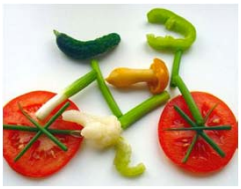
Nutrition for the Athlete



Healthy Columbus Nutrition Seminar
February, 2014 Ashley Harris, MS, RD, CSO

FRESH FOOD PERSPECTIVE

Outline

- Importance of Nutrition
- Making Energy/Fuel Sources
- What and When to Eat
- Hydration
- Supplements

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Importance of Sports Nutrition

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Importance of Sports Nutrition

- Good nutrition essential to athletic performance
  - "It is the position of the American Dietetic Association, Dietitians of Canada, and the American college of Sports Medicine that physical activity, athletic performance, and recovery from exercise are enhanced by optimal nutrition."

    Position Paper from the Journal of the American Dietetic Association
- Provides fuel, aids with muscle and glycogen recovery, builds muscles, maintains clear thinking, prevents muscle and bone loss

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Importance of Sports Nutrition

Think of it this way - as a runner, biker or any sort of athlete, one of the most important legs of your performance starts with nutrition.

Proper nutrients drive the engine, the best bike or running shoe will not make up for a poor diet.

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Making Energy/Fuel Sources

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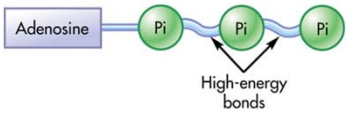
Fuel Source for the Body

- All cells, including muscle cells, use ATP
- **ATP (adenosine triphosphate)** = main energy currency for cells. Energy comes from breaking of high energy bonds between phosphates



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Fuel Source for the Body

- Energy comes from breaking of chemical bonds between phosphates

  ATP → Energy to do activity + ADP + Pi

- ATP is formed from energy obtained from food or breakdown of body's energy stores (glycogen, fat, muscle)

  ADP + Energy from food + Pi → ATP

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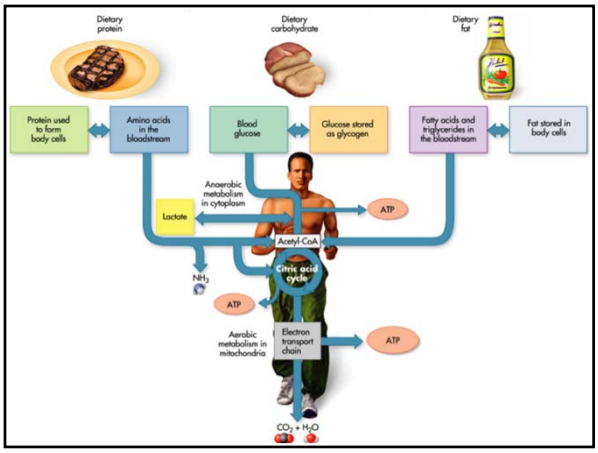

Fuel Source for the Body

- Resting muscle cell contains only small amount of ATP
  - Keep muscle working at maximum capacity for ~2-4 seconds
- Muscles also contain PCr (phosphocreatine) = able to be quickly broken down to form more ATP for muscles to use

  PCr + ADP→ ATP + Cr
- Energy from PCr lasts ~1 minutes or less (i.e. jumping, lifting, throwing, quick sprint)

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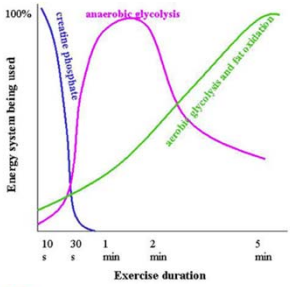
Fuel Source for the Body



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Anaerobic Glucose Breakdown

- Occurs when oxygen supply limited
- Fastest way to convert glucose to ATP
  - Needed for quick energy bursts from ~30 seconds – 2 minutes (i.e. 400m sprint or 100m swim)
- Disadvantages
  - Only produces ~5% of total possible ATP's from glucose
  - Produces lactic acid in muscles – leads to fatigue, sore muscles, potassium loss

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Aerobic Glucose Breakdown

- Occurs when oxygen in plentiful supply
- Produces sustained energy for longer term activities
  - ~2 minutes to 3+ hours (i.e. when jogging, swimming)

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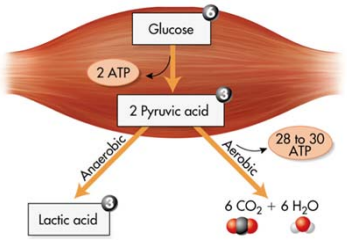
Anaerobic vs. Aerobic



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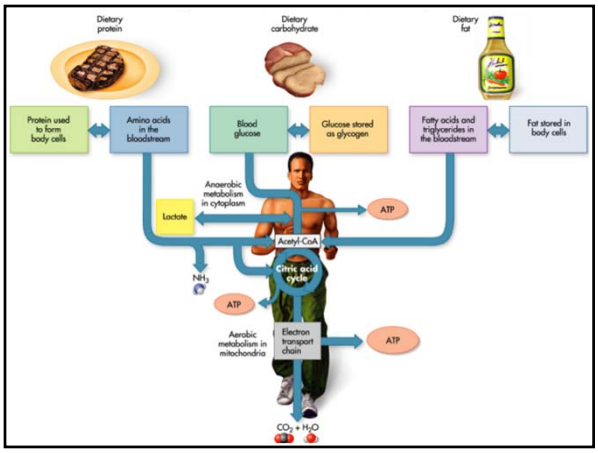

What and When to Eat

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Energy (Calorie) Requirements

- Priority to meet energy needs to have optimal performance
- Energy needs differ according to many variables
  - Sex, prior nutrition status, duration/frequency/intensity of exercise, body composition goals, etc

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Energy (Calorie) Requirements

Adult man
662 − 9.53 (age in years) + PA* [15.91 (weight in kilograms) + 539.6 (height in meters)].

Adult woman
354 − 6.91 (age in years) + PA [9.36 (weight in kilograms) + 726 (height in meters)]

PA level	
1.0-1.39	Sedentary, typical daily living activities (eg, household tasks, walking to bus).
1.4-1.59	Low active, typical daily living activities plus 30-60 minutes of daily moderate activity (eg, walking at 5-7 km/h).
1.6-1.89	Active, typical daily living activities plus 60 minutes of daily moderate activity.
1.9-2.5	Very active, typical daily activities plus at least 60 minutes of daily moderate activity plus an additional 60 minutes of vigorous activity or 120 minutes of moderate activity.

- Best way to predict calories is track intake and watch weight

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Carbohydrate Needs

- General estimate ~60% of total calories from carbs for athletes
- Should be at least 5g carbs per kg body weight
  - People involved in aerobic and endurance activities more than 60 minutes per day may need up to 7g per kg
  - Athletes exercising at several hours per day may need up to 10g per kg
    - Triathletes, marathoners may need 500-600g per day!
  - Kg body weight = body weight (pounds) ÷ 2.2

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Starches—15 grams Carbohydrate per Serving (80 kcal)	
One Serving	
dry breakfast cereal*, 1/2–3/4 cup	baked potato, 1/4 large
cooked breakfast cereal, 1/2 cup	bagel, 1/4 (4 oz)
cooked grits, 1/2 cup	English muffin, 1/2
cooked rice, 1/3 cup	bread, 1 slice
cooked pasta, 1/3 cup	pretzels, 3/4 oz
baked beans, 1/3 cup	saltine crackers, 6
cooked corn, 1/2 cup	pancake, 4 inches in diameter, 1
cooked dry beans, 1/2 cup	taco shells, 2 (add 45 kcal)
Vegetables—5 grams Carbohydrate per Serving (25 kcal)	
One Serving	
cooked vegetables, 1/2 cup	
raw vegetables, 1 cup	
vegetable juice, 1/2 cup	
Examples: carrots, green beans, broccoli, cauliflower, onions, spinach, tomatoes, vegetable juice	
Fruits—15 grams Carbohydrate per Serving (60 kcal)	
One Serving	
canned fruit or berries, 1/2 cup	grapes (small), 17
fruit juice, 1/2 cup	grapefruit, 1/2
figs (dried), 1 1/2	dates, 3
apple or orange, 1 small	peach, 1
apricots (dried), 8	watermelon cubes, 1 1/4 cups
banana, 1 small	
Milk—12 grams Carbohydrate per Serving	
One Serving	soymilk, 1 cup
milk, 1 cup	
plain low-fat yogurt, 2/3 cup	
Sweets—15 grams Carbohydrate per Serving (variable calories)	
One Serving	
cake, 2-inch square	ice cream, 1/2 cup
cookies, 2 small	sherbet, 1/2 cup

*The carbohydrate content of dry cereal varies widely. Check the labels of the ones you choose and adjust the serving size accordingly.

Modified from *Exchange Lists for Meal Planning* by the American Diabetes Association and American Dietetic Association, 2003, Chicago, American Dietetic Association.

1500 kcal Diet	2000 kcal Diet	3000 kcal Diet	4000 kcal Diet	5000 kcal Diet
Breakfast Fat-free milk, 1 cup Cheerios, 1/2 cup Bagel, 1/2 Cherry jam, 2 tsp Margarine, 1 tsp	**Breakfast** Fat-free milk, 1 cup Cheerios, 1 cup Bagel, 1/2 Cherry jam, 1 tbsp Margarine, 1tsp	**Breakfast** Fat-free milk, 1 cup Cheerios, 2 cups Bagel, 1 Cherry jam, 2 tsp Margarine, 1 tsp Oat bran muffins, 2	**Breakfast** Fat-free milk, 1 cup Cheerios, 2 cups Orange, 1 Bran muffins, 2	**Breakfast** Fat-reduced milk, 1 cup Cheerios, 2 cups Bran muffins, 2 Orange, 1
			Snack Chopped dates, 3/4 cup	**Snack** Low-fat yogurt, 1 cup Chopped dates, 1 cup
Lunch Chicken breast (roasted), 2 oz Figs, 1 Fat-free milk, 1/2 cup Banana, 1	**Lunch** Chicken breast (roasted), 2 oz Wheat bread, 2 slices Mayonnaise, 1 tsp Raisins, 1/4 cup Cranberry juice, 1 1/2 cups Banana, 1	**Lunch** Chicken breast (roasted), 2 oz Wheat bread, 2 slices Provolone cheese, 1 oz Mayonnaise, 1 tsp Raisins, 1/3 cup Cranberry juice, 1 1/2 cups Low-fat fruit yogurt, 1 cup	**Lunch** Romaine lettuce, 1 cup Garbanzo beans, 1 cup Grated carrots, 1/2 cup French dressing, 2 tbsp Macaroni and cheese, 3 cups Apple juice, 1 cup	**Lunch** Apple juice, 1 cup Chicken enchilada, 1 Romaine lettuce, 1 cup Garbanzo beans, 1 cup Shredded carrots, 3/4 cup Chopped celery, 1/2 cup Seasoned croutons, 1 oz French dressing, 2 tbsp Wheat bread, 2 slices Margarine, 1 tbsp
Snack Oatmeal-raisin cookie, 1 Low-fat fruit yogurt, 1 cup	**Snack** Oatmeal-raisin cookies, 3 Low-fat fruit yogurt, 1 cup	**Snack** Banana, 1 Oatmeal-raisin cookies, 3	**Snack** Wheat bread, 2 slices Margarine, 1 tsp Jam, 2 tbsp	**Snack** Banana, 1 Bagel, 1 Cream cheese, 1 tbsp
Dinner Spaghetti w/meatballs, 1 cup Romaine lettuce, 1 cup Italian dressing, 2 tsp Green beans, 1/2 cup Cranberry juice, 1 1/2 cups	**Dinner** Broiled beef sirloin, 3 oz Romaine lettuce, 1 cup Italian dressing, 2 tsp Green beans, 1 cup Fat-free milk, 1/2 cup	**Dinner** Broiled beef sirloin, 3 oz Romaine lettuce, 1 cup Garbanzo beans, 1 cup Italian dressing, 2 tsp Spinach pasta noodles, 1 1/2 cups Margarine, 1 tsp Green beans, 1 cup Fat-free milk, 1/2 cup	**Dinner** Skinless turkey breast, 2 oz Mashed potatoes, 2 cups Peas and onions, 1 cup Banana, 1 Fat-free milk, 1 cup	**Dinner** Fat-reduced milk, 1 cup Beef sirloin, 5 oz Mashed potatoes, 2 cups Spinach pasta noodles, 1 1/2 cups Grated parmesan cheese, 2 tbsp Green beans, 1 cup Oatmeal-raisin cookies, 3
			Snack Pasta, 1 cup cooked Margarine, 2 tsp Parmesan cheese, 2 tbsp Cranberry juice, 1 cup	**Snack** Cranberry juice, 2 cups Air-popped popcorn, 4 cups Raisins, 1/3 cup
18% protein (68 grams) 64% carbohydrate (240 grams) 19% fat (32 grams)	17% protein (85 grams) 63% carbohydrate (313 grams) 20% fat (44 grams)	17% protein (128 grams) 62% carbohydrate (465 grams) 21% fat (70 grams)	14% protein (140 grams) 61% carbohydrate (610 grams) 26% fat (116 grams)	14% protein (175 grams) 63% carbohydrate (813 grams) 24% fat (136 grams)

Protein Needs

- Protein important for rebuilding of muscles AFTER exercise (no benefit gained from protein loading on the front-end)

Activity Group	grams/kilograms	Amount for a 70-kilogram (154 lb) Person (grams)
Sedentary	0.8	56
Strength trained, maintenance	1.0–1.2	70–84
Strength trained, gain muscle mass	1.5–1.7	105–119
Moderate intensity endurance activities	1.2	84
High-intensity endurance training	1.6	112

*Calculate kilograms by dividing pounds by 2.2.
Source: Burke L, Deakin V: Clinical Sports Nutrition, McGraw-Hill, Roseville NSW2069, Australia, 2000.

FRESH FOOD PERSPECTIVE

Protein

Healthy Proteins

- **Lean meat/poultry, fish** -3 oz = 27g
- **Cheese** - 1 oz, 1 slice = 6-8g
- **Cottage cheese** - 1/2 cup = 14g
- **Eggs, egg whites** - 1 egg, 2 egg whites) = 6g
- **Greek yogurt** - 6 oz = 14-18g
- **Beans (black, kidney, lentils, etc)** - 1/2 cup = 9g
- **Hummus** - 1/4 cup = 5g
- **Nut butters (peanut, almond, cashew)** - 2 Tbs = 7g
- **Seeds, Nuts** - 1/4 cup = 7g

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Fat Needs

- In general, a diet of ~30% of calories from fats recommended for the athlete
- Focus should be on healthy fats (i.e. monounsaturated, omega-3's, etc) with consuming saturated fats in moderation and avoiding trans-fats
  - See Nutrition 101 webinar for more info!
- At this time, evidence does not support very high diets or "fat-training" with diets >70% calories from fat

FRESH FOOD PERSPECTIVE

Micronutrient Needs

- Vitamins and minerals athletes at greatest risk for deficiency:
  - Calcium
  - Vitamin D
  - B Vitamins
  - Iron
  - Zinc
  - Magnesium
  - Antioxidants (i.e. Vitamin C, Vitamin E)

- Most able to meet through balanced diet
  - Athletes restricting foods/intake at greatest risk
  - Can take MVI not exceeding 100% RDA if concerned
  - See Nutrition 101 for food sources!

FRESH FOOD PERSPECTIVE

Eating Before Exercise

- **2-4 hours before endurance exercise = Light meal**
  - Up to 1000 kcal depending on exercise intensity
  - Carbohydrate rich (up to 200g) + small amount protein
  - Low-fat/fiber for optimal digestion
  - Ideas:
    - Peanut butter & honey on toast + instant breakfast drink
    - Fruit & yogurt smoothie + low-fat granola
    - Oatmeal with brown sugar & almonds + skim milk + banana
    - Low-fat cottage cheese + apple butter + crackers + grapes
    - Lean hamburger on bun w/ lettuce & tomato + side salad + yogurt parfait
    - Turkey & Swiss sandwich + fruit + sports drink
    - Low-fat tuna melt sandwich + fruit cup + fat-free yogurt

FRESH FOOD PERSPECTIVE

Eating Before Exercise

- **30-60 minutes before endurance exercise = light snack**
  - Ideally liquid, blended or easy to digest snack for optimal digestion
  - Ideas:
    - Sports drink
    - Sports gel, sport beans or gummies, sports bar
    - Piece of fruit or jam sandwich

FRESH FOOD PERSPECTIVE

Eating During Exercise

- **For exercise lasting 60+ minutes**
  - Carbohydrates during activity can replenish glycogen stores, prevent "hitting the wall"
  - Keep snacks small, easy to digest – too large can cause cramping, intestinal problems
  - Need to replenish carbohydrates, fluids, electrolytes
  - Ideas:
    - Sports drinks (6-8% carbs)
    - Sports/carbohydrate gels or gummy chews
    - Banana
    - Roll with jam or honey
    - Bite-sized pieces of low-fat granola bar or sports bar

FRESH FOOD PERSPECTIVE

Eating After Exercise

- **Begin recovery snack 15-60 minutes after completing exercise**
  - Goal of 1-2g carbs per kg body weight
  - Ratio of 3:1 (Carbs:Protein)
- Important to eat for recovery
  - Carbohydrates replace glycogen (muscle fuel) stores lost during exercise
  - Protein aids in repair of damaged muscles and stimulates growth of new muscles

FRESH FOOD PERSPECTIVE

Eating After Exercise

- Snack Ideas:
  - Smoothie (yogurt + frozen berries)
  - Sport bar (carbs/electrolytes)
  - Graham crackers & peanut butter
  - low-fat chocolate milk
  - Banana + piece of cheese
  - Greek yogurt (flavored or with fruit)
  - Trail mix

- Meal Ideas:
  - Whole wheat pita sandwich + turkey & veggies + pretzels + low-fat milk
  - Rice bowl with beans, cheese, salsa, avocado + whole grain tortilla chips or whole wheat tortilla
  - Stir fry with lean steak, broccoli, bell peppers, carrots + brown rice

FRESH FOOD PERSPECTIVE

Product	Energy (kcal)	Carbohydrates (g)	Fiber (g)	Protein (g)	Fat (g
Balance Bar (chocolate)	200	22	<1	14	6
Balance CarbWell (chocolate fudge)	190	23	2	14	6
Balance Gold (rocky road)	210	22	1	15	7
Clif Bar (chocolate chip)	250	45	5	10	5
Clif Shot (vanilla)	100	25	0	0	0
Genisoy Bar (cookies & cream)	240	35	1	14	4.5
Kashi GoLean Bar (malted chocolate crisp)	290	49	6	13	6
Luna Bar (cherry-covered chocolate)	180	28	3	9	5
PowerBar Gel (strawberry banana)	110	27	0	0	0
PowerBar Performance (chocolate)	230	45	3	10	2
PowerBar Pria (French vanilla crisp)	110	17	5	5	3
PowerBar ProteinPlus (cookies & cream)	300	38	1	23	6
PowerBar Triple Threat (s'mores)	230	30	4	10	8
Snickers Marathon (multigrain crunch)	220	32	2	10	7
Zone Perfect (apple cinnamon)	210	21	1	15	7

Overall, choosing energy bars is preferable to choosing candy bars and packaged cakes. When used in sports situations, energy bars can be handy. Better yet, however, is to eat a variety of wholesome foods; these offer more health-protective compounds. This is also a less expensive choice, especially for day-to-day snacks. An additional concern is that micronutrient toxicity might occur if numerous bars are eaten in a day, as many are highly fortified. Vitamin A and iron are two nutrients of special concern in this regard.

Weight Loss for the Athlete

- Low-energy intake will not sustain athletic training
  - **Do not exceed decreases of energy intake by more than 10-20% of normal intake**
- Strive to achieve weight loss through healthy choices of foods rich in fruits, vegetables, whole grains, nuts, seeds, and lean proteins
- Remember "low-fat" will not make you skinny (usually equal to or higher in calories)
- Dehydration of means of weight loss is dangerous and ineffective

FRESH FOOD PERSPECTIVE

Muscle Gain for the Athlete

- Eat balanced diet rich in carbohydrates, lean proteins and healthy fats to supply body with energy it needs to build new muscle
- **Include up to 300-500 extra calories/day** by adding snacks or increasing portion sizes
- Eat every 3-4 hours
- Have body composition assessed by a professional to ensure added weight is muscle, not fat

- Incorporate a strength training program into your program to stimulate muscle gain

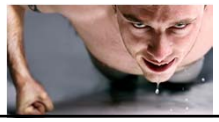
FRESH FOOD PERSPECTIVE

Hydration

FRESH FOOD PERSPECTIVE

Hydration & Sweat Loss

- Sweat important to cool the body and prevent overheating
  - Loss influenced by many factors: genetics, gender, age, environmental temperature, exercise intensity, fitness level
- Monitor sweat loss
  - Weigh self before and after exercise without consuming fluids during
    - Goal no more than 2% body weight loss
  - Monitor urine color (aim for light yellow, dark = dehydration)
  - Remember sweat when swimming or cold weather activities too!



FRESH FOOD PERSPECTIVE

Hydration

- **Goals of Hydration:**
  - Begin activity well hydrated – drink fluids regularly in the 24 hour period before the activity
    - General goal 9 cups/day for women, 13 cups/day for men
    - Drink 1.5-2.5 cups fluid 2-3 hours before exercise
    - Fluids include water, diluted juice, sports drinks, broth
  - Replace sweat losses by drinking fluids regularly during activity
    - Avoid excessive (>2% body weight loss) dehydration – can cause early fatigue, cardiovascular stress, increased risk of heat illness and decreased performance
    - With events lasting >30 minutes, consume .5-1.5 cups fluid every 15-20 minutes

FRESH FOOD PERSPECTIVE

Hydration

- **Goals of Hydration (continued):**
  - Rehydrate after performing to replace weight lost as a fluid during activity
    - Within 4-6 hours, drink 2.5-3 cups fluid for each pound lost during exercise
    - Do not rehydrate with caffeinated beverages
    - For those with longer activity or high sodium losses during activity, replenish after with sodium containing fluids (i.e. broths, vegetable juice, Gatorade)
  - For short duration activity (<60 minutes) – **hydrate with water** (before, during, after)
  - For longer activity (>60 minutes) – **hydrate with sports drinks** (6-8% carbohydrates) to replace carbohydrates and electrolytes lost
  - Avoid over hydration!!

FRESH FOOD PERSPECTIVE

Caffeine

- Benefits:
  - Evidence caffeine may enhance performance in endurance athletes (cyclists, runners, swimmers, rowers) and speed endurance athletes (mid-distance runners, soccer and hockey players)
  - May delay fatigue and improve mental sharpness
- Potential Risks:
  - Side effects include anxiety, jitteriness, rapid heartbeat, upset stomach and insomnia
  - Caffeine is an addictive substance. Tolerance may minimize benefits and withdrawal symptoms can negatively impact performance
  - In high amounts, caffeine is a banned substance (>15 ug/mL in the urine = ~500mg right before competition)

FRESH FOOD PERSPECTIVE

Caffeine

- **Strategies for Consumption**
  - Timing: ~1 hour before pre-competition (trial this during training first)
  - Amount: Tolerance depends on the individual but ~2-6 mg/kg body weight (no more than 9 mg/kg)
  - Type: Research suggests pill form may be more effective and better tolerated than coffee
- **Tips for Caffeine Consumption**
  - Know what you are putting in your body! Some caffeine containing products with additional additives could impair performance
  - In moderation does not cause dehydration or electrolyte imbalance but utilize non-caffeinated beverages for rehydration
  - Meet with RD to determine appropriate caffeine amounts for you

FRESH FOOD PERSPECTIVE

Caffeine

Caffeine Source	Amount (mg)
Brewed coffee (8oz)	60-150
Energy Drinks/Energy Bars (vary by type)	80-200+
Pills (1 tablet)	100
Soda/Tea (8 oz)	40-60

FRESH FOOD PERSPECTIVE

Alcohol & Performance

- Acts as a diuretic by increasing urine volume and interfering with rehydration
  - Puts athletes at risk for dehydration, heat illness, muscle cramping
- Suppresses fat use as a fuel during activity
- Interferes with post-activity recovery by delaying carbohydrate repletion and muscle repair
- Increases risk for nutrient deficiencies by decreasing vitamin and mineral absorption
- Adds calories and acts as an appetite stimulate which can result in over consumption of calories
- Can interfere with sleep patterns by reducing time spent in deep, restful sleep
- **Bottom Line:** Do not exceed recommended maximum of 1 drink/day for women, 2 drinks/day for men & fully rehydrate and refuel post-activity before drinking alcohol

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Supplements

FRESH FOOD PERSPECTIVE

Supplements

- Use extreme caution if utilizing dietary supplements!!!
  - Not needed for majority of athletes
  - Many can be dangerous to health (see following slides)
  - Can cause adverse health effects and a positive test for banned substances
    - Especially supplements with multiple ingredients and/or unrealistic claims
  - Not regulated by the FDA
    - Find a trusted 3rd party source that verifies purity and potency
      - NSF International (www.NSF.org)
      - US Pharmacopeia (www.USP.org)

FRESH FOOD PERSPECTIVE

Supplements

Substance/Practice	Rationale	Reality
Useful in Some Circumstances		
Creatine	Increase phosphocreatine (PCr) in muscles to keep ATP concentration high	Use of 20 grams per day for 5 to 6 days and then a maintenance dose of 2 grams per day may improve performance in those who undertake repeated bursts of activity such as in sprinting and weightlifting. Vegetarian athletes benefit the most because their diets are low in or void of creatine. Some of the muscle weight gain noted with use results from water consumed in muscles. Endurance athletes do not benefit from use. Little is known about the safety of long-term creatine use. Continual use of high doses has led to kidney damage in a few cases. Cost: $20 to $65 per month.
Sodium Bicarbonate (baking soda)	Counter lactic acid buildup	Partially effective in some circumstances (when lactic acid is rapidly produced), such as wrestling, but induces nausea and diarrhea. The dose used is 300 milligrams/kilogram, given 1 to 3 hours before exercise. Cost: nil
Caffeine	Increase use of fatty acids to fuel muscles, promote mental alertness	Drinking two to three 5-ounce cups of coffee (equivalent to 3 to 9 milligrams of caffeine per kilogram of body weight) about 1 hour before events lasting about 5 minutes or longer is useful for some athletes; benefits are less apparent in those who ingest caffeine on a regular basis. For highly trained, habitually consume caffeine; intake of 6 mg/kg (about 600 milligrams, six to eight cups of coffee) elicits a urine concentration illegal under NCAA rules (greater than 15 micrograms per milliliter). A possible side effect is reduced body hydration and shakiness. Cost: $0.08 per 300 milligrams.
Possibly Useful, Still Under Study		
Beta-hydroxy-beta-methylbutyric acid (HMB)	Decrease protein catabolism, causing a net growth-promoting effect	Research in livestock and humans suggests that supplementation with this substance may increase muscle mass. Still, safety and effectiveness of long-term HMB use in humans is unknown. Cost: $100 per month.
Glutamine (an amino acid)	Enhance immune function, preserve lean body mass	Some preliminary studies show decreased occurrence of upper respiratory tract infections in athletes with use. It also may promote muscle growth, but long-term studies are lacking. Protein foods are a rich source of glutamine. Cost: $10 to $20 per month for 1 to 2 grams per day.
Branched-chain amino acids (BCAA) (leucine, isoleucine, valine)	Important energy source, especially when carbohydrate stores are depleted	Supplementation of BCAA (10 to 30 grams per day) during exercise can increase BCAA in the blood when it has been lowered due to exercise, but there is no consistent evidence of improved performance. Carbohydrate feeding, by delaying use of BCAA as fuel, may negate the need for BCAA supplementation. Preliminary studies show that BCAA use increases muscle mass more than does carbohydrate supplementation alone in swimmers, but there are no studies regarding resistance training. Protein-rich foods (especially dairy proteins) are also rich in BCAA. Cost: $20 per month.

FRESH FOOD PERSPECTIVE

Supplements

Substance/Practice	Rationale	Reality
Dangerous or Illegal Substances/Practices		
Anabolic steroids (and related substances, such as androstenedione and tetrahydrogestrinone)	Increase muscle mass and strength	Although effective for increasing protein synthesis, anabolic steroids are illegal in the United States unless prescribed by a physician. They have numerous potential side effects, such as premature closure of growth plates in bones (thus possibly limiting the adult height of a teenage athlete), bloody cysts in the liver, increased risk of cardiovascular disease, increased blood pressure, and reproductive dysfunction. Possible psychological consequences include increased aggressiveness, drug dependence (addiction), withdrawal symptoms (such as depression), sleep disturbances, and mood swings (known as "roid rage"). Use of needles for injectable forms adds further health risk. Banned by the International Olympic Committee.
Growth hormone	Increase muscle mass	At critical ages, may increase height; may also cause uncontrolled growth of the heart and other internal organs and even death, potentially dangerous, requires careful monitoring by a physician. Use of needles for injections adds further health risk. Banned by the International Olympic Committee.
Blood doping	To enhance aerobic capacity by injecting red blood cells harvested previously from the athlete, or alternately the athlete may use the hormone erythropoietin (Epogen) to increase red blood cell number	May offer aerobic benefit; very serious health consequences are possible, including thickening of the blood, which puts extra strain on the heart; is an illegal practice under Olympic guidelines.
Gamma hydroxybutyric acid (GHB)	Promoted as a steroid alternative for bodybuilding	FDA has never approved it for sale as a medical product; is illegal to produce or sell GHB in the United States. GHB-related symptoms include vomiting, dizziness, tremors, and seizures. Many victims have required hospitalization, and some have died. Clandestine laboratories produced virtually all of the chemical accounting for GHB abuse. FDA is working with the U.S. Attorney's office to arrest, indict, and convict individuals responsible for the illegal operations.

Substances promoted to athletes but that have yet to show any clear ergogenic effects include pyruvic acid (pyruvate), glycerol, chromium, coenzyme Q10, ribose, medium chain triglycerides, L-carnitine, conjugated linoleic acid (CLA), bovine colostrum, inositol, and amino acids not already mentioned in this section. Any use of these products is not recommended at this time. These substances are defined in the glossary.

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Questions??

THANK YOU!!

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