Ergogenic Aids - Dietary Supplements

Assembled by the
IHSA Sports Medicine Advisory Committee

Ergogenic Aids

- Any substance taken to enhance athletic performance.
- These substances include dietary supplements which may be legal or illegal.

Dietary Supplements

- Products intended to supplement the diet that contain at least one dietary ingredient to include:
  - Vitamins
  - Minerals
  - Herbs or other botanicals
  - Amino acids
  - and substances such as enzymes, organ tissues, glandulars, and metabolites

Dietary Supplements

- These products are taken by mouth.
- These products are found in many forms to include:
  - Tablets
  - Capsules
  - Softgels
  - Gelcaps
  - Liquids
  - Powders
  - Bars

Dietary Supplement Health and Education Act 1994

- As a result of this act,dietary supplements are no longer regulated as foods and are not subject to pre-market safety evaluations.

Dietary Supplement Health and Education Act 1994

- The product must be labeled as a dietary supplement.
- Information on the product label must not represent the product as a conventional food or a sole item of a meal or diet.

Dietary Supplement Health and Education Act 1994

- Allows for product labeling claims as long as it does not diagnose, prevent, treat or cure a specific disease.

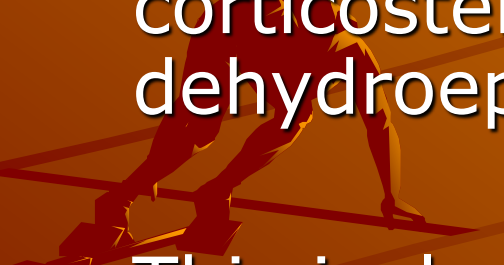
- While the statements must be truthful and not misleading, there is not a review/approval process by the FDA.

Dietary Supplement Health and Education Act 1994

- The manufacturer is responsible to ensure the product is safe.
- Manufacturers/distributors are not required to record, investigate or forward to the FDA any reports of injuries or illnesses that may be related to use of their product.

Anabolic Steroid Control Act of 2004

- Expands the definition of anabolic steroids to include any drug or hormonal substance, chemically and pharmacologically related to testosterone. (other than estrogens, progestins, corticosteroids, and dehydroepiandrosterone)



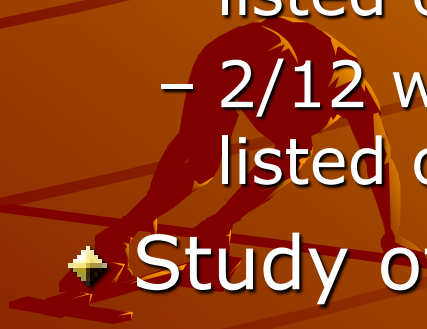
- This includes androstenediol and androstenedione.

General Concerns

- Without regulatory control there is a buyer beware market
  - Dietary supplement advertisements can be misleading and deceptive
  - Claims of effectiveness may not be credible
  - The concentration and quality of active ingredients can differ from product to product

Analysis of Dietary Supplements

- Study of 12 brands
  - 11/12 contained <90% or >110% of amount listed on label
  - 5/12 contained at least one ingredient not listed on label
  - 2/12 were missing at least one ingredient listed on label
- Study of 240 supplements
  - 18.8% contained steroids or pro-hormones not listed on label



Green, 2001; Geyer, 2004

General Concerns

- Dietary supplements may adversely interact with each other as well as prescription medications.

- Dietary supplements are often utilized as a short cut to optimal nutritional practices.

Research Concerns

- There is a lack of quality peer reviewed research on human subjects.
- The high dosages, utilized by athletes, have not been well studied.
- The long term side effects are not well studied, if at all.
- Research has not been equally completed on men, women and adolescents.

Protein

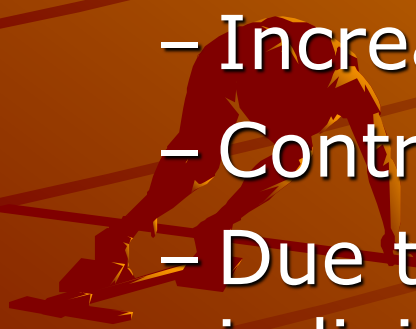
- Background:
  - Proteins are linked amino acids that occur naturally in foods
  - Example foods that contain protein include: meats, fish, poultry, milk, soybeans
  - Protein supplementation can include: powders, shakes and bars

Protein

- Claims include:
  - Improved muscle growth and function
    - Increased weight gain
    - Increased lean muscle mass
    - Increased strength/power

Protein

- Potential side effects:
  - High protein intake may displace carbohydrate in the diet possibly affecting performance
  - Increased urinary calcium loss
  - Contribute to dehydration
  - Due to the stress on the kidneys, individuals with kidney disease should avoid high protein diets



Protein

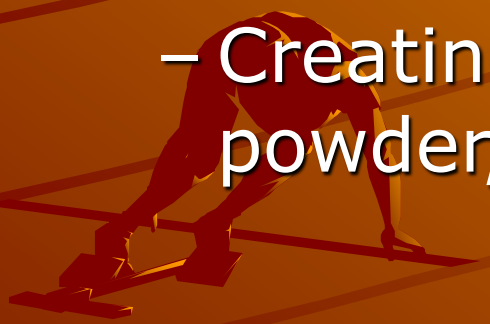
- Research findings:
  - The protein requirement in athletes is higher than non-athletes.
  - Most research studies do not support supplementation as having a positive effect on muscle size and function.
  - Research may be affected by the fact that most athletes consume levels of protein that exceed recommended amounts.

Protein

- Legal status:
  - Is a legal substance
  - Is not banned by sports governing bodies

Creatine

- Background:
  - Naturally occurring compound derived from amino acids
  - Found in meat and fish
  - Creatine supplementation can include: powder, candy gum, tablets and gel



Creatine

- Claims include:
  - Increase lean body mass
  - Increase maximal energy production/performance (short duration high intensity exercises – example sprints)
  - Delayed fatigue in workouts/competition
  - Improved recovery after workouts/competition

Creatine

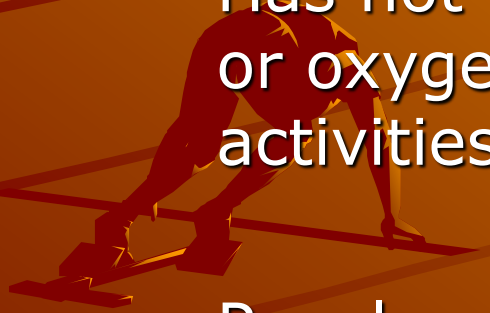
- Potential side effects:
  - Increased body weight
    - Suspected to be from water weight
  - Gastrointestinal upset
    - Upset stomach
    - Diarrhea
    - Nausea
  - Muscle cramping and strains

Creatine

- Potential side effects:
  - Dehydration
  - Possible kidney effects/overload

Creatine

- Research findings:
  - Research is not unanimous; however, creatine appears to be beneficial in short duration high intensity exercise (sprints/football/volleyball)
  - Has not been found to benefit aerobic exercise or oxygen carrying capacity (endurance activities – example 800/1600 meter run)
  - People with low to normal creatine stores respond better with supplementation than those with normal to high stores

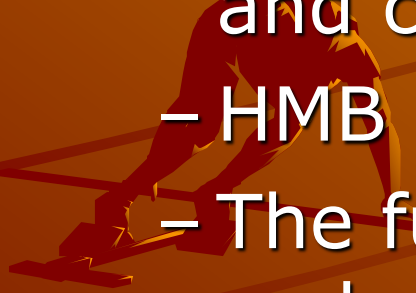


Creatine

- Legal status:
  - Is a legal substance
  - Is not banned by sports governing bodies

HMB

- Background:
  - HMB is derived in the breakdown of the essential amino acid leucine
  - Found in some foods such as citrus fruit and catfish
  - HMB is not an essential nutrient
  - The function of HMB is not fully understood
    - Thought to limit protein breakdown during activity



HMB

- Claims Include:
  - Increased muscle mass
    - Increased strength
  - Enhancement of physical appearance

HMB

- Potential Side Effects:
  - There does not appear to be any side effects with short tem utilization of HMB
  - There is limited research on the side effects of HMB

HMB

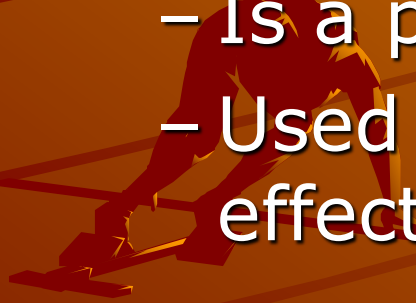
- Research Findings:
  - Research is limited
  - HMB supplementation may limit exercise induced muscle damage/protein breakdown.
  - While there has been some improvement in strength and body composition the data is limited and further research is needed to determine any ergogenic benefit of HMB.

HMB

- Legal Status:
  - Is a legal substance

Androstenedione - DHEA

- Background:
  - Weak anabolic-androgenic steroid hormones produced by the gonads and adrenal glands
  - Is a precursor to testosterone
  - Used by athletes based on the effectiveness of testosterone



Androstenedione - DHEA

- Claims include:
  - Increase muscle size/mass
  - Increase lean body mass
  - Increase muscle strength

Androstenedione - DHEA

- Potential side effects:
  - Dependent on the dosage and testosterone levels the potential side effects are the same as anabolic-androgenic steroids

Androstenedione - DHEA

- Potential side effects:
  - Due to increased estrogen levels males are associated with gynecomastia (breast become bigger) as well as other feminizing side effects
  - **Increased cardiovascular disease risk**
  - **Liver damage/cancer**

Androstenedione - DHEA

- Potential side effects:
  - **Women risk virilization (male secondary sex characteristics)**
  - **Children have been associated with premature growth plate closure leading to diminished height as well as virilization (male secondary sex characteristics)**

Androstenedione - DHEA

- Research Findings:
  - Do not support the notion that testosterone concentration increased with supplementation
  - Not shown to increase muscle size/strength or be an ergogenic aid

Androstendione - DHEA

- Legal Status: Androstenedione
  - Is a illegal substance
- Legal status: DHEA
  - Is a legal substance
  - Is banned by the IOC, NCAA, USCO/USADA

Dietary Supplements

- This presentation highlights only a few of the several dietary supplements available.
- Remember quality research is lacking on the effectiveness and side effects of dietary supplements.
- As shown, utilization of dietary supplements is a buyer beware market as you are not guaranteed to get the ingredients that you purchased or you may get ingredients that you do not want.

Alternatives to Supplementation

- Appropriate diet and nutritional practices.
- Appropriate weight training and conditioning.

- Appropriate rest and recovery.
- Appropriate goal setting.

Reliable resources

- National Institute on Drug Abuse www.nida.nih.gov
- National Center for Drug-Free Sport www.drugfreesport.com
- World Anti-Doping Agency www.wada-ama.org
- International Olympic Committee (IOC) www.olympic.org
- National Collegiate Athletic Association (NCAA) www.ncaa.org
- Taylor Hooten Foundation www.taylorhooten.org
- FDA Center for Food Safety and Applied Nutrition www.cfsan.fda.gov
- NIH Office of Dietary Supplements www.ods.od.nih.gov
- National Center for Complementary & Alternative Medicine www.nccam.nih.gov
- Tufts Nutrition Navigator (Critical review of supplement web sites) www.navigator.tufts.edu
- United States Anti-Doping Agency www.usantidoping.org/