

PERFORMANCE ENHANCING DRUGS?

Leslie Bonci, MPH, RD, CSSD, LDN
Director of Sports Nutrition, UPMC

Disclosures

- Board member: Whey Protein Advisory Panel
- Ambassador: National Dairy Council

Supplements

- TO correct a deficiency (micronutrients)
- To provide additional calories (macronutrients)
- To meet the demands of growth, underlying morbidities (diet, disease, excessive exercise)

Supplements

- Complement
- Replacement
- Displacement
- Supplement safety- DO NO HARM
- Supplement effectiveness-biological/plausible mechanism of action for purported ergogenic effect
- Consider risks/benefits based upon safety and effectiveness

The Challenge

- You are asked to be:
 - Educator
 - Counselor
 - Enforcer
- We cannot dismiss the athlete's desire to pursue an advantage
- If we just say "no," we turn the athlete off!
- Need to educate re: facts vs. claims
- We need to prevent abuse or harmful side effects
- Provide options

How do you know if a product is a supplement?

Supplement Facts

Serving Size 1 Tablet

| | Amount Per Serving | % DV |
|---|--------------------|-------|
| Vitamin A (as retinol acetate) | 1250 IU | 25 % |
| Vitamin D (as vitamin D3 from organic lichen) | 1000 IU | 250 % |
| Vitamin K (as vitamin K2 (menaquinone-7)***) | 90 MCG | 113 % |
| D-Ribose | 300 MG | ** |
| Organic Blueberry fruit juice powder | 80 MG | ** |

**Daily Value (DV) Not Established

Other Ingredients: Natural Wild Berry Flavor,
Citric Acid, Organic Beet Root and Silica

***Natural vitamin K2 fermented on chickpeas

Supplement errors

- Timing
- Dose
- Consistency
- Replaces food

So what can I take

- Ergogenic supplements
 - Sports drinks
 - Sports gels
 - Higher carbohydrate sports bars
 - Certain sports shakes
 - Multivitamin-mineral supplements
 - Individual micronutrients if needed, ie. Iron, calcium

How to approach the athlete

- Remind athletes that supplements are substances that can be used to AUGMENT, not REPLACE the diet
- Natural and safe are not synonymous
- Discuss cost
- Talk about “contamination effect” what you see isn’t always what you get

Benefits of supplements

- Can provide extra calories for the athlete who needs to increase weight
- May be appropriate for the athlete with a nervous stomach before competition instead of solids
- May provide protein and/or carbohydrate for athletes whose diets are deficient
- May be a good choice for athletes who have trouble controlling intake in the afternoon or evening, or who routinely skip breakfast

Risks of supplements

- May be too concentrated in a certain nutrient or micronutrients in large doses or with other fortified products or foods
- May contain herbs and other additives
- Athletes with food allergies/digestive disorders may know what foods to avoid, but may not realize that bothersome ingredients may be in supplements

Guidelines

- Multi over individual micronutrients
- Not > 100% of Daily Value (DV)
- Check expiration date
- Look for USP verified dietary supplements seal



Whey Protein

- Fluid portion of milk obtained by removing the curd during cheese production
 - Milk is ~8% whey
- Contains high levels of essential amino acids and branched chain amino acids (BCAA)
- Absorbed more rapidly than other types of protein

Leucine

- Assists in protein synthesis acting as a dietary trigger to support an anabolic response in muscle tissue
- Meal plan adequate in leucine → ↑ or maintain MP
- Meal plan inadequate in leucine → block MPS
- Vegetarians will need to eat more total protein to get adequate leucine

Leucine in Food

| FOOD | LEUCINE (g) |
|--------------------------------------|-------------|
| Whey protein isolate, 25gram serving | 2.15 |
| Beef, 3 oz | 2.15 |
| Chicken, 3 oz | 2.00 |
| Tuna, 3 oz | 1.75 |
| Salami, 3 oz | 1.45 |
| Milk, 8 oz | 0.85 |
| Peanuts, 1/3 cup | 0.75 |
| Lentils, 1/2 cup | 0.65 |
| Egg, 1 large | 0.60 |
| Almonds, 1/3 cup | 0.40 |
| Soybeans, 1/2 cup | 0.40 |
| Asparagus, 1/2 cup | 0.10 |

Soy - pros and cons

- Quality source of amino acids
- Soy as an ingredient is OK, but processed soy isn't
- Whey > Soy > Casein
 - Rate different proteins affected muscle protein synthesis*
- Research suggests soy consumption does not effect testosterone levels in boys**

Casein

- Absorbed more slowly than most other types of protein
- Companies claim they have produced a time-release protein are merely marketing a casein based protein product
 - Studies show postprandial leucine balance is maintained for up to 7 hours after casein consumption

Source of protein

- Whey & soy-fast proteins (quick digest)
 - Rapidly increase blood AA levels
- Casein- Slow protein- slow digest
Moderate \uparrow in blood AA levels
- Skim milk vs soy post resistance training $>$ MPS
- Whey post resistance training $>$ \uparrow MPS than soy or casein
- Whey and soy $>$ MPS than casein

Branch Chain Amino Acids (BCAA' s)

- Shown to have various functions such as serving as a nitrogen source for glutamine synthesis in skeletal muscle
- Primary AA' s that are oxidized in tissues other than liver
 - Valine
 - Leucine
 - Isoleucine

Scientific Studies

- Early studies have shown a significant improvement in nitrogen balance and improved mortality rates in burn patients
- Human studies have only recently concentrated on BCAA's effects on athletes
- BCAA doses given may not be high enough to elicit a response; some suggest dosage should be 6 g/70kg body weight
- There are no known side effects of low-doses of BCAA supplementation
- It only takes ~10g of a complete protein (like milk) to provide the 6g of BCAA used in studies

Creatine

- Natural compound produced in the body
 - Synthesis of creatine involves 3 amino acids:
 - arginine
 - glycine
 - methionine
 - 95% of stored creatine is in skeletal muscle
 - Stored in the form of creatine phosphate
- Found naturally in foods
 - Average dietary intake 1.5 to 2.0g

Why creatine?

- Creatine-phosphate energy system is important for quick energy
- Supposed to enhance short-duration, high intensity anaerobic activities (e.g., weight lifting, sprinting, etc)

Creatine and Athletes

- Studies in young, healthy males have shown an increase in muscle creatine by 10-20% following “loading protocol”
- Benefit is greatest in those with low baseline creatine stores
- ~70-75% of creatine users experience intended benefit (e.g., strength gains, weight gain, decreased sprint times, etc)

Potential Side Effects

- Weight gain
- Muscle strains/pulls
- Muscle cramping
- Dehydration
- Cancer?
- Death?

Common Dosage Protocol

- Loading Phase
 - 20 g/day in 4-5 divided doses
- Typical Maintenance Phase
 - 5 g/day
- Recent studies now show loading phase is unnecessary and 2-3 g/day is sufficient to maintain stores

Creatine in foods

- 8 oz pork- 1.1 gm creatine
- 8 oz salmon- 1.0 gm creatine
- 8 oz beef- 1.0 gm creatine
- 8 oz cod- 0.7 gm creatine

Nitric oxide

- Athlete's Viagra
- Nitric oxide synthase catalyzes arginine oxidation to produce nitric oxide and subsequent vasodilation- muscle “pump”
- Minimal adverse side effects
- Supplementation does not influence nitric oxide levels in muscle
- No effect on performance
- \$\$\$\$\$\$

Dietary nitrates

- Beet root juice or beets
- Good source of inorganic nitrate- converted in vivo to nitrite and then to nitric oxide
- Contribute to vasodilation
- May reduce oxygen cost of exercise by ↓ total ATP cost of muscle force production and ↓ breakdown of PCr
- Contains quercetin and resveratrol may ↑ aerobic capacity

Food sources of dietary nitrates

- Food safety- bacteria can convert nitrate to nitrite
- Excessive beet root juice consumption: Red urine and stools
- Consider other sources too:
 - Celery
 - Lettuce
 - Spinach
 - Arugula
 - Greens

Products of concern

- Those with methylhexaneamine- geranium oil, Hardcore, Jack3D, Lipo 6 Black
- 1,3 –dimethylxanthine
- Acetamidoxolutamide (S4 or Andarine) selective androgen receptor modulator
- D-limonenes and Licorice root extract- ‘non hormonal’ supplements that block testosterone conversion to 5 dihydrotestosterone
- Velvet deer antler- contains IGF-1- intent to use IGF-1 is an anti-doping rule violation
- M-Drol Anabolic Muscle Building Formula- methyldrostanolone (amazon.com)
- Competitive Edge Labs P-Plex- contains Madol (amazon.com)

Beta Alanine

- It's the “new kid on the block”
- What is it?
 - Beta alanine is an amino acid
 - Your body uses it to form carnosine
 - Carnosine is found in skeletal muscle and helps delay fatigue



Strength Training Benefits?

- Early research suggests it could help improve strength and endurance
 - One study measured the effects of 4.8 grams/day beta alanine for 30 days
 - Subjects were resistance training and experienced a 22% increase in total training volume per workout
- Studies have NOT shown increases in lean body mass

Endurance Training Benefits?

- Endurance training is largely dependent on lactate threshold (the “burn” you feel during long training)
- One research study found that 28 days of supplementation (3.2 g/day) resulted in a 16% increase in work capacity during cycling
 - These data suggest beta alanine may allow endurance athletes to perform at a higher capacity and delay fatigue

Take Home Points

- It appears to take about 2-4 weeks to build up enough carnosine in your muscles to have an effect
- Exact dosage recommendation is unknown
 - Dosages in studies range from 3.2-6.4 grams/day
 - Some experts suggest dividing doses evenly throughout the day
- NOTE: may notice tingling in arms and legs with use

Green Tea Extract

- Green tea has a high concentration of both caffeine and catechin polyphenols, particularly epigallocatechin (EGCG), which *may* enhance thermogenesis
- May mask steroids when used in extract form
- May offer protective effect against oxidative damage that occurs during exercise
- 1 cup of brewed green tea
 - Approximately 50 mg of caffeine
 - 100 to 150 mg EGCG

NSF certification

- Supplement certification in place in the NFL , MLB,NCAA, NBA
- NSF app





Sport Nutrition Products

Information

Athletes should rely mostly on real food to supply their energy needs throughout the day. Sports nutrition products such as sports drinks, sports bars and gels have been designed to supplement an athlete's eating program pre-, during and post-training and not be a replacement or a substitute for food.

Application

There are many sports nutrition products on the market and it is quite confusing at times to make a good choice based on your nutrition needs for your training cycle and body weight goals. Below is a description of the three main sports nutrition products.

Sports Drinks

Sports drinks are flavored beverages that contain mostly carbohydrate and electrolytes and are typically consumed before, during and after training sessions. They will help maintain hydration and carbohydrate replacement for optimal performance. **Look for a product that supplies the following per 8 ounces: 14-15 grams carbohydrate, and at least 100 mg sodium.** Drink about 15-20 oz of sports drink 1-2 hours before training, 6-12oz of sports drink every 15-20 minutes during training >1 hour and 24 oz of sports drink after training for every pound of body weight lost..

Sports Bars

Energy bars are designed to provide athletes a compact source of calories, carbohydrate and protein before, during or after training sessions when other solid foods are not well-tolerated. Although the size and composition of these energy bars varies, it is typically best to consume one that contains 30-100 grams of carbohydrate and 6-20 grams of protein. If used before training, eat a bar that is higher in carbohydrate (60-100 grams), moderate in protein (10-15 grams) and low in fat (<6 grams) 3-4 hours before and a bar that is lower in carbohydrate (30-40 grams), protein (<8 grams) and fat (<3 grams) 1-2 hours before.

Sports Gels

Energy gels are semi-solid forms of mostly carbohydrate that help to maintain blood sugar levels during training and competition. Most energy gels will contain at least 22 grams of carbohydrate and sometimes vitamins and minerals. If used during exercise, consume 1-2 gels per hour with 4-8 ounces of water for each gel eaten.

Refer to a qualified Sport Dietitian for more information about choosing a product and deciding on a timing protocol that is best for your needs.

PERFORMANCE SERVICES

usolympicteam.com

DMAA

DMAA has been getting a lot of attention lately, and although products containing DMAA are legal in the U.S., a scientific review is underway. As such, the HPRC has compiled a list of currently available commercial products that contain this ingredient. The list is accurate as of the time of compiling, although some manufacturers have already modified their products to exclude DMAA and others may do so in the future. The list also may not include all products available. Some retailers still have stock of products that were previously made with DMAA, and newer, non-DMAA versions may have the same product name. So it is important to read ingredient labels carefully before using any product, especially those promoted for bodybuilding and weight loss (and party pills).

In checking labels, you need to know that there are numerous terms/synonyms for DMAA. The most common ones are 1,3-dimethylamylamine; methylhexaneamine or MHA; dimethylpentylamine or DMP; 4-methylhexan-2-amine; Geranium; and geranium oil, extract, or stems and leaves. However, other names are also used, so we have compiled a list of various terms that could appear on an ingredient label:

- 1,3-dimethylamylamine
- 1,3-dimethylpentylamine
- 2-amino-4-methylhexane
- 2-hexanamine,4-methyl-(9CI)
- 4-methyl-2-hexanamine
- 4-methyl-2-hexylamine
- 4-methylhexan-2-amine (IUPAC)
- C₇H₁₇N (chemical formula)
- CAS 105-41-9
- dimethylamylamine (DMAA)
- dimethylpentylamine (DMP)
- Fouramin
- Geranium (Proviant™)
- Geranium extract
- Geranium flower extract
- Geranium oil
- Geranium oil extract
- Geranium stems and leaves
- Metexaminum
- Methexaminum
- Methylhexanamine
- Methylhexaneamine (MHA)

Some additional resources

- Natural medicines comprehensive database-
www.naturaldatabase.com
- www.consumerlab.com
- www.drugfreesport.com
- [National Library of Medicine database-
www.ncbi.nlm.nih.gov/PubMed](http://www.ncbi.nlm.nih.gov/PubMed)
- Dietary Supplement Information Bureau-
www.supplementinfo.org
- www.herbalgram.org
- www.nsf.org
- NSF app- www.nsf sport.com/sport_app.asp

Your To-Do List

- DO ask WHICH supplements your athletes are currently or considering taking
- Do ask WHY they want to take them
- Do ask WHAT they notice as a result of taking them
- Do ask them about their basic eating plan:
When, what and How much

Bottom line

- When it comes to supplements our job is to educate our athletes, and their support systems to be:
 - Safe
 - Smart
 - Selective
 - Sure

Contact information

- Leslie Bonci,, MPH, RD, CSSD, LDN
- 412-559-5974
- boncilj1@gmail.com
- @lesliebonci #ActiveAdvice