

Dietary Supplements: The Good, The Bad, The Ugly

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Dietary Supplements

- What are they?
- How are they regulated?
- What are they used for?
- Who uses them?
- Evaluating claims



What are they?

- The application of a **nutritional**, physical, mechanical, psychologic, physiologic, or pharmacologic procedure or **aid to improve physical work capacity, athletic performance, and responsiveness to exercise training.**

Nutritional Ergogenic Aids

- “...a product taken by mouth that contains a “dietary ingredient” *intended to supplement the diet*. The **“dietary ingredients” in these products may include: vitamins, minerals, herbs or other botanicals, amino acids, and substances such as enzymes, organ tissues, glandulars, and metabolites**. Dietary supplements can also be **extracts or concentrates**, and may be found in many forms such as **tablets, capsules, softgels, gelcaps, liquids, or powders.**”

Dietary Supplement Health and Education Act (DSHEA)

- Dietary supplements **DO NOT** need pre-market approval from the FDA before they are marketed, except in the case of new dietary ingredients
- There are **NO FDA regulations specific to dietary supplements** that establish a minimum standard of practice for manufacturing dietary supplements

- Sales of performance supplements are around ~\$800 million/year
- One study suggests 58% of high school athletes had used ≥ 1 supplement
- Estimates show ~8% of HS athletes use(d) creatine
- 75% of them **didn't know how much they were taking** or **took more than the recommended dose**

Supplements Most Often Used

(without known effect on youth)

- **Protein**
- **Creatine**
- **Amino acids**
- HMB
- Carnitine
- Vitamins/Minerals
- Caffeine
- Bicarbonate

Journal of Pediatrics, 2009

Dietary supplement use by adolescents

Pediatric sports nutrition: an update

- There is currently not enough evidence to support carbohydrate loading
- Creatine use, although common among youth, is not recommended.
- Adequate hydration is essential to optimal performance.
- Consumption of iron-rich foods should be encouraged, particularly in female athletes

“SUMMARY: In the highly competitive world of the child athlete, proper nutrition is of essence. Unfortunately, most of the knowledge in this field is based on adult literature.”

Current Opinion in Clinical Nutrition and Metabolic Care, 2009

Protein Myths

- Too much protein will *cause* kidney failure
- Only 50 g of protein can be absorbed at a time
- Protein is the *only* necessary macronutrient needed for gaining muscle
- Protein supplementation is *necessary* to gain muscle mass

Exploring Protein Supplements

- **Whey**
- **Soy**
- Casein
- Egg

Whey Protein?



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

Forms of Whey Protein

Typical Whey Protein Ingredient Composition			
Whey Components	Whey Powder	Whey Protein Concentrate	Whey Protein Isolate
Protein	11%-14.5%	25%-89%	90%+
Lactose	63%-75%	10%-55%	0.5%
Milk Fat	1%-1.5%	2%-10%	0.5%

Table adapted from Geiser, M: NSCA Performance Training Journal, 2003

Pros?

- Safe
- Convenient source of quality nutrients
- Much better than many other options young athletes choose
- Quick, quality meal if they may skip or if trying to gain weight

Cons?

- There is currently no direct evidence that demonstrates whey protein *alone* can promote gains in lean body mass
- Some may rely on protein and think it's necessary for performance
- Protein supplements aren't always high quality

Name This Product

- U-D WATER, **SUGAR (SUCROSE)**, **CORN MALTODEXTRIN**, **CALCIUM & SODIUM CASEINATES**, **SOY OIL**, **SOY PROTEIN ISOLATE**, **CORN OIL**, **CANOLA OIL**, ARTIFICIAL FLAVOR, SOY LECITHIN, CARRAGEENAN, VITAMINS & MINERALS, POTASSIUM CITRATE, CALCIUM PHOSPHATE, SODIUM CITRATE, MAGNESIUM CHLORIDE, MAGNESIUM PHOSPHATE, SALT (SODIUM CHLORIDE), CHOLINE CHLORIDE, ASCORBIC ACID, ZINC SULFATE, DL-ALPHA-TOCOPHERYL ACETATE, FERROUS SULFATE, NIACINAMIDE, CALCIUM PANTOTHENATE, MANGANESE SULFATE, CUPRIC SULFATE, VITAMIN A PALMITATE, THIAMINE CHLORIDE HYDROCHLORIDE, PYRIDOXINE HYDROCHLORIDE, RIBOFLAVIN, FOLIC ACID, CHROMIUM CHLORIDE, BIOTIN, SODIUM MOLYBDATE, POTASSIUM IODIDE, SODIUM SELENATE, PHYLLOQUINONE, VITAMIN D3, AND CYANOCOBALAMIN.
CONTAINS MILK AND SOY INGREDIENTS; LACTOSE- AND GLUTEN-FREE.

Name This Product

- Whey protein isolate (from **milk**), less than 1.5% **soy** lecithin added to aid in product dispersibility

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**

*Ingestion of whey hydrolysate, casein, or soy protein isolate: effects on mixed muscle protein synthesis at rest and following resistance exercise in young men.

**Clinical studies show no effects of soy protein or isoflavones on reproductive hormones in men: results of a meta-analysis

How much protein do these foods provide?

Breakfast

1 cup whole grain cereal
1 cup skim milk
½ banana

Snack

½ cup mixed nuts
½ cup dried fruit

Lunch

2 slices whole grain bread
2 oz turkey breast
1 slice cheese
1 orange
1 carton skim milk

Snack

Baby carrots
1 string cheese
Yogurt

Dinner

3 oz chicken breast
1 sweet potato
1 cup mixed greens
½ cup skim milk

Snack

1 cup yogurt
¼ cup granola

Strength Training Supplements



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Creatine

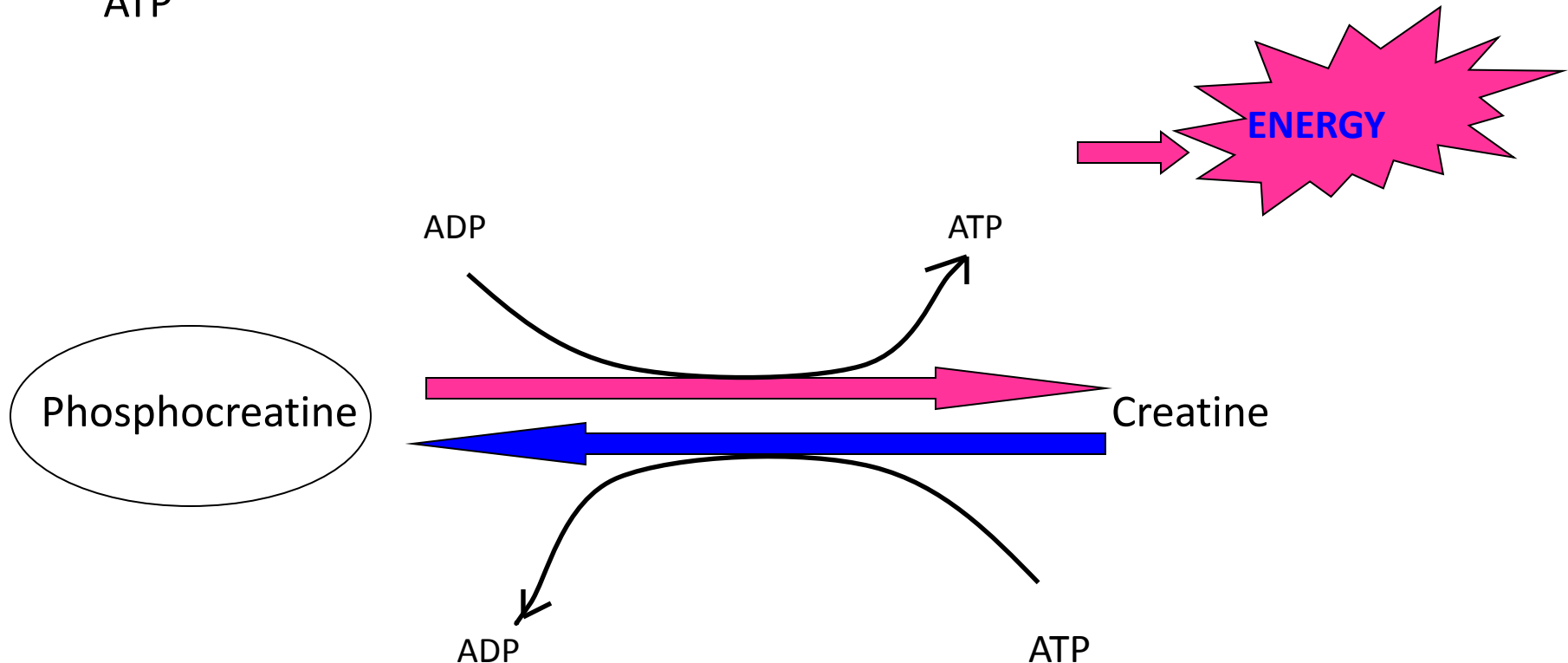
- Natural compound produced in the body
 - Synthesis of creatine involves 3 amino acids:
 - arginine
 - glycine
 - methionine
 - 95% of stored creatine is in skeletal muscle
 - Stored in the form of creatine phosphate
- Found naturally in foods
 - Average dietary intake 1.5 to 2.0g
 - Herring 3 to 4.5 g/lb
 - Red meat 1.4 to 2.3g/lb

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 Rationale

- ATP is an energy source
- High energy compound that can donate a phosphate group from ADP to ATP



Scientific Studies in Youth

- Less than 10 scientific studies have been conducted in this age group using creatine
- Studies that have been done show performance improvement in elite junior athletes

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 cycling?

Should Young Athletes Use Creatine?

- Journal *Pediatrics* “The widespread use of creatine in young athletes is troubling...safety in those under 18 is not known and long term effects in adolescents and preadolescents are unknown...”
- **American College of Sports Medicine** has recommended explicitly that it is not to be used by anyone who is younger than 18 years

The Ugly?

- **Nov 3, 2009** “Bodybuilding.com is Conducting a Voluntary Nationwide and International Recall of 65 Dietary Supplements That **May Contain Steroids**”
- **July 7, 2009** – VPX Nutrition is recalling 17 lots of the powdered dietary supplement, Stealth Chocolate and Stealth Vanilla, because it has the **potential to be contaminated with *Salmonella***
- **May 1st, 2009** “Voluntarily Recalls on Hydroxycut-Branded Products because of 23 **reported liver-related problems**”

Recent Headlines

- **Jan 20, 2010** “VMG Global pleaded guilty on to selling products under the guise of dietary supplements that had been illegally spiked with steroids”
- **Nov 11, 2009** “FDA notified consumers of a recall of Pai You Guo, a weight loss dietary supplement, due to **the presence of sibutramine...** and phenolphthalein, a **solution used in chemical experiments and a suspected cancer-causing agent that is not approved for marketing in the United States**

“Was at NSF last week in Ann Arbor – **15 products tested positive for stimulants and/or steroids.** Athletes buying blindly off the internet or at health food store are **as vulnerable as ever for positive doping outcomes.**”

Looking Ahead

- Looking at new regulatory groundwork for dietary supplements
- Offer the FDA ability to crack down on rogue companies that manufacture supplements spiked with steroids and other banned substances.
- The proposed legislation would require supplement companies to list ingredients and give FDA the authority to recall products if they pose dangers to consumers.

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