informed discussion and counseling of athletes desiring ergogenic aids.



Brief History

- Supplements: \$18 Billion in 2007
- Some studies estimate 25-30% adolescents use.
- Estimates of 30-40% use in 50+ active.
- Information available is often poor and biased.



Counseling Pitfalls

- Avoid: “All supplements are a rip-off.”
- Avoid: Supplements are not regulated.
 - FDA regulates safety and labeling.
 - FTC regulates advertising.
 - Has led to independent agencies.
- Be sure you have valid resources to supply to you patient.



SUBSTANCES TO BE DISCUSSED

- CREATINE MONOHYDRATE
- β -Hydroxy- β -Methylbutyrate (HMB)
- CHROMIUM
- INSULIN-LIKE GROWTH FACTOR
- PROTEIN SUPPLEMENTS
- ENERGY DRINKS



CREATINE MONOHYDRATE

- Creatine is a substance made in our liver from arginine, methionine, and glycine.
- Creatine is ingested in fish and meat.
- Most of the body's creatine is stored in the muscles as creatine phosphate.
- Act as an intracellular buffer, replenishing ATP during short bursts of high intensity exercise. (Volek et al.)



Mechanism of Action

- Taken into cell by Na^+ dependant and Insulin dependant pathways.
- Rephosphorylation of ATP.
- Energy transport within the cell.
- Prevents increase in intracellular ADP.
- Prevents intracellular acidosis.
- Maintains ATP/ADP ratio.



CREATINE MONOHYDRATE

- Numerous studies have shown that creatine loading yields performance enhancement in brief high-intensity work .
- Normal muscle creatine levels in skeletal muscle is between 90 and 150 mmole/kg.
 - People with lower baseline levels respond better to loading.
- 16oz beef, pork, fish yields 2 g of creatine.



CREATINE LOADING

- Ingestion of 25-30 grams per day in divided doses of 5g/dose for 7 days.
 - A maintenance dose of 2-3 g/day after loading phase to continue the 20% increase in intracellular phosphocreatine.
 - Hultman et al showed that loading with a carbohydrate load increased muscle uptake.
 - most likely due to upregulation of creatine transporter via insulin secretion.
- Many are now just using a maintenance regimen.



CREATINE LOADING

- Due to the increased uptake with carbohydrate the athlete will inject insulin while Creatine Loading.
 - Has been cases of death due to hypoglycemia in a bodybuilder using insulin to Carb Load.
- Some are using oral hypoglycemics.
 - Metformin is big because of the “safety profile”
- Caffeine negates Creatine.



Cycling

- May be a slow long-term decrease in muscle creatine over time.
- Loading Phase [5-7 days]
- Maintenance Phase [5-8 weeks]
- Off Cycle [2-10weeks]
- Timing with season or competition.



Adverse Effects

- RENAL
 - No long term deleterious effects found. (5yrs)
 - Elevated serum creatine w/o ↓GFR.
 - Recent study showed rapid progression of renal disease.(Han:SPRD-cy Rats).
 - Case study of acute nephrotic syndrome.
- Do not use if renal disease or FHx.



Adverse Effects

- **Gastrointestinal**
 - Anecdotal reports with no scientific backing.
 - Probably due to the high glucose/fructose content in supplements.
 - Usually occurs during Loading Phase.
 - Lower incidence reported with dissolved powders.
- **Acute Compartment Syndrome**
 - Case of Athlete with ACS of thigh after workout.
 - Was using multiple other “supplements”



Adverse Effects

- Heat Intolerance
 - Several reports and ACSM Roundtable(2000)
 - No scientific evidence that this is true.
- Most noted side effect is water retention.
 - Increases total body water.
 - Lower CBT and HR compared to placebo group when exercising in heat.
 - Dehydrated individuals exercising heat show no difference in heat intolerance when compared to placebo.



Heat Intolerance

- Numerous studies show short term and long term supplementation may even be advantageous for athletes exercising in the heat.
 - Lower Core Body Temperature
 - May be due to increase total body water??
 - Exact mechanism unknown!



CREATINE MONOHYDRATE

- Has shown some promise in treating neuromuscular disorders.
 - Myasthenia Gravis patients.
 - Being studied in many muscle wasting disorders.
 - Has been used in HIV and cancer patients.



For whom does Creatine work?

- Short burst, anaerobic athletes.
 - Football players, throwers, weight lifters, sprint cyclist.
- Has not been shown to improve sprinters or swim sprint times.
 - Many think this is due to the weight gain.



HMB

(BETA-HYDROXY BETA-METHYLBUTYRATE)

- HMB is a natural metabolite of leucine.
 - Found in catfish, grapefruit, and mothers milk.
- HMB supplementation resulted in enhancement of muscle function in humans undergoing resistance training.
(Nissen)
 - People receiving HMB showed increased muscle mass and strength and decreased muscle breakdown with weight training. (untrained)
 - Often combined with arginine and glutamine (Juven--Abbott)



HMB

(BETA-HYDROXY BETA-METHYLBUTYRATE)

- Recent study at Ball states showed no ergogenic or deleterious effects.
- No adverse side-effects have been shown with HMB use.
- No good studies showing Positive effects in well trained athletes.
- Best used early in training
- Very expensive.



CHROMIUM

- Touted to be lost in sweat during exercise.
- There is no proof chromium in any form is ergogenic
- Interferes with iron and zinc metabolism.
- May be needed in athletes with poor diets high in processed foods and high carbohydrates



CHROMIUM PICOLINATE

- Chromium is a trace element which is bound to picolinate to increase GI absorption.
 - Cr acts as a cofactor that enhances the action of insulin.
- Evans and Hasten found it to increase lean body mass and decrease percent bodyfat.
 - Poor studies which were never duplicated.
- Has been shown to cause dysplastic changes in hamster ovaries.
- Wasser et al report a case of chronic interstitial nephritis after chromium picolinate use.



Insulin-like Growth Factor

- Produced in liver
- Mediates hGH function.
- Stimulates protein synthesis.
- Mobilizes Free Fatty Acids
- Reduces the metabolism of glucose for energy.



Insulin-like Growth Factor

- Reasons Athletes use IGF.
 - Increase muscle strength.
 - Increase lean body mass.
 - Improved muscle function.
- Reasons Athletes Should Not use IGF
 - Acromegaly
 - Myalgias
 - Severe Hypoglycemia.



Whey Protein

- A supplement, not food replacement.
- One of the two main proteins found in milk
- It is really not one protein but a combination of many proteins and compounds.
- Well absorbed and highly useable
- Also high in branched chain amino acids.
- How much? 1.2-1.5 grams/kg daily
- Can be used after strength training-help recovery.



Glycerol

- Used for hyperhydration prior to endurance events.
 - Be careful with dilutional hyponatremia.
- Has been shown to improve water retention 50%.
- Studies vary in regard to heat tolerance and performance.
- Shows promise in rehydrating in ultra-endurance and multistage events.

Energy Drinks

- Usually high in caffeine, taurine and sugar.
 - Can cause “anxiety” and tachycardias.
 - Can cause diuresis and diarrhea.
- Effectiveness based on caffeine.
- I do not like athletes using these drinks prior to competition.



Thank you
See you in Anaheim 4/14-17/10

