Practical Approach to Adolescent Sports Nutrition

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Objectives

- Understand the basic physiology of sports nutrition
- Provide practical nutritional recommendations for the competitive athlete in regards to **performance**
- Discuss commonly used nutritional supplements and ergogenic aids

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Overall Goals

1. Appropriate Energy Balance
2. Optimal Sports Performance
3. Safe Utilization of Supplements

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Energy Balance

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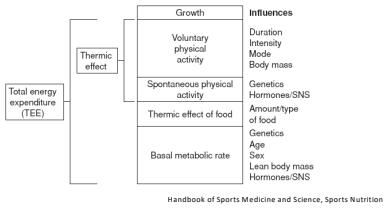
Determinants of Energy Expenditure



Handbook of Sports Medicine and Science, Sports Nutrition

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Sport Specific Considerations

- Body Weight and Lean Body Mass
- Sport, Position, In-Season, Pre-Season
- Gender
- Training Regimen (Strength vs Endurance Training)
- Climate, Supplements

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Energy (Calories)

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ATP (Adenosine Triphosphate)

- ATP is required by muscle cells to perform work
- **Very little ATP is stored in muscle, so it is not considered a good supplemental energy source.**
- **ATP stored in muscle would only sustain about 1 second of maximal intensity exercise.**

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Creatine Phosphate

- Creatine Phosphate (CP) is produced endogenously as well as obtained from the diet.
- ADP + Pi (from CP)= ATP
- CP metabolism is only used for a matter of seconds(~10s). Short bursts (ie. sprints, weights, shot put)

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Glycogen

- Glycogen is the storage form of carbohydrate.
- Anerobic Glycogenolysis (ANG) typically starts within 10 seconds and lasts up to 2 to 3 minutes
- ANG - Glycogen is utilized to produce lactate and relatively few ATP.

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Glycogen

- Typically after anerobic glycogenolysis is depleted energy from the glucose in blood stream and aerobic glycogenlosysis is utilized.
- **As the intensity of exercise increases there is a greater reliance on CHO as energy. When you pass 60-75% V02 max, CHO are primary source of energy.**
- **Over a period of 1-2 hours muscle glycogen is depleted and fat oxidation is utilized. (hitting the wall)**

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Fat

- In low intensity exercise at < 50% of V02 max fat is the primary fuel, accounting for more than 50%
- Additionally, blood glucose and muscle glycogen contribute equally to the remainder of fuel usage.
- **Fat oxidation is not adequately sufficient to maintain a running pace and therefore is detrimental in competition.**

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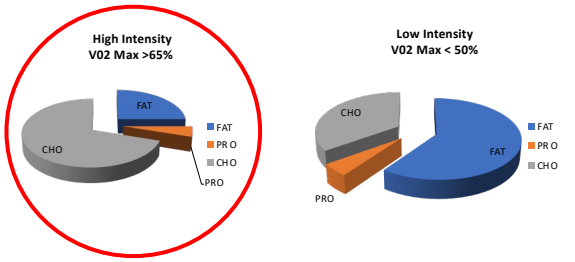
Macronutrient Utilization



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Protein

- There is no significant store of protein in the body to be utilized for energy.
- Protein provides 3 to 5 percent of total energy needs during endurance exercise.
- Key to utilizing dietary protein for muscle building is to make sure you have enough muscle glycogen available during exercise!

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Prescription

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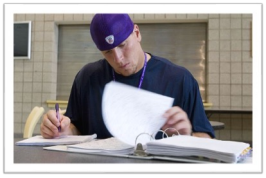
What do we tell our athletes?

"Carbo load"

"Drink lots of fluids"



"Stay hydrated"

"Get some fluids in you"

"You've got to eat more protein"

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Protein

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Protein Requirement

Non - Athlete

- Recommended protein intake for general population is 12-15% of caloric intake
  - 2000 calories per day **X** 13 % = 260 calories
  - 260 calories**/** 4 calories per gram = **65g of protein**
- Non-athletes typically recommended to intake 0.8g per kg of body weight
  - 180 lb / 2.2 = 81kg
  - 81kg X 0.8 = **65 g of protein**

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Protein Requirement

- Protein requirement for athletes is approximately double that of non-athletes – **1.2 to 1.7 g per kg**
  - 80kg X 1.5g/kg = **120 g protein**
  - Remember the protein requirement is not for energy usage during exercise. Generally used for body functions such as enzymatic activity and tissue repair
- Despite the increased protein requirement, most athletes consume enough protein through their daily diet

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Protein Requirement

- Typical athlete at 80kg would need **120g of protein**
  - 4 oz chicken breast = 25 g
  - 1.5 cup black beans = 21g
  - Turkey Club = 44 g
  - 2 scrambled eggs = 14 g
  - 3 oz can albacore tuna = 21g
- Eat a healthy diet and you should easily take in 1-2g/kg PRO/day

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Remember Physiology

- A surplus of protein is not particularly beneficial to the body
- Excess protein is broken down to ammonia and converted to urea to be excreted through the urine
  - Excess water loss
- Excess calories consumed that are not utilized for muscle mass are typically stored as fat
  - Consuming more calories than necessary, no matter the source, will lead to weight gain. Just not the kind you want

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Carbohydrates

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Preparation for Sport

- CHO intake 7-10g/kg per day to replenish stores in 24 hours period.
- Loading - CHO load 10g/kg for 3 days as exercise is tapered. Carbohydrate loading can potentially **double** the muscle glycogen stored if done correctly.
- 80kg = 176 lbs = 560 - 800g CHO/day

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Food	CHO
Honey Nut Cheerios w/ Milk	71g CHO
Banana	23 g CHO
Orange Juice (16 fl oz)	52g CHO
Cliff Bar	43g CHO
Turkey Sandwich, Cheddar on Wheat (2)	60g CHO
Apple	13g CHO
Lays BBQ Potato Chips	24g CHO
Gatorade 20 oz	34g CHO
Bagel w Peanut Butter	68g CHO
Cliff Bar	43g CHO
Gatorade 20 oz	34g CHO
Chipotle Burrito, Chicken, Rice, Lettuce, Cheese	72g
Gatorade 20 oz	34g
Total	571

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Pre-Game Meal

- 3-4 hours prior to game for metabolism
- 1-4 g/kg CHO or about 200 – 300 g CHO

80kg x 3g = 240g CHO

Food	CHO
Footlong Subway Sweet Onion	120g
Gatorade 20 oz	34g
Cliff Bar	41g
Doritos	19g
Total	214g

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Pre-Game Recommendations

- Aim for 7g/kg CHO per day in active athlete
- Increase to ~10g/kg CHO per day 2-3 days prior to event
- If early morning game, eat right before bed, light snack in AM and continually throughout competition
- Watch large intake too close to game time, may cause insulin spike (rest and digest, decrease blood glucose)
- May consider protein or low GI foods, in addition to CHO just prior to sport to slow absorption to avoid insulin spike.

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During Exercise

- After 60-120 mins muscle glycogen is depleted
- If sport is greater than 60 mins, continuously replenish CHO throughout
- Absorption is limiting factor so 30-60 g per hour is adequate, (1gm/minute)

Food	CHO
Gatorade 32 oz	56g
Gatorade Energy Chews (6)	24g
Banana	26g
Apple Sauce Single	18g
Gu Energy Gel	20g
Orange	21g

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Fluid Intake

- Fluid should be replaced at 200-300ml every 20 - 30 minutes
  - 32oz Gatorade = 1L Fluid and 54g of carbs
- If less than 60-90 minutes water is fluid of choice but if greater a 6-8% carbohydrate solution can enhance performance.

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In-Game Recommendations

- Plan ahead! If you know length of activity, you can plan accordingly.
- Replenish CHO as you go, every 15-30 minutes.
- Use high GI foods during the game to facilitate absorption
- If tolerated try to consume liquid CHO intake in order to sustain hydration and fuel.
- Don't over do it. Body can only absorb so much CHO at one time (30-60g).

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Post Exercise

- **"Golden Hour"** -Rapid Phase of Glycogen Synthesis (30 - 60 mins)
  - No insulin required, GLUT-4 Transporters stimulated by muscle contraction, and low glycogen
  - Increased glycogen synthase activity
  - Increased permeability to muscle cell membrane to glucose
- 2 hours post-exercise there is a 50% reduction in glycogen synthesis
- Goal intake is 1.0 - 1.2g/kg/h -> repeat until meal.
- Should add PRO to this recovery phase as it has a synergistic effect on insulin release.

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Post-Game Recommendations

- Refuel immediately after leaving the field, especially if multiple games in a short period of time. (1g/kg)
- CHO to PRO ratio is usually about 3:1
- High GI foods would be appropriate in this setting.
- Post game meal should be within 2-3 hours after competition, sooner the better.
- Fluid intake should be about 1.5 times of what is lost. The best way to do this pre and post exercise weights.

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Recommendations

20 oz = 65g CHO & 20g PRO

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Summary

- Understand the physiology, before making recommendations
- Eating a well balanced diet should attain adequate PRO intake.
- CHO, CHO, CHO when focused on performance
- Plan ahead!
- Golden Hour
- Prescribe don't Generalize

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Supplement Recommendations

- If protein supplementation is necessary consider **both whey and casein at strategic times of the day**.
- **Creatine monohydrate** has been shown to be a beneficial supplement with no major short term safety concerns
- **BCAA** have a physiologic basis for supplementation but have not clearly shown a benefit and can be consumed in one's diet.
- **Caffeine** studies have shown a benefit to performance with a good safety profile at low levels
- Consider supplementation of **Vitamin D** as low levels can lead to injury or impact performance.

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