Nutritional Factors in Health and Performance

Most athletes have two basic dietary goals: eating to maximize performance and eating for optimal body composition. Whether the diet is designed to enhance performance, prevent disease, or both, two fundamental components of the diet must be present:

- appropriate Calorie level
- appropriate nutritional levels to prevent nutrient deficiency or toxicity

The food guide pyramid displays recommended types and amounts of food to eat daily. The pyramid classifies foods into five groups.

1. Bread, cereal, rice and pasta
2. Fruit
3. Vegetables
4. Milk, yogurt, and cheese
5. Meat, poultry, fish, dry beans, eggs and nuts

The USDA food guide pyramid or its counterparts are excellent starting points from which to evaluate the adequacy of an athlete's diet. Because athletes, especially elite and professional athletes, have different needs from those of the general population, the guidelines may need to be adjusted to meet the dietary requirements specific to the athlete's training program. For example, consuming maximum number of servings in the food guide pyramid provides about a 2,800 kcals; while most athletes have energy requirements that exceed 2,800 kcal. The food guide pyramid is based on the general guideline of 50% carbohydrate, 20% protein and 30% fat.

A macronutrient is a nutrient that is required in significant amounts in the diet. Three important classes of macronutrients are protein, carbohydrates, and lipids (fats).

Protein

When estimating the protein requirements for individuals, two key factors, caloric intake and biological value of the protein, must be considered. The higher the biological value of the protein, the lower the protein requirement needed. Foods with high biological value are from animal origins, meat, fish, poultry, dairy products, and eggs. Assuming adequate caloric intake and two thirds or more of the protein from animal sources, the recommended dietary allowance (RDA) for protein for adults is 0.8g/kg of body weight for both men and women (General population).

Both aerobic endurance training and strength training can increase protein need, although the exact mechanisms are unclear and may be different. For aerobic endurance athletes, the underlying mechanisms could include tissue repair and the use of branched-chain amino acids for auxillary fuel; whereas for strength and power athletes, the mechanisms are probably for tissue repair and the maintenance of a positive nitrogen balance so that the hypertropic stimulus is maximized.

Research indicates that the protein requirement of aerobic endurance athletes is slightly over 0.8g/kg of body weight and can reach 1.4 g/kg of body weight, due to increased use of protein as fuel source during exercise. Research has shown that strength training can increase requirements to as high as 1.7 g/kg of body weight.

Because most athletes do not fall neatly into one category (aerobic endurance or strength-trained athletes), a general recommendation of 1.5 g/kg of body weight ensures adequate protein intake.

Carbohydrate
The primary role of carbohydrate in human physiology is energy provision. Traditionally, breads, cereals, pasta, fruits, and starchy vegetables are promoted to athletes as ideal sources of carbohydrate. American health authorities generally recommend consuming at least 50% of total calories from carbohydrate. Because of the relationship of carbohydrate intake to muscle and liver glycogen stores and to protein-sparing effect of high concentrations of muscle glycogen, a high-carb diet is commonly recommended for all athletes.

Aerobic endurance athletes who train for long durations (90 min or more daily) should replenish glycogen levels by consuming maximal levels of carbs, approximately 8 to 10 g/kg of body weight. This is equivalent to 600-750 g of carbohydrate (2,400-3,000 kcal from carb) per day for an athlete weighing 165lb.

Intake of approximately half of that recommended for aerobic endurance athletes appears adequate to support training and performance of strength, sprint, and skill athletes, and thus an intake of 5 to 6 g/kg per day is reasonable.

Fats
The saturation of fats affects their physiological effect. For example, some saturated fats cause an increase in blood LDL and HDL cholesterol, monounsaturated fats generally do not exert an effect on cholesterol, and polyunsaturated fats tend to lower HDL and LDL cholesterol.

HDL = Healthy Cholesterol
LDL = Bad Cholesterol

Fat serves many functions within the body. Energy is stored primarily as adipose tissue (fat). Although commonly considered negatively, body fat is necessary for insulation and protection of organs and hormonal regulation. Fat also serves as a carrier for the fat soluable vitamins A, D, E, K and supplies the essential fatty acids, linoleic acid (omega-6) and linolenic acid (omega-3). These two essential fatty acids are necessary for the formation of healthy cell membranes, the proper development and functioning of the brain and nervous system, and the production of hormones.

Fat phobia, fear of eating fat, can lead to nutrient deficiencies, which harm performance.

Approximately 34% of calories in the typical American diet are from fat. The recommendation for the general public from health organizations such as the American Heart Association is that fat constitute 30% or less of the total calories consumed.

Fat guidelines for individual athletes, however, may be higher than standard “heart healthy” guidelines. Research shows that during periods of heavy endurance training, increasing dietary fat as high as 50% of calories does not negatively affect plasma

lipids (ie: gaining weight). In fact, fat intakes greater than 30% are common in elite athletes. In light of the differing metabolism of fats in actual people, the Subcommittee on Nutrition of the United Nations recommends an upper limit for fat intake of 35% of total calories for active people.

Diets extremely low in fat (less than 15% of total calories) may decrease testosterone production, thus decreasing metabolism and muscle development.

At rest or low intensity exercise, a high percentage of the energy produced is derived from fatty acid oxidation. With increasing exercise intensities, however, there is a gradual shift from fat to carbohydrate as the preferred source of fuel.

Estimated Daily Calorie Needs of Male and Female Athletes by Activity Level

	Male		**Female**	
Activity Level	**Kcal/lb**	**Kcal/kg**	**Kcal/lb**	**Kcal/kg**
Light	17	38	16	35
Moderate	19	41	17	37
Heavy	23	50	20	44

**Essentials of Strength Training and Conditioning, National Strength and Conditioning, 2nd Edition

Example: 175lb male, Heavy activity level = 4025 Kcals/day

In Summary

Protein
- General Population = .8 g/kg of body weight
- Endurance Athletes = .8 – 1.4 g/kg of body weight
- Strength and Power Athletes = .8 – 1.7 g/kg of body weight

Carbohydrate
- General Population = 50% of calories
- Endurance Athletes = 8 – 10 g/kg of body weight (600-750g for 165lb individual)
- Strength and Power Athletes = 4 – 5 g/kg of body weight (300-375 g for 165lb individual)

Fats
- General Population = 30% or less of total calories
- Endurance Athletes = can consume up to 50% without negatively affecting plasma lipids
- Strength and Power Athletes = Upper limit for fat intake of 35% of total calories for active people

Keep in mind that this doesn't mean that you should consume saturated fats to increase fat consumption, this will increase chances of health problems. Consume healthy fats such as monounsaturated or polyunsaturated fats; the following is a list of some good fats to supplement the bad fats in your diet: avocados, peanut butter, olive oil, almonds, cashews, salmon, and walnuts.