Supplements in athletes

Team Physician Course
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Objectives

• Define some common terms in various supplements used by athletes and others
• Provide overview to their use
• Describe the general use
• Describe the potential problems in the use of these substances
• Group various supplements by their purported use
• Will not cover details of all individual substances
Introduction

• Definitions
• History
• Overview
  – Uses
  – Problems
• Individual Agents
Definitions

- Food
- Drug
- Dietary Supplement
- Marketing terms
  - Natural
  - Organic
- Effects
  - Ergogenic
  - Anabolic
Food

- Any nourishing substance that is eaten, drunk, or otherwise taken into the body to sustain life, provide energy, promote growth, etc.

- Food is any substance consumed to provide nutritional support for the body. It is usually of plant or animal origin, and contains essential nutrients, such as carbohydrates, fats, proteins, vitamins, or minerals. The substance is ingested by an organism and assimilated by the organism's cells to provide energy, maintain life, or stimulate growth.
Drug

• The FD&C Act defines drugs, in part, by their intended use, as "articles intended for use in the diagnosis, cure, mitigation, treatment, or prevention of disease" and "articles (other than food) intended to affect the structure or any function of the body of man or other animals" [FD&C Act, sec. 201(g)(1)].
Dietary Supplement

- Product intended for ingestion that contains a "dietary ingredient" intended to add further nutritional value to (supplement) the diet. A "dietary ingredient" may be one, or any combination, of the following substances:
  - vitamin, mineral
  - herb or other botanical
  - amino acid
  - a dietary substance for use by people to supplement the diet by increasing the total dietary intake
  - a concentrate, metabolite, constituent, or extract

http://www.fda.gov/AboutFDA/Transparency/Basics/ucm195635.htm
Natural (FDA)

- Nothing artificial or synthetic (including all color additives regardless of source) has been included in, or has been added to, a food that would not normally be expected to be in that food.

- Not intended to address food production methods, such as the use of pesticides, nor did it explicitly address food processing or manufacturing methods, such as thermal technologies, pasteurization, or irradiation.

- Did not consider whether the term “natural” should describe any nutritional or other health benefit.
Organic

- The term "organic" is not defined by law or regulations that FDA enforces
- The National Organic Program (NOP) is a regulatory program housed within the USDA Agricultural Marketing Service
- European Union, the United States, Canada, Mexico, Japan, and many other countries require producers to obtain special certification
- No evidence safer or healthier
- No evidence of better taste
Are dietary supplements approved by FDA?

No. Dietary supplement manufacturers and distributors are not required to obtain approval from FDA before marketing dietary supplements. Before a firm markets a dietary supplement, the firm is responsible for ensuring that

- the products it manufactures or distributes are safe
- any claims made about the products are not false or misleading
- the products comply with the Federal Food, Drug, and Cosmetic Act
  all other respects

Dietary Supplements

FDA regulates both finished dietary supplement products and dietary ingredients. FDA regulates dietary supplements under a different set of regulations than those covering "conventional" foods and drug products. Under the Dietary Supplement Health and Education Act of 1994 (DSHEA):

- Manufacturers and distributors of dietary supplements and dietary ingredients are prohibited from marketing products that are adulterated or misbranded. That means that these firms are responsible for evaluating the safety and labeling of their products before marketing to ensure that they meet all the requirements of DSHEA and FDA regulations.
- FDA is responsible for taking action against any adulterated or misbranded dietary supplement product after it reaches the market.
Why Vitamins and Other 'Dietary Supplements' Can Contain Anything

Six former FDA commissioners regret inabilities to ensure safety and legitimacy of products.

JAMES HAMBLIN | JUN 26, 2016 | IDEAS 2016

FDA regulation of drugs versus dietary supplements

All prescription and non-prescription drugs are regulated in the United States by the Food and Drug Administration (FDA). But dietary supplements are treated more like special foods.

Because supplements aren’t considered drugs, they aren’t put through the same strict safety and effectiveness requirements that drugs are. So all the drugs you can buy, even without a prescription, must be proven safe and effective – but dietary supplements do not.

www.cancer.org

Drugs are considered unsafe until proven safe

Dietary supplements are considered safe until proven unsafe
Ergogenic—Work Producing

• Stimulants
  – Cocaine / Crack
  – Amphetamines

• Anabolics
  – Anabolic Steroids
  – Growth Hormone

• Blood doping and EPO
Anabolic

• Anabolic-androgenic Steroids (AAS)
• Human Growth Hormone (HGH)
• Creatine
• Insulin
History

- **776 BC - 393 BC** - Ancient Greeks Use Performance Enhancing Drugs
- Gorged themselves on meat - not a normal dietary staple of the Greeks
- experimented with herbal medications in an effort to enhance their performance
- drank wine potions, used hallucinogens and ate animal hearts or testicles in search of potency
History

• **1889**- Dr Brown-Sequard announced he was able to reverse aging in his 72 yo body
  – Injected himself with extract of dog and Guinea pig testicles

• **1905**- discovery of unknown hormone
  – **1935**- testosterone isolated

• **1950**- Russian weightlifters began to outpace US Olympic athletes
1988 - At the Seoul Olympics, Ben Johnson tested positive for a prohibited anabolic steroid, was stripped of his gold medal and was suspended for two years.
A Brief History of Doping

- **1999**- World Anti-Doping Agency (WADA) formed
- **2000**- USADA began operations as the independent anti-doping agency for Olympic related sport in the to represent the interests of Olympic, Pan American Games, and Paralympic athletes.
Why

- Athletes always look for an edge
- When is it unsafe and cause harm?
- When has the athlete been cheated?
  - Substances that have low or no effectiveness
- When does it become cheating?
  - and why should we care
No easy answers

- What is acceptable?
- When is it a Supplement?
- When is it Doping?
- When is it Cheating?
Why should we care?

• If you ain’t cheatin, you ain’t racin’
• It’s our job to cheat; it’s their job to catch us
• It’s only cheating if you get caught

Richard “King” Petty
The Olympic Motto

• Citius-Faster
• Altius-Higher
• Fortius-Stronger
Cynical
The Olympic Motto

• Citius-Faster
  – Speed/Stimulants
• Altius-”higher”
  – Recreational
• Fortius-Stronger
  – Steroids
Speed Spectrum
Where would you draw the line?

Caffeine
Energy Drinks
Adderall
Amphetamine
Cocaine
Methamphetamine
“Higher” Spectrum
Where would you draw the line?

Sugar
Caffeine
Energy Drinks
Alcohol
Marijuana
Cocaine
Party Drugs
Heroin
Stronger Spectrum
Where would you draw the line?

- Good nutrition
- High Protein diet
- Protein supplements
- Amino Acid
- Creatine
- Steroid precursors
- HGH
- Steroid precursors
General Categories of Ergogenic Supplements

- Stimulant
- Anabolic
- Enhancement
- Recovery
- Herbal
- Vitamins and minerals
Where do athletes get information?

• 25 top sports supplements *Nutrition Express* Jeff S. Volek, Ph.D., R.D.

• Top 7 Supplements for Athletes Michele Vieux

• *Nutrition and Athletic Performance* 2015. www.acsm-msse.org
Suggestions from a Sales Site

• Protein
  – Whey Protein
  – Cassein Protein
  – Egg white protein
  – Soy Protein

• Amino Acid
  – BCAA/Leucine
  – Protein (amino acid) tablets
  – Glutamine
  – Taurine
  – Beta-alanine

25 top sports supplements Nutrition Express Jeff S. Volek, Ph.D., R.D.
Suggestions from a Sales Site

• Performance Enhancers
  – Creatine
  – Beta-alanine
  – D-Ribose
  – HMB
  – Nitric Oxide

• Testosterone Support
  – Tribulus
  – ZMA (Zinc and magnesium aspartate)
    • Magnesium
    • D-Aspartic Acid
  – L-Carnitine
Suggestions from a Sales Site

- Fat Burners
  - Green Tea Extract
  - Raspberry Ketones
  - Caffeine
  - CLA (Conjugated linoleic acid)
  - Green Coffee Bean Extract

- Omega-3s/EPA & DHA
  - Fish Oil
Suggestions from a Cross Fit Blog

- Omega 3 Fatty Acids (Fish Oil)
- B-Vitamins
- Magnesium
- Vitamin D
- Protein
- Vitamin C
- Coenzyme Q10 (CoQ10)

https://www.crossfitinvictus.com/blog/top-7-supplements-for-athletes/
Joint Position Statement 2015

- Academy of Nutrition and Dietetics (AND)
- Dietitians of Canada (DC)
- American College of Sports Medicine (ACSM)
Suggestions from nutritional experts

- **Medical Supplements**
  - Iron
  - Calcium
  - Vitamin D
  - Multivitamins and minerals

- **Performance supplements**
  - Creatine
  - Caffeine
  - Sodium Bicarbonate
  - Beta alanine
  - Nitrate

Creatine

• Positive
  – Improves performance of repeated bouts of high-intensity exercise with short recovery periods
  – Direct effect on competition performance
  – Enhanced capacity for training

• Negative
  – Weight gain
  – Gastrointestinal
  – Purity

http://journals.lww.com/acsm-msse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx
Caffeine

• Positive
  – Reduces perception of fatigue
  – Allows exercise to be sustained at optimal intensity/output for longer

• Negative
  – Tremor, anxiety, palpitations
  – Diuretic
  – Complete content of some supplements unknown

http://journals.lww.com/acsm-msse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx
Sodium bicarbonate

• Positive
  – Improves performance of events that would otherwise be limited by acid–base disturbances associated with high rates of anaerobic glycolysis
  – High intensity events of 1–7 minutes such as repeated high-intensity sprints

• Negative
  – May cause gastrointestinal side-effects which cause performance impairment

http://journals.lww.com/acsm-msse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx
Beta-alanine

• Positive
  – Improves performance of events that would otherwise be limited by acid–base disturbances associated with high rates of anaerobic glycolysis
  – Mostly targeted at high-intensity exercise lasting 60–240 seconds

• Negative
  – Some products with rapid absorption may cause paresthesia (tingling sensation)

http://journals.lww.com/acsm-msse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx
Nitrate

• **Positive**
  – Improves exercise tolerance and economy
  – Improves performance in endurance exercise at least in non-elite athletes

• **Negative**
  – Consumption in concentrated food sources (eg, beetroot juice) may cause gut discomfort and discoloration of urine
  – Efficacy seems less clear cut in high caliber athletes

[http://journals.lww.com/acsm-mssse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx](http://journals.lww.com/acsm-mssse/Fulltext/2016/03000/Nutrition_and_Athletic_Performance.25.aspx)
Suggestions from nutritional experts

- Athletes motivated to enhance performance
- False advertising, unsubstantiated claims
  - 100% pure
  - Pharmaceutical grade
  - Free of banned substances
  - Natural health product
- Prevalence of use 37-89%
  - Higher in elite and older athletes
Potential Problems

- Unintended effects
- Contamination
- Adulteration
- Labeling
  - Sampling from 12 supplement brands
  - 1 brand had 177% of labeled amount
  - 2 brands contained NONE
  - 1 had testosterone (unlabeled)

Analysis of over the counter dietary supplements. Clin j Sports med 2001;11
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• http://www.fda.gov/Cosmetics/GuidanceRegulation/LawsRegulations/ucm074201.htm
• http://www.cancer.org/treatment/treatmentsandsideeffects/complementaryandalternativemedicine/dietarysupplements/dietary-supplements-fda-regulations
Questions?