Dietary Supplements on Athletic Performance

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What are Supplements?

- **Definition:** A product taken orally that contains one or more ingredients such as…
  - Vitamins
  - Minerals
  - Herbs
  - Amino acids
- …that are intended to supplement one's diet and are not considered food
- Come in a variety of forms
  - Tablets
  - Capsules
  - Powders
  - Drinks and energy bars

What Are Supplements? Continued…

- Sports supplements = ergogenic aid
- **Ergogenic:** tending to increase work
- **Ergogenic aid:** "A physical, mechanical, nutritional, psychological, or pharmacological substance or treatment that either **directly improves physiological variables** associated with exercise performance or **removes subjective restraints** which may limit physiological capacity"

Defining Doping

"…the administration of or use by a competing athlete of any substance foreign to the body or of any physiological substance taken in abnormal quantity or taken by an abnormal route of entry into the body, with the sole intention of increasing in an artificial manner his/her performance in competition is regarded as doping…"

Examples of Supplements

- Caffeine
- Creatine
- Amino acids
- BCAAs
- Whey protein powder
- Sports gels
- Omega-3 fatty acids
- Bicarbonate
- Diuretics

What Do They Do To My Body?

- Aid in replenishing adequate amounts of essential nutrients
- Do NOT take place of food from the diet
- Some are beneficial for overall health and managing some health conditions
  - **Example:** calcium and vitamin D keep bones strong and reducing bone loss

How Do I Know if I Need Supplements?

- Do not self-diagnose any health condition
- Talk with your health care provider before considering a supplement
- Serum lab values
  - **Examples:** iron, vitamin B_{12}, vitamin D
- Certain health conditions require them
  - **Example 1:** Vitamin C may be used to reduce cold symptoms
  - **Example 2:** Fish oil is taken to lower elevated blood triglycerides (fats)

Safety and Risk

- Be aware of possible side effects, especially with new products
- Side effects may occur when taken in place of prescribed medications
- Increase risk of bleeding
- Excessive intake from food in addition to supplements
  - **Example:** vitamin A = headaches, liver damage, reduce bone strength, birth defects
- Cautious when pregnant or nursing
- FDA: 800-FDA-1088

Why Do Athletes Take Supplements?

- Some athletes think that supplements will enhance their performance
- Build muscle
- Replenish energy
- Enhance appearance

Nutritional Sports Supplements: Caffeine

- The most highly consumed drug in North America and Europe
- IOC initially banned caffeine in 1962, then removed from list in 1972
- Today, urinary caffeine >12 micrograms per liter is an IOC infringement
  - NCAA >15 microgram per liter
- Urinary level requires >13.5 mg/kg of body weight caffeine (1 cup coffee = 80mg)

Ergogenic benefit: 330 mg/80 mg = **4.1 cups**

IOC banned dosage: 1012 mg/80 mg = **12.7 cups**

Nutritional Sports Supplements: Caffeine

Advantages

- Improved exercise endurance
- Stimulant to Central Nervous System
- Increases diuresis
- Increases lipolysis
- Increases incidence of cardiac arrhythmias
- Decreases muscle glycogenolysis

Disadvantages

- Nervousness and anxiety
- Tremors
- Insomnia
- Increased HR
- Creates a “high” and then a drop
- Dehydration

Nutritional Sports Supplements: Creatine

- Most popular nutritional supplement
- Main component of creatine phosphate
- Creatine is naturally found in meat and fish
- Also synthesized in the liver, pancreas and kidneys
  - Synthesizes 1 g/day
  - Synthesis is suppressed with supplementation

Nutritional Sports Supplements: Creatine Continued…

Advantages

- Maintains muscle ATP levels
  - Dietary supplementation of at least 15-25 g/day for 2-7 days can increase muscle creatine by 20-30%
- Increases strength and possibly fat-free body mass
- Not banned by IOC

Disadvantages

- Increased weight, muscle cramping, possible kidney damage from long-term intake
  - Physiological benefits are inconsistently reported
    - Changes are not significant
    - Not shown to help endurance performance, sprint running, or sprint swimming performance
- Banned by NCAA

Nutritional Sports Supplements: Amino Acids

- L-tryptophan and BCAAs
- Naturally found in the diet (protein)
  - Meat, poultry, fish, seafood, eggs, beans, tofu, dairy

Advantage

- Proposed to increase endurance performance by delaying fatigue

Disadvantage

- Studies are inconclusive on effects on performance

Nutritional Sports Supplements: L-Carnitine

- A type of amino acid (a building block of protein) that is naturally produced in the body
- Naturally found in the diet (protein)
  - Meat, poultry, fish, seafood, eggs, beans, tofu, dairy

Nutritional Sports Performance: L-Carnitine

Advantages

- Increased fat metabolism
- Can lower RPE
- Increased total work output
- Additional source of energy
- Enhanced recovery

Disadvantages

- Excess can result in renal failure
- Muscle weakness and seizures
- GI discomfort: nausea, abdominal cramps, vomiting, diarrhea

Nutritional Sports Supplements: BCAAs

- Branched Chain Amino Acids
- Consist of leucine, isoleucine and valine
- Found in meat, dairy and legumes
  - Eat a balanced diet

Nutritional Sports Supplements: BCAAs

Advantages

- Decreases fatigue
- Stimulates protein synthesis (muscle building)
- Maintains the level of testosterone and cortisol

Disadvantages

- Excess → fat
- Not necessary with a balanced diet
- Conflicting results on sports performance in specific exercises
- Consuming >2g/kg is not beneficial

Nutritional Sports Supplements: Whey Protein Powder

- Used in smoothies and shakes

Advantages

- Provides additional energy
- Contains high levels of BCAAs
- May stimulate growth hormone release (arginine and lysine)
  - Increases muscle mass (“gains”)
  - Decline in body fat
- Rich source of calcium
  - Reduces stress factures and prevents bone loss
- Good option for vegetarian and vegan athletes

Disadvantages

- Similar to BCAAs
- Again, eating a balanced diet provides the same nutrients

Nutritional Sports Supplements: Sports Gels

- Carbohydrate polymers
  - Large molecules of many monosaccharides held together by molecular bonds
- Possibly delivers more carbohydrates with a lower gastric emptying rate
  - Meaning less sloshing stomach contents
- Beneficial for endurance sports
  - Marathon, ultramarathon, triathlon, Ironman, Tour de France
- Provides 100 calories per gel pack
  - Provides some energy for long durations of exercise
- Examples:
  - Gu Energy Gel, Gu Roctane, PowerBar Energy Gel, Carb-Boom! Energy Gel, Accel Gel, Clif Shot, Hammer Gel

Nutritional Sports Supplements: Omega-3 Fatty Acids

- Fish oil
- Popular, new supplement for athletes and non-athletes alike

Advantages

- Improves blood vessel function
- Reduces inflammation
- Increases energy production from fat
- Can be consumed in the diet
  - Salmon, canola oil, flaxseed and flaxseed oil, eggs, soybeans, walnuts

Nutritional Sports Supplements: Sodium Bicarbonate Continued…

Advantages Continued…

- Naturally part of the body's buffering system to maintain normal pH
- Loading increases blood alkalinity so that more lactate can be cleared
  - Delay fatigue
- Ingesting 300 mg/kg body weight can increase performance in all-out exercise bouts between 1 and 7 minutes

Disadvantage:

- Can cause GI cramping, bloating, and diarrhea

Nutritional Sports Supplements: Diuretics

- A type of drug that causes increased production and excretion of urine

Advantages

- Weight reduction
  - Water loss
- Masks other drugs during drug testing

Disadvantages

- Dehydration
- Impaired thermoregulation
- Electrolyte imbalances
- Cramping

Overall…

- Balanced diet is key
- Consider the side effects (is it worth it?)
- Use relaxation techniques
  - Breathing exercises, imagery, mind-to-muscle relaxation, yoga, music
- If your routine works for you, continue doing it
- If not, consult with your coach and sports RD
- Be aware that some supplements are illegal and can risk you being banned from competing

Questions?