Section 11

Factors That Influence The Hypothalamus

- Senses, like taste and smell, can stimulate or depress appetites.
- An empty stomach stimulates the hunger center, whereas a full stomach stimulates the satiety center.
- Receptors in the hypothalamus monitor blood levels of various nutrients such as glucose, fats and proteins thereby influencing hunger and satiety.
- The hypothalamus detects changes in body temperature. An increase in body temperature inhibits the hunger center.
- Hormones, such as insulin, can influence feeding behavior.

The Nutritional Needs of the Athlete

Carbohydrates:

In the early stages of moderate exercise, carbohydrates provide 40 to 50 percent of the energy requirement. Carbohydrates yield more energy per unit of oxygen consumed than fats. Because oxygen often is the limiting factor in long duration events, it is beneficial for the athlete to use the energy source requiring the least amount of oxygen per kilocalorie produced. As work intensity increases, carbohydrate utilization increases.

Complex carbohydrates come from foods such as spaghetti, potatoes, lasagna, cereals and other grain products. Simple carbohydrates are found in fruits, milk, honey and sugar. During digestion, the body breaks down carbohydrates to glucose and stores it in the muscles as glycogen. During exercise, the glycogen is converted back to glucose and is used for energy. The ability to sustain prolonged vigorous exercise is directly related to initial levels of muscle glycogen. The body stores a limited amount of carbohydrate in the muscles and liver. If the event lasts for less than 90 minutes, the glycogen stored in the muscle is enough to supply the needed energy. For events that require heavy work for more than 90 minutes, a high-carbohydrate diet eaten for two to three days before the event allows glycogen storage spaces to be filled. Long distance runners, cyclists, cross-country skiers, canoe racers, swimmers and soccer players report benefits from a precompetition diet where 70 percent of the calories comes from carbohydrates.

According to the Olympic Training Center in Colorado Springs, endurance athletes on a high-carbohydrate diet can exercise longer than athletes eating a low-carbohydrate, high-fat diet. For continuous activities of three to four hours, make sure that glycogen stores in the muscles and liver are at a maximum. Consider taking carbohydrates during the event in the form of carbohydrate solutions. The current recommendation is a 6 to 8 percent glucose solution.

A diet where 70 percent of calories comes from carbohydrates for three days prior to the event is sometimes helpful for endurance athletes. (See Table 1 for a sample menu.) Water retention often is associated with carbohydrate loading. This may cause stiffness in the muscles and sluggishness early in the event.

Water

Water is an important nutrient for the athlete. Athletes should start any event hydrated and replace as much lost fluid as possible by drinking chilled liquids at frequent intervals during the event. Chilled fluids are absorbed faster and help lower body temperature.

Recommendations for hydration.	
Day before	**Drink fluids frequently**
Pre-event meal	2-3 cups water
2 hours before	2-2 1/2 cups water
1/2 hour before	2 cups water
Every 10-15 minutes during the event	1/2 cup cool (45-55 degrees) water
After event	2 cups fluid for each pound lost
Next day	Drink fluids frequently (it may take 36 hours to rehydrate completely).

Fats

Fat also provides body fuel. For moderate exercise, about half of the total energy expenditure is derived from free fatty acid metabolism. If the event lasts more than an hour, the body may use mostly fats for energy. Using fat as fuel depends on the event's duration and the athlete's condition. Trained athletes use fat for energy more quickly than untrained athletes.

Fat may contribute as much as 75 percent of the energy demand during prolonged aerobic work in the endurance-trained athlete.

Protein:

After carbohydrates and fats, protein provides energy for the body. Exercise may increase an athlete's need for protein, depending on the type and frequency of exercise. Extra protein is stored as fat. In the fully grown athlete, it is training that builds muscle, not protein per se. A protein intake of 10 to 12 percent of total calories is sufficient. Most authorities recommend that endurance athletes eat between 1.2-1.4 grams protein per kg of body weight per day; resistance and strength-trained athletes may need as much as 1.6-1.7 grams protein per kg of body weight. (A kilogram equals 2.2 pounds.)

To calculate your protein needs, divide your ideal weight by 2.2 pounds to obtain your weight in kilograms. Then multiply kilograms by the grams of protein recommended.

Vitamins and Minerals:

There is no evidence that taking more vitamins than is obtained by eating a variety of foods will improve performance. Excessive amounts of fat-soluble vitamins may have toxic effects.

Minerals play an important role in performance. Heavy exercise affects the body's supply of sodium, potassium, iron and calcium. To replenish sodium lost through sweating, eat normally following the competition. Avoid excessive amounts of sodium. Eating potassium-rich foods such as oranges, bananas and potatoes supplies necessary potassium.

The Pre-Game Meal:

A pre-game meal three to four hours before the event allows for optimal digestion and energy supply. Most authorities recommend small pre-game meals that provide 500 to 1,000 calories.

The meal should be high in starch and the starch should be in the form of complex carbohydrates (breads, cold cereal, pasta, fruits and vegetables).

Avoid a meal high in fats. Fat takes longer to digest. Fiber has a similar effect, as well.

Two pre-event meal plans.	
Pre-Event Meal Plan I (approximately 500 calories)	
Milk, skim	1 cup
Lean meat or equivalent	2 ounces
Fruit	1 serving (1/2 cup)
Bread or substitute	2 servings
Fat spread	1 teaspoon
Pre-Event Meal Plan II (approximately 900 calories)	
Milk, skim	2 cups
Cooked lean meat or equivalent	2 ounces
Fruit	1 serving (1/2 cup)

Pasta or baked potato	1 cup or 1 medium
Bread or substitute	2 servings
Vegetable	1 serving (1/2 cup)
Fat spread	1 teaspoon
Dessert: Angel food cake or plain cookies	1 piece 2 cookies

A Basic Dietary Plan for an Athlete

With the following plan, instead of the athlete counting calories they merely calculate the number of servings from each food group that they need daily depending on their goals.

Food Group	**Trim Down**	**Shape Up**	**Gain**
Meats/Protein	7	9	10
Grains	10	13	16
Fresh Fruits	3	3	4
Vegetables	4	4	5
Dairy	2	2	3
Fats	2	3	6
Calories	**1,800**	**2,200**	**3,000**

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[1] http://www.chap.com/diet4.htm