

Basic Nutrition for Athletes

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Objectives

- ~ Review the role and importance of optimal nutrition in physical activity, athletic performance and recovery
- ~ Review general energy metabolism and the role of energy balance in athletic performance
- ~ Review current recommendations regarding macronutrient (carbohydrate, fat and protein) ingestion for training, competition and recovery

Optimal Nutrition

- ~ Nothing *basic* about nutrition...
- ~ *Very* individualized
- ~ Goal dependent
- ~ Complex

Variation in Nutrition Requirements

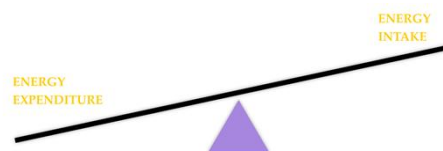
- ~ Type of exercise
- ~ Intensity of exercise
- ~ Duration of exercise
- ~ Weight/body composition challenges
- ~ Age/sex
- ~ Training/competition schedule
- ~ Goals?
- ~ Travel and time zone changes

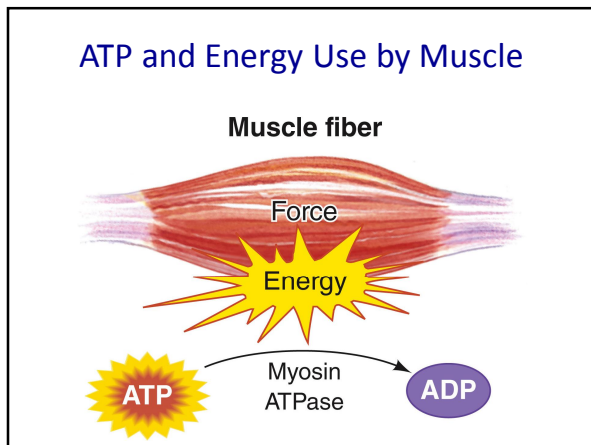
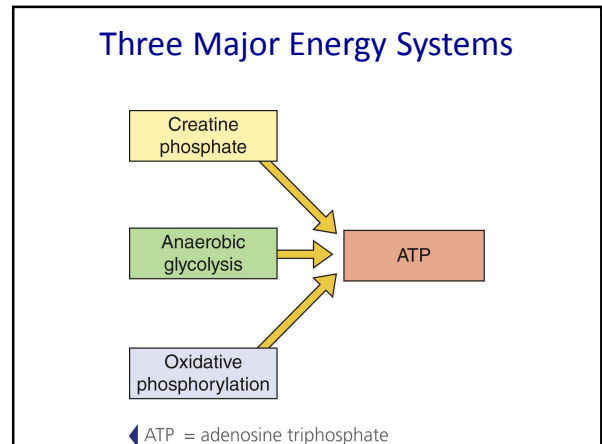
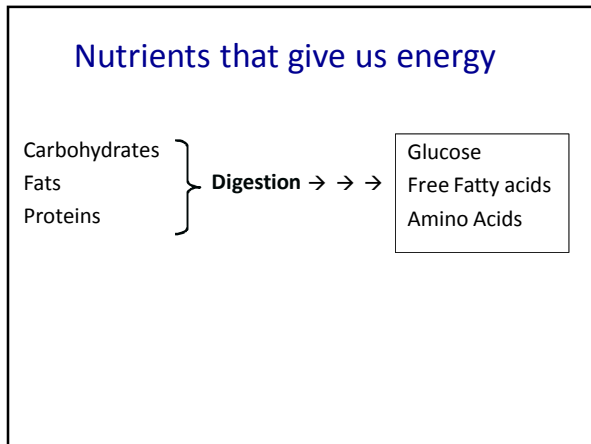
Basic Nutrition Goals

- ~ Adequate...
 - . Energy intake to meet the demands of training
 - . Replenishment of muscle and liver glycogen with dietary carbohydrates (CHO)
 - . Protein intake for growth and repair of tissue, particularly muscle
 - . Overall diet (e.g., proteins, antioxidant vitamins) to maintain a healthy immune system
 - . Hydration

Energy Balance

Dietary energy intake
- Exercise energy expenditure
= Energy Availability

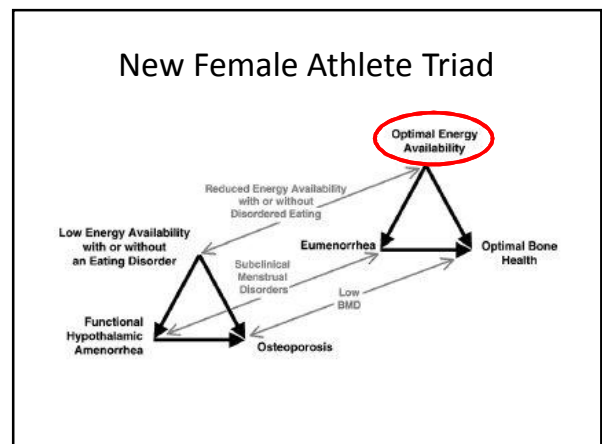
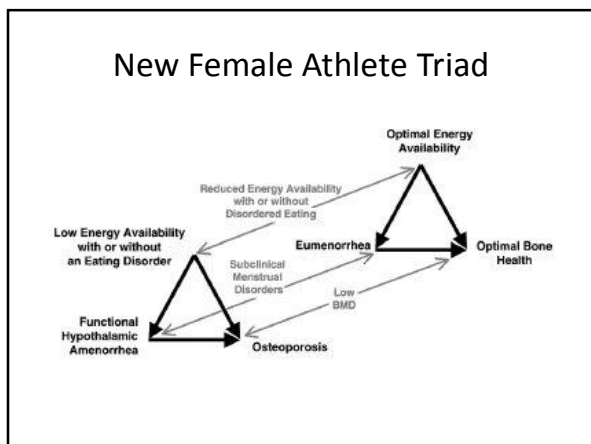




Energy Balance

Dietary energy intake - Exercise energy expenditure = Energy Availability

- “ Consume adequate energy to maintain body weight and health and maximize training effects
- “ Negative energy balance can result in:
 - . Loss of muscle mass
 - . Menstrual dysfunction
 - . Loss or failure to gain bone density
 - . Inc risk of fatigue, injury, illness
 - . Prolonged recovery process



Adequate Energy Needs

“ **Variation!**

- . *Male endurance athletes: 3000-5000 kcal/day*
- . *Female athletes with energy intakes < 1800-2000 kcal/day at risk*

“ **Majority additional energy needs supplied as CHO**

Body Weight and Composition

“ **“Ideal” Body Composition?**

- . No valid scientific rationale
- . Better to define a “range” of values, and monitor both health and performance
- . Limitations of current methods
- . May precipitate disordered eating behaviors

Body Weight and Composition

- “ Should not be a criterion for sports performance
- “ Frequent weigh-ins discouraged
- “ Optimum body fat level dependent on age, sex, heredity and may be sport specific

Body Weight and Composition

- “ Assessment techniques have variability and limitations
- “ Weight loss should take place in off season and involve sports dietician
- “ *If weight (fat) loss is required, it should start before the competitive season and involve a trained health and nutrition professional*

Basic Nutrition

“ **CARBOHYDRATES**

“ **PROTEINS**

“ **FATS**

“ **MICRONUTRIENTS**

- . **VITAMINS AND MINERALS**

“ **WATER**

Carbohydrates

- “ Maintain blood glucose during exercise
- “ Replenish muscle glycogen after glycogen-depleting exercise
- “ As exercise duration increases, carbohydrate needs rise

Carbohydrates

- ~ Carbohydrate needs increase particularly during:
 - . periods of high intensity training w/ few rest days
 - . multiple workouts/day
 - . tournaments with multiple games per day
- ~ 6-10 g/kg/day (2.7-4.5 g/lb)
- ~ Dependent on energy expenditure, sex, sport, and environmental conditions

Protein

- ~ Maintain and build muscle mass
- ~ Repair and rebuild muscle tissue
- ~ Maintain immune function
- ~ Fluid balance
- ~ Hormones
- ~ Energy

Protein Recommendations

- ~ General recommendation: 1.0-2.0 g/kg/day
- ~ Sport-based recommendations:
 - Recreational athletes → 1.0 g/kg/day
 - Endurance athletes → 1.2-1.4 g/kg/day
 - Ultraendurance athletes → 1.2-2.0 g/kg/day
 - Strength athletes → 1.5-2.0 g/kg/day

Fats

- ~ Source of energy
- ~ Fat soluble vitamins **A, D, E, K**
- ~ Essential fatty acids
- ~ Should be < 30% of normal diet (<10% saturated fat)
- ~ No evidence high-fat is ergogenic
- ~ Fat provides 70% of energy at rest
- ~ Fat supports vital organs, insulates and preserves body heat

Dietary Fat Recommendations

- ~ Dependent on energy needs
 - . Higher energy expenditure → higher fat needs
- ~ Most athletes require ~ **1.0 g/kg/day**
 - . 20-35% of total calorie intake
- ~ Endurance athletes
 - . Up to **2.0 g/kg/day**
- ~ Ultraendurance athletes
 - . Some reported to consume up to **3.0 g/kg/day**

Dietary Fats

- ~ Primarily monounsaturated and polyunsaturated
- ~ Monounsaturated fats:
 - olives, oils, nuts, avocados
- ~ Polyunsaturated fats:
 - fish, fish oil, flaxseed, walnuts, some oils
- ~ **<10% of total calories should be from saturated fat**

Micronutrients

- “ Most common vitamins and minerals of concern in athletes diets:
 - . Calcium, Vit D
 - . B vitamins
 - . Iron
 - . Zinc
 - . Magnesium
 - . Antioxidants: C, E, beta carotene and selenium

Micronutrients

- “ Vitamin and mineral supplements not needed if proper foods consumed
- “ Supplements may be needed in athletes who:
 - . Restrict energy intake
 - . Use severe weight loss practices
 - . Eliminate food groups from diet

The Training Diet

Before...

...During...

...After

Before/Pre-Exercise

- “ Fluid to maintain hydration
- “ Low in fat
- “ Low in fiber
- “ Facilitate gastric emptying and minimize gastric distress
- “ High CHO to to max maintenance of blood glucose
- “ Moderate protein
- “ Familiar foods to athlete

Carbohydrate Before Exercise

- “ Carbohydrate (g) before training/competition
 - . 1-4 gm/kg 1-4 hours prior

| Grams/kg | Grams/lb | 150 lb athlete | Time |
|----------|----------|----------------|------------|
| 1.0 | 0.5 | 75g | 1 hr prior |
| 2.0 | 0.9 | 135g | 2 hr prior |
| 3.0 | 1.4 | 210g | 3 hr prior |
| 4.0 | 1.8 | 270g | 4 hr prior |

- . If unable to eat breakfast before an early-morning workout, eating ~30g easily digested carbohydrates 5-15 minutes before exercise may improve performance

During Exercise

- “ Replace fluid loss
- “ Provide CHO for maintenance of BG levels
- “ Especially when:
 - . exercise > 1 hr
 - . inadequate pre-exercise intake
 - . extreme conditions
- “ Consumption in 15-20 min intervals better than 2 hour bolus
- “ Addition of protein inconclusive on performance

Carbohydrates **During** Exercise

- ~ Sport drinks, energy bars, fruit, breads
- ~ For long-duration, moderate to high intensity exercise
- ~ Consume 30-60 grams per hour (~1 gram/minute)
- ~ Dilute concentration (<10%) may be advantageous by optimizing fluid absorption/delivery

After Exercise

- ~ Provide adequate fluids and energy:
 - . Replace muscle glycogen stores
 - . Ensure rapid recovery
 - . With protein, aids in the repair of muscle tissue after training/competition.
- ~ Recovery nutrition most important for:
 - *athletes training intensely on a daily basis*
 - *athletes with more than one competition or workout in a day*
 - *after a major event or competition*

Carbohydrate **After** Exercise

- ~ Recovery snack should be consumed immediately after exercise (within 30 min.)
- ~ Again q2H for 4-6 hours
- ~ 1.0-1.2 grams per kg (~0.5 g/lb)

| | | | | |
|-----------------|-------|-------|-------|-------|
| Weight Lbs → | 110 | 125 | 155 | 170 |
| Kg → | 50 | 57 | 70 | 77 |
| Carb (g) | 50-60 | 57-68 | 70-84 | 77-92 |

Protein + Carbohydrate

Role of Protein Ingestion During Recovery from Exercise:

- ~ Studies assessing the addition role of protein (in a CHO + PRO mixture) to enhance muscle glycogen resynthesis are inconclusive
- ~ However, protein added to a CHO recovery drink may aid in the repair and synthesis of muscle protein after endurance exercise
- ~ Recommended (post-exercise): CHO 1.2 g/kg/hour, PRO 0.1-0.2 g/kg/hour
- ~ Ex. Low-fat chocolate milk → convenient, inexpensive

Recovery Foods

| Food Item | Serving Size | Carbohydrate (g) | Protein (g) |
|-----------------|--------------|------------------|-------------|
| Orange juice | 16 oz. | 60 | 0 |
| Bagel | Large (4 oz) | 60 | 8 |
| Chocolate milk | 16 oz. | 52 | 16 |
| Yogurt Smoothie | 10 oz. | 44 | 10 |
| Clif bar | 1 | 45 | 10 |
| PB & J sandwich | 1 | 45 | 12 |
| Cereal & milk | 1 cup each. | 42 | 11 |
| Banana | Medium | 23 | 0 |

Vegetarian Athletes

- ~ May be at risk for low energy intake
- ~ Low protein, fat intake
- ~ Low micronutrients:
 - . Iron, calcium, Vit D, riboflavin, zinc, B-12

Summary

- “ Carbohydrates, Fats and Protein all play an important role in the Athlete Diet
- “ Importance of Energy Balance
- “ Individualized Nutrition Requirements
 - . Variation due to type, duration, and frequency of activity; age, sex, environment
- “ Training Diet = Before, During and After Exercise

References

- “ Position of the American Dietetic Association, Dieticians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance, J Am Diet Assoc. 2009; 109:509-527.