Herbs, Supplements and Athletes

Neilson Mathews MD
Lehigh Valley Health Network, neil.mathews@lvhn.org

Published In/Presented At

Mathews, N. (2105, November 6). Herbs, Supplements and Athletes. Presentation presented at: Pennsylvania Academy of Family Physicians, Allentown, PA.

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Athletes and Dietary Supplements

NEIL MATHEWS, M.D., FAAFP, CAQSM
LEHIGH VALLEY FAMILY MEDICINE RESIDENCY/SPORTS MEDICINE FELLOWSHIP
NOVEMBER 6, 2015

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Disclosures

- Dr. Neil Mathews has no conflict of interest, financial agreement, or working affiliation with any group or organization.
  - I have nothing to disclose, but my wife does leave whole-food supplements out for me to take in morning, which I do.

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Creatine would most likely benefit which of the following athletes?

A. Weight lifter-to improve strength
B. Cross country runner-to improve endurance
C. Track sprinter-to improve speed
D. Ballerina-to help maintain healthy body weight

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What percentage of patients did NOT reveal supplement use during a pre-operative clearance exams?

A. 25%
B. 33%
C. 50%
D. 66%

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What percentage of herbal products tested with DNA barcoding technology revealed product substitution (main ingredient not found AND unknown ingredient found)?

A. 10%
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D. 90%

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Objectives

- To be able to list reasons athletes use dietary supplements (DS)
- To understand the issues related to consumption of DS, including efficacy, purity, quality, and athlete testing
- To be able to list the DS that have shown to aid athletic performance and explain how they work

Epidemiology

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- $60 Billion industry/$20 B in US alone
- Since 1994, products from 4,000 to 55,000; 1,000 companies
- > 100,000,000 people take supplements
- 85% of elite track and field athletes take at least one DS (J of Sports Science, Apr 2009)
- Bailey, J of Nutrition 2011
  - 70% don't tell physicians
  - 44% think physician doesn't know much
  - 67% don't tell of use before surgery
  - 30% drug/supplement interaction

Why Take a Supplement?

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Correct nutritional deficiency-sound evidence-Iron or B12 deficiency

Treat medical disease or condition-good evidence-B2 and Magnesium for migraine prophylaxis

Improve health or optimize performance-grade of poor evidence

Last reason is why most athletes take supplements

Reasons Athletes Take Supplements

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- "I can't get everything I need from my diet"
  - In few cases is this true; may need review c Nutritionist
- "I don't have time to prepare and cook meals"
  - Does take time; need to plan; help from Nutritionist
- "Everyone is using them and they will have an advantage over me"
  - Companies pray on fears; not true, but often slim margin from 1st to 4th place
- "Supplement recommended by my doctor"
  - Limited training for most physicians
- "Natural and organic way to enhance health"
  - More to come on this; not proven and often not natural
- Note: 50% of Olympic-caliber athletes would take a banned substance if they would win all competitions for 5 years, but die from adverse effects

Dietary Supplement Regulation

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Dietary Supplement Health and Education Act of 1994 (DSHEA)

FDA regulates DS

- Manufacturer responsible for product safety before marketing and that label is truthful and not misleading
- Post-market: FDA responsible for monitoring safety and inspecting product info
- Federal Trade Commission (FTC) responsible for truth in advertising- needs to be symptom specific, not disease oriented

FDA Oversight

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- 51% of Class 1 FDA recalls since 2004 are for supplements
- Food additives regulated more stringently than DS
- 2003- Ban on Kava (Nutraingredients)
- 2009- Warning placed on Hydroxycut products after number serious side effects and 1 death
- 2010- Voluntary recall of "Off Cycle II Hard Core"-contained aromatase inhibitor
- Emergen-C warned about untruthful advertising

A Note on Quality

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Consumer Grade DS:

- Drug store/Health food store
- Cheapest ingredients to max profit and shelf life
- Artificial ingredients, colors, fillers, preservatives, binders
- Minimum amount active ingredient

Professional Grade DS:

- Full label disclosure
- Standardization of herbal extracts
- Therapeutic dosages
- 3rd party testing

Testing

Depending on athlete, will have one or more governing body that oversees their participation

2 MAJ categories

- At time: Anabolics, hormones
- In competition: Steroids, THC
- In selected sports: B-blocker, alcohol

Therapeutic Use Exemption (TUE)- Approval for banned substance

- Applied for before competete
- Documented need
- Not use to enhance performance over a medical need

WORLD ANTI-DOPING AGENCY play true

USADA

Supplement 411

NCAA

INTERNATIONAL OLYMPIC COMMITTEE

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CHEATING

"But I swear I didn't cheat!"

Jessica Hardy-set 2 world records in 2008, never made it to Beijing

- Positive for Clenbuterol; tested and found in her DS, one of her sponsors!
- Accepted one year ban, not usual 2

Lashawn Merritt-world champion 400 m

- Positive for DHEA from Androstenedione
- Did not read label; 2 year ban

Scott Moninger-multiple victories in road cycling

- Positive for norandrosterone from OTC DS he bought at convenience store
- One year ban

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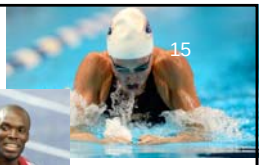

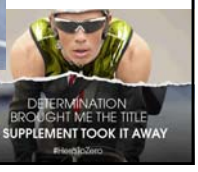

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World Anti-Doping Agency (WADA)

- WADA does NOT distinguish between deliberate cheating and inadvertent doping
- Athlete is responsible for everything that enters their body

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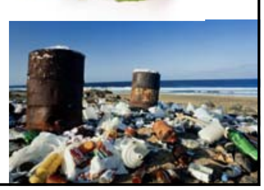
What's in There?

- 50% of 33 brands creatine in Europe exceed limits for one contaminant
- Non-medicine contaminants include pesticides, bugs, animal feces, lead, broken glass
- Chemical contaminants include stimulants, anabolic steroids, aromatase inhibitors, GH releasing peptide, IGF1 in growth promoter
- Risk with allergies-fillers rice, wheat, and soy
- Watson P etal, Med Sci Sports Exer, 2009-just 2.5 mcg norandro in creatine DS (0.00005%) resulted positive urine/doping violation

DNA Barcoding Study

- Newmaster SG et al, BMC Medicine 2013
- DNA barcodes for 44 herbal products; detect contamination and substitution
- Results:
  - 33% contaminated or filler that was not listed
  - 69% substituted
  - 48% authenticated
  - 2/12 companies authentic product and no sub, contaminants, or fillers



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NSF Certified for Sport

- Recognized by NFL, MLB, PGA, NHL
- Participating manufacturers
- Label content, facility inspections, ongoing monitor of manufacturing and product analysis
- BUT, still do not guarantee any product is safe or pure therefore it is still buyer beware
- Does not assess efficacy
- App available for smartphones-lists companies and specific products

NSF
Certified for Sport®
www.nsf.org

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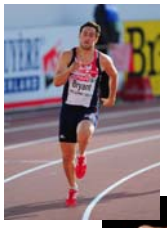
Types of Athletes and Exercise

- Endurance athlete-long bouts of exercise (run, swim, cycle, team-soccer)
- Short intense sport bouts (track sprints, team-football, volleyball)
- Strength athlete-power exercises (weight lifting, football linemen)
- Many RD tested in non-athletes and more extrapolated to athletes
- While may actually help one athlete, may be negative to another



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A Good Diet

- Need to have first
- If well balanced diet, no vitamin or mineral supplement are required
- "Eat the Rainbow"
- Better to get nutrients in natural state instead of pill form
- Vegetarians, and especially vegans, at risk (low in energy, protein, fat, iron, Calcium, Vit D, Riboflavin, Zinc, B12

Creatine

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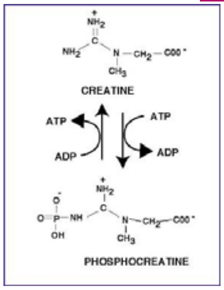
- Most well studied DS ever
- Naturally occurs in body (mostly in muscles) and in many foods (meat and fish)
- Complex amino acid
- Can only hold so much; reach saturation in few days
- USA consumes 4 M Kg creatine/year
- Allowed by IOC, NCAA, pro sports
- ACSM recommends NOT use if < 18 yo
- 2001 report-62/1103 adolescents on creatine, ?lead to steroid use



Creatine

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- Effects: increase strength, increase free fat mass, increase performance in short repetitive bouts of high intensity exercise (30-90 seconds), faster regeneration of ATP between bouts, increased muscle mass
- NOT proven benefit aerobic training or performance
- Can be taken as loading dose 20-30 gm/d for 5-7 days, then maintenance 2-4 gm/day; extra cannot be stored or used
- Responders and non-responders; vegetarians at risk
- Side effects-most common: weight gain (fluid), GI upset, diarrhea, muscle cramping
- Caution in patients with kidney disease, liver disease, diabetes
- Excellent safety profile, especially if taken as recommended
- Now, 20+ new novel creating preparations-pitch better absorbed-no research to prove

Vitamin D- “The Sunshine Vitamin”

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- Steroid hormone affecting calcium metabolism, bone health, muscle strength, immune function, and balance
- 71% general population with low levels
- 50-70% kids
- Rates doubled 1994-2004; poor diet, limited exposure to sun
- At risk-Northern latitudes, indoor athletes (80% v 48%), vegetarians, image sports (gymnasts, skaters)
- 25 (OH) D is best indicator of status

Vitamin D

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- Emerging evidence to support direct impact on athletic performance via enhancement muscle function (Close GL, J Sports Sci 2013)
- NFL players released for injury or poor performance had significantly lower levels Vit D compared to other players (Maroon JC, Am J Sports Med 2015)
- Indirectly affects performance via immunity-higher number URI in deficient group
- General accepted levels
  - Adequate: 30-100 ng/ml
  - Borderline: 20-30 ng/ml
  - Deficient: <20 ng/ml
  - Many believe current RDA is not adequate
- Peak neuromuscular performance at levels near 50 ng/ml
- Toxicity rare with supplementation
- Screen: Stress fx, recurrent infection, MSK pains, everyone???

Whey Protein

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Includes all amino acids, good source BCAA

Easier to absorb than soy or casein

ADA average protein needs:

- Non-athlete: 0.8 g/kg/d
- Endurance: 1.2-1.4
- Strength: 1.6-1.7

Caution with athletes with renal disorders, lactose intolerance, dairy allergies

No side effects up to 2 g/kg/day

Whey Protein/BCAA

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- Prevent negative Nitrogen balance, aid protein synthesis especially during high intensity exercise; synthesize, repair, and maintain skeletal muscle proteins; prevent fatigue and overtraining
- Important source of energy in prolonged endurance exercise (soccer, tennis, running, swimming, cycling)
- Good in post-exercise smoothie-take within 20-30 minutes of bout, mix with CHO 3:1 protein

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Caffeine

Stimulant, methylxanthine similar to theophylline

Claims-decreased level of exertion, increase mobilization of FFA and rate lipid metabolism; conserve glycogen

Peaks 1-2 hours after ingest

Average American-2 cups coffee per day

84% athletes believe improves concentration

73% believe is ergogenic

Allowed by IOC, WADA-watch list

NCAA-limit 15 ug/ml urine; have to drink 6 cups coffee hour before activity

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Caffeine

- ACSM-may be effective, ?ethics if ergogenic
- Side effects-jitteriness, palpitations, anxiety, insomnia, arrhythmias
- Caution with energy drinks and caffeine powder
  - Next to MVI, most popular DS c teens and young adults
  - 24 oz drink contains 500 mg caffeine (4-5 c/coffee); Guarana
  - 2007-2011: ER visits doubled for caffeine intox, most > 40 yo
  - FDA advisory-pure caffeine powder c 2 deaths young men
  - Powder 1 tsp=25 cups/coffee
  - Available on internet
  - Drinks often combined with alcohol use

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Others with some good evidence…

- Alkalinizing agents (Sodium Bicarbonate)-improves anaerobic endurance performance through increased pre-exercise pH and increased buffering ability
- L-arginine-improves aerobic endurance exercise performance through increased plasma nitrite levels and reduced O2 consumption during submaximal exercise
- Beta-alanine-Improves aerobic and anaerobic endurance performance through increased carnosine content and improves intracellular buffer capacity
- Nitrate-improves aerobic endurance exercise performance-increases plasma nitrate levels, reduces O2 consumption, reduces ATP cost of muscle force production, and inhibits fall in muscle PhosphorylCreatine content during contractions
- "Dietary Supplements for Athletes: Emerging Trends and Recurring Themes"; Maughan RJ et al, J of Sp Sciences, 2011.

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As for the rest of them…

No convincing evidence for most other DS

If has, is limited, poorly studied, flawed studies

Fat burners, immune boosters, steroid enhancers, testosterone boosters

Some do work! Study found AAS contamination in many DS manufactured in Holland (25.8%), Austria (22.7), UK (22.7), USA(18.8)- Geyer et al, 2004.

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Helpful Resources

- American College of Sports Medicine (acsm.org)
- National Center for CAM (www.nccam.nih.gov)
- Food and Drug Administration (fda.gov)
- Office of Dietary Supplements (ods.od.nih.gov)
- US Anti-Doping Agency (www.usada.org)
- GlobalDRO.org-website for Olympics/International
- National Center for Drug Free Sport (www.drugfreesport.com)
- "Position of American Dietetics Assoc., Dieticians of Canada, and ACSM: Nutrition and Athletic Performance" J. of ADA 2009
- Academy of Nutrition and Dietetics (eatright.org)
- Local Sports Nutritionist/Registered Dietician (RD)

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Summary for Family Physicians

- Athletes, and many others, are using DS and many are not aware of the risks and limited benefits
- Ask about use in non-judgmental way when covering meds and vitamins
- Few have proven beneficial effects
- Be aware of special circumstances regarding elite, competitive athletes (restrictions and testing)
- Start with improving diet first before recommending DS; consider referral to Sports Nutritionist
- Use abundant, reputable resources to educate athlete and yourself

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STRONG MEDICINE FOR AMERICA

Thank You!

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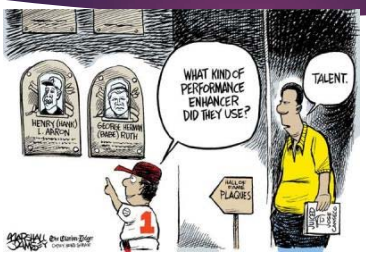

Contact Info:
neil.mathews@lvhn.org

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