Performance Enhancing Drugs: Dietary Supplements & Ergogenic Aids

THE BAD, THE UGLY, THE GOOD

Tony Ricci - D.Sc, M.S. FISSN, CSCS, PES, CDN, CNS
Assistant Professor- EXERCISE & NUTRITIONAL BIOCHEMISTRY – Long Island University, Brooklyn
International Society of Sports Nutrition- Fellow, Advisory Board & Certified Sports Nutritionist
Member – American College of Nutrition, CBNS – Board Certified Nutritionist (CNS)
Licensed/ Certified, Dietician/Nutritionist – (CDN) Department of Public Health, States of CT, NY
Certified Mixed Martial Arts Conditioning Coach – MMA CC
NSCA – Certified Strength & Conditioning Specialist  NASM-Performance Enhancement Specialist
Certified – United States Track & Field Coach
Sports Science Director – Team Serra/Longo MMA
Team Dymatize - Scientific Advisory Board
Fight Performance Training – FIGHTSHAPE INTERNATIONAL LLC

tony@fightshape.net
INSTAGRAM – fightshape_ricci
For Your Attendance.....

Thank You!

I hope to provide an brief overview of the RX, good and bad OTC’s currently used by athletes at all levels and then share open dialogue.
Disclosure

- I serve on the Scientific Advisory Board for Dymatize Sports Nutrition

- My academic studies, personal research, training experience, personal athletic experience, and field work as Strength Coach and Sports Nutritionist have formed my conclusion that there are OTC supplements (providing quality assured) that are both efficacious and safe.

- The framework for this presentation is based on the NSCA - Performance Enhancing Substances

Jay R. Hoffman, PhD; CSCS,*D; FACSM; FNSCA
Jeffrey R. Stout, PhD, CSCS, FACSM, FISSN, FNSCA
Ergogenic Aid

Any substance, technique or device used to improve performance
many are placebos

Categories

• Nutritional aids
• Pharmacological aids
• Physiological aids
• Psychological aids
• Mechanical or biomechanical aids
The Bad
Hormones/Steroids

- Anabolic Steroids
- HGH
- EPO
- Insulin
- IGF-1
- B-Adrenergic Agonists
- B-Blockers
- HCG
The synthetic (man-made) derivatives of the male sex hormone, testosterone. Administration largely oral & injectable.

Who Uses Anabolic Steroids?
- Olympic athletes, professional athletes, collegiate athletes, and high school athletes have been reported to use steroids.
- Many users are not involved in sports; they use steroids to improve appearance.

Ergogenic Benefits
Muscle Mass and Strength
- Increases in muscle protein synthesis with steroid use are likely responsible for increases in lean body mass.
- Changes occur in both recreationally trained and competitive athletes.
- Commonly used.

Improperly administered, easily available.
The Bad – Yes, They Work!

- **Nandrolone**
- **Placebo**

**Increase in fat-free mass (kg)**

8 weeks of use: Nandrolone vs Placebo
14 weeks after cessation: Nandrolone vs Placebo

*(Note: The bar with an asterisk (*) indicates a significant difference.)*
And because they work, in competition where supplemented athletes are competing against those free of Rx, particularly in contact sports, beyond unfair, its outright dangerous.
Human Growth Hormone (HGH) stimulates growth, cell reproduction & regeneration.

- Naturally secreted in the anterior pituitary gland. Highest levels @ night during sleep.

- Used as a prescription drug to treat children’s growth disorders & adult growth hormone deficiency.

- Abused by competitors in sports since the 1970s.

- Banned by IOC, NCAA, CFL, Minor League Baseball and now the NFL.

- Only detectable through blood testing.

- There has been serious debate about how reliable testing is, although the World Anti-Doping Agency (WADA) says there has been a reliable test for over a year.

The Bad - HGH

- Enhance cellular amino acid uptake & protein synthesis in skeletal muscle.

- ↓glucose utilization

- ↓glycogen synthesis

- ↑amino acid transport across cell membrane

- ↑protein synthesis

- ↑utilization of fatty acids

- ↑lipolysis

- ↑availability of glucose & amino acids

- ↑collagen synthesis

- Stimulates cartilage growth

- ↑retention of N, NA, K, Ph

- Enhances immune cell function
Recombinant human erythropoietin (rhEpo) is used to treat anemia by stimulating the bone marrow to produce more red blood cells. rhEpo is structurally identical to native Epo, a hormone produced primarily in the kidney.

Injections of EPO are associated with elevations in both hematocrit and hemoglobin.

Health risks include increased risk of blood clotting, elevations in systolic blood pressure, a compromised thermoregulatory system, and dehydration during aerobic endurance events.

Figure courtesy of Dr. H. Franklin Bunn.
THE BAD – Additional Rx

- **Human Chorionic Gonadotropin**
  When injected into men, HCG can increase testicular testosterone production.

- **Insulin**
  Insulin increases protein synthesis, but the side effect of hypoglycemia can be fatal.

- **Amphetamines - “Greenies”**
  Widespread use of the stimulant since the late 1960's.
  Considered by many to be the first commonly used "performance enhancing drug.”
Dietary Supplements
**Ergogenic/Dietary Supplements: A Definition**

- **Ergogenic supplements** defined as ingredients that have been shown to significantly enhance exercise performance (e.g., helps you run faster, lift more weight, and/or perform more work during a given exercise task) using evidence-based research, or help athletes to stay injury-free and/or healthy during intense training, yielding and indirect improvement in performance.

- Consequently, employing nutritional practices that help prepare individuals to perform and/or enhance recovery from exercise should also be viewed as ergogenic.
**Dietary Supplements**

- $4 billion annually in US alone!!!

- The sport supplement industry throughout the world has exploded, with more than 600 sport nutrition companies marketing over 4,000 products that produce annual sales of more than $4 billion in the United States alone.

- Are they all legit? Well they can be, completely contingent upon the supplement, its action, and the integrity of the company, which is where, and why, it can get UGLY.
The Dietary Supplement Health and Education Act of 1994 ("DSHEA"), is a 1994 statute of United States Federal legislation which defines and regulates dietary supplements. DSHEA established a formal definition of "dietary supplement" using several criteria.

A dietary supplement:

- is a product (other than tobacco) that is intended to supplement the diet that bears or contains one or more of the following dietary ingredients: a vitamin, a mineral, an herb or other botanical, an amino acid, a dietary substance for use by man to supplement the diet by increasing the total daily intake, or a concentrate, metabolite, constituent, extract, or combinations of these ingredients.

- is intended for ingestion in pill, capsule, tablet, or liquid form.

- is not represented for use as a conventional food or as the sole item of a meal or diet.

- is labeled as a "dietary supplement."

- includes products such as an approved new drug, certified antibiotic, or licensed biologic that was marketed as a dietary supplement or food before approval, certification, or license (unless the Secretary of Health and Human Services waives this provision).
Dietary Supplements
The UGLY!!!

DSHEA IS SO TERRIBLE… THAT IT’S ABSOLUTELY AWESOME!!!!!!
DSHEA can get Supplements to the Athlete Faster and Cheaper, but if not careful in product selection - you may get a Protein Powder, Pre Workout, Weight Gainer, with some, or all of the following.

Some ingredients in supplements and sports drinks that are either directly banned by the International Olympic Committee's Medical Commission or that have been shown to cause a positive doping outcome in some people:

- Ephedrine
- Ma Huang
- Pseudoephedrine
- Guarana
- Strychnine
- Caffeine (if consumed in sufficiently high quantities to produce a urinary caffeine concentration of >12 µg/ml)
- Methylhexaneamine
- Dehydroepiandrosterone (DHEA)
- Androstenedione, androstenediol
- 19-norandrostenedione, 19-norandrostenediol and related compounds
A USA TODAY investigation finds that a wide array of dietary supplement companies caught with drug-spiked products are run by people with criminal backgrounds and regulatory run-ins.

FDA Warns 14 Sports Supplement Companies Of Illegal DMBA (AMP Citrate)

Lecheek Nutrition (Products: Ampilean and Ampitropin)
Iron Forged Nutrition d/b/a TGB Supplements (Product: Contraband)
Nutrex Research, Inc. (Product: Adipodex)
Blackstone Labs LLC (Product: Angel Dust)
1ViZN LLC (Product: Velocity)
Core Nutritionals LLC (Product: AMP Citrate)
RPM Nutrition, LLC (Product: Red Rum SS)
Brand New Energy LLC (Product: Yellow Bullet AMP)
DSEO LLC (Products: HybriLean and PREAMP)

ENERGY????

ENERGY IS THE PRODUCT OF WHAT YOU DO OVER MONTHS, TRAINING, SLEEP, HYDRATION, NUTRITION, .... HIGH-PERFORMANCE, SUSTAINABLE ENERGY, EXISTS NOT IN A CAN.
NCAA Student-Athletes are responsible for what they ingest.

NCAA Nutritional/Dietary Supplements Warning

• Before consuming any nutritional/dietary supplement product, review the product and its label with your athletics department staff!
  • Dietary supplements are not well regulated and may cause a positive drug test result.
  • Student-athletes have tested positive and lost their eligibility using dietary supplements.
  • Many dietary supplements are contaminated with banned drugs not listed on the label.
  • Any product containing a dietary supplement ingredient is taken at your own risk.

• [http://www.ncaa.org/nutritionandperformance](http://www.ncaa.org/nutritionandperformance)
Dietary Supplements
The Good!!
Dietary Supplements
The Good!!

PRIMUM NON
NOCERE!!!

If the Following Supplements are supported by Research for Safety and Efficacy

Then I will contend they are a viable alternative to the Rx and junk that remains on
the market, and athletes with extremely high training volumes can benefit from
such.

https://ods.od.nih.gov/factsheets/ExerciseAndAthleticPerformance-HealthProfessional/
Dietary Supplements
The Good!!
Number 1

- **Whey Protein** Builds, maintains, and repairs muscle
  Numerous clinical trials

- Research findings: Optimizes muscle training response during exercise and subsequent recovery period
  No safety concerns reported at daily recommended intakes for athletes of up to about 2.0 g/kg body weight (e.g., 136 g for a person weighing 150 lb)

- Reported adverse effects: None known
Creatine - Helps supply muscles with energy for short-term, predominantly anaerobic activity. Numerous clinical trials generally showing a benefit for high-intensity, intermittent activity; potential variation in individual responses.

Research findings: Increase strength, power, and work from maximal effort muscle contractions; over time helps body adapt to athlete-training regimens; of little value for endurance sports. Few safety concerns reported at typical dose (e.g., loading dose of 20 g/day for up to 7 days and 3–5 g/day for up to 12 weeks).

Reported adverse effects: Creatine is one of the most thoroughly studied and widely used dietary supplements to enhance exercise and sports performance. Studies have found no consistent set of side effects from creatine use, except that it often leads to weight gain, because it increases water retention and possibly stimulates muscle protein synthesis. Several studies have found that supplemental creatine monohydrate, when used for a strength-training program, can lead to a 1–2 kg increase in total body weight in a month.
Beta-alanine Increases synthesis of carnosine, a dipeptide that buffers changes in muscle pH, thereby reducing muscle fatigue and loss of force production; considerable individual variation in associated muscle carnosine synthesis. Numerous clinical trials with conflicting results.

Research findings: Inconsistent effects on performance in competitive events requiring high-intensity effort over a short period, such as team sports; little or no performance benefit in activities lasting more than 10 minutes. No safety concerns reported for use of 1.6–6.4 g/day for up to 8 weeks.

Reported adverse effects: Paresthesia (tingling) in face, neck, back of hands, and upper trunk with at least 800 mg or over 10 mg/kg body mass; pruritus (itchy skin)
**Dietary Supplements The Good!!**

*Number 4*

- **Fish Oil – Omega 3 –**
  - Increased dietary intake of omega 3 with reduced incidence in coronary heart disease and complications related to this disease.

  - Inflammation Mitigation- Rheumatoid Arthritis: Fish oil treatment resulted in decreased joint tenderness and morning stiffness, grip strength and joint activity indices for patients supplemented with 3-6g of EPA and DHA per day (over 15 studies, RCTs)

  - Osteoarthritis: 5 studies with benefit in WOMAC and/or VAS pain ratings, QOL

  - Along with curcumin, vitamin D and creatine, essential fatty acids in the form of fish oils, are one class of natural compounds with exciting potential therapeutic benefits in the treatment of traumatic brain injury (TBI).

  - Australian researchers published results of a study examining the effects of fish oil on **weight loss** in combination with diet and exercise in the May 2007 issue of *American Journal of Clinical Nutrition*. The results show that a combination of fish oil supplements and regular exercise can reduce body fat while also improving heart and metabolic health.
Dietary Supplements
The Good!!
Worthy of Inclusion

- **Beetroot or beet juice** - Beets are one of the richest food sources of inorganic nitrate. Ingested nitrate might enhance exercise and athletic performance in several ways, primarily through its conversion into nitric oxide in the body. Growing number of clinical trials investigating beetroot juice or concentrate as an ergogenic aid have been published since 2007. Beetroot has generally improved performance and endurance to different extents compared with placebo among runners, swimmers, rowers, and cyclists in time trials and time-to-exhaustion tests, but not in all studies.

- **Beta-hydroxy-beta-methylbutyrate (HMB)** Helps stressed and damaged skeletal muscle cells restore their structure and function. **Research findings**: Might help speed up recovery from exercise of sufficient amount and intensity to induce skeletal muscle damage.

- **Caffeine**: Blocks activity of the neuromodulator adenosine; reduces perceived pain and exertion. Numerous clinical trials with mostly consistent results. **Research findings**: Can enhance performance in endurance-type activities (e.g., running) and intermittent, long-duration activities (e.g., soccer) when taken before activity- Glycogen Sparing, Mental Alertness, Altered Pain Perception.

- **Essential Amino Acids**: EAAs alone stimulate as much protein synthesis as a whole protein with the same EAA content.

- The Future will include Nootropics and supplements that enhance Brain performance.
Food Remains Foundational

Let food be thy medicine, and let thy medicine be food."

Hippocrates

A Poor Diet Supplemented, is still, A Poor Diet
NUTRIENT TIMING – Be Quick

The proposed “Metabolic Window” (Modified from Ivy and Portman, 2004) “Without nutrient intervention, the metabolic window begins to close within forty-five minutes following exercise.” (Incr GLUT-4 receptor activity and glycogen synthase)
To Remain Updated in Sports Nutrition, Ergogenic Aids and Supplementation –
Refer to:

http://www.sportsnutritionsociety.org/
The ISSN

THANK YOU!!!

QUESTIONS – DISCUSSION!!
Body is 40 - 75% water. Under normal conditions the body can survive 30 – 40 days without food, as few as 4 days without water.

**Water affects athletic performance more than any other nutrient.**

- Water loss 1%/bdywt can increase core temp.
- 2% can lead to significant decline in performance.
- 3 - 5 % cardiovascular strain and inability to dissipate heat.
- 7%, collapse is likely.

- Average requirement for adults is 2 to 2.7 quarts (1.9 - 2.6L) per day. This is the amount required to replace fluid loss in urine and does not include insensible loss from skin, lungs, and loss in feces.

- Athletes sweating profusely for several hours can exceed 1.9qt/h (1.8L/h) of water loss.
Hydration

- Athletes sweating profusely throughout the day may need to consume as high as 2 extra gallons per day.

- Proper hydration levels can be monitored by weighing athletes before and after practice.

- Drink at least 2 to 3 cups of fluid for every pound of body weight lost.

- Or ingest a fluid volume that is 125% of sweat loss, i.e., (1 liter of sweat loss equals 1.25 liters of fluid intake).

- Drink 16 ozs. of cool water 2 hours before work out. During activity, drink frequently 6 to 8 ozs. every 15 minutes.

- The ultimate goal of fluid replacement in sports is to start exercise, training or practice, hydrated!
References


- NCAA National Study of Substance Use Habits of College Student-Athletes, August 2014.


