Chapter 6: NUTRITIONAL CONSIDERATIONS

Diet influences virtually every aspect of sports participation. _____ _____ (Slide 2). Coaches often lack adequate and reliable nutrition knowledge and incorporate _____ (Slide 2). According to the results of one survey, at the high school and collegiate level, certified athletic trainers were the most knowledgeable about nutrition; 73% reported having taken a college-level nutrition course. In this survey, athletes reported that their leading sources of nutritional information were parents, TV commercials, and magazines.

I. Essential Nutrients: An Overview

A. Carbohydrates (CHO). This class of nutrients provides energy for _____ (Slide 3). The three types of carbohydrates are monosaccharides, disaccharides, and polysaccharides. Most dietary sources of carbohydrates are from plants. The recommended percentage of CHO in the diet ranges from _____ (Slide 3) of total calories. Each gram of carbohydrate supplies 4 kilocalories. _____ (Slide 3) is the body's storage form of carbohydrate.

1. Carbohydrate (Glycogen) Loading. Glycogen loading is the process of storing an increased amount of glycogen in the liver and muscles prior to competition. Athletes involved in aerobic sports, especially those lasting _____ (Slide 3), benefit most from glycogen loading. See Table 6.1 for a two-stage glycogen loading technique.

B. Fats (Lipids). The body uses fat for _____ (Slide 4). Fatty acids and _____ (Slide 4) make up simple fats. Fatty acids can be _____ (Slide 4). Unsaturated fats can be *monounsaturated* (one double bond within the carbon chain) or *polyunsaturated* (two or more double bonds within the carbon chain).

1. The recommended percentage of fat in the diet is _____ (Slide 4) of total calories. Regardless of the type of fat, each gram supplies ___ (Slide 4) kilocalories. The body stores more energy as fat than as CHO.

C. Proteins. Proteins are comprised of amino acids. _____ _____ (Slide 5). Muscle protein is an energy source for muscles during prolonged exercise, as much as _____ (Slide 5) of the energy needed for an activity can be from this source.

1. _____ (Slide 5) because they must be supplied by the diet. Complete proteins contain all essential amino acids and are in eggs, meat, and dairy products. Plant proteins are incomplete because they lack one or more of the essential amino acids. Vegetarians can carefully combine plant foods to obtain all amino acids or include eggs and/or milk products in their diets.

2. Protein Supplementation. There are two major concerns about increasing protein intake above recommended levels. Eating more protein-rich foods can _____ _____ (Slide 6) may be unable to eliminate the by-products of protein breakdown.

a. No scientific evidence supports the use of protein supplements for enhancing muscle development. Athletes involved _____ (Slide 6) need between 1.2 and 1.8 grams of protein per kilogram of body weight. The best way to achieve these amounts is by consuming food instead of protein supplements.

D. Vitamins. Vitamins have a variety of functions in the body, _____ _____ (Slide 7) Some vitamins serve as _____(Slide7), protecting structures from the damaging effects of free radicals. Free radicals are released during vigorous exercise. Vitamins provide no caloric value.

1. Vitamins are classified as _____ (Slide 7). Compared to excesses of water-soluble vitamins, excesses of fat-soluble vitamins are more likely to result in toxic buildup because they are stored in the body.

2. To obtain vitamins, athletes should eat a balanced diet. In some instances, taking a multiple vitamin supplement is necessary.

E. Minerals. Minerals are elements that are needed for various body functions. _____ (Slide 8) is the most prevalent mineral in the body. There is no scientific evidence that taking minerals in excess of recommended amounts will enhance performance. If an athlete's diet is not well balanced, _____

_____ (Slide 8) that meets the recommended amounts is advisable. *Megadoses* of nutrients should be _____ (Slide 8)

1. Female athletes may be at risk of calcium deficiency and osteoporosis because they consume too little calcium.

F. Water. Water is _____ (Slide 9) for many bodily functions, including heat regulation and waste elimination. Adult requirement for water is approximately 2.5 L daily, but under conditions of heavy exercise (especially in hot weather), water requirements can increase to _____ (Slide 9) daily. During heavy exercise, significant amounts of body water are lost to eliminate the heat generated by energy metabolism. This water needs to be replaced to maintain the body's fluid balance.

II. Dietary Habits of Athletes: What the Research Shows

A. In a survey of 43 university football players, researchers found that the athletes' diets were 34.7% CHO, 17% protein, and 42% fat. The recommended proportions of macronutrients were 45% to 70% CHO, 12% to 15% protein, and 20% fat.

1. _____ (Slide 10).

B. Studies of elite female high school gymnasts indicated that many were consuming fewer calories than recommended as well as too little B-6, folic acid, iron, calcium, and zinc.

C. Duester et al. studied 51 female distance runners and concluded their average intakes of protein, fat, and CHO were 13%, 32%, and 55% respectively; the runners' diets were too low in calories to provide adequate energy to support their activity.

D. Sports scientists think female endurance athletes do not consume enough iron. Iron is lost through sweating, gastrointestinal and menstrual bleeding, and red blood cell destruction (**hemolysis**).

E. Low caloric intake among female volleyball athletes may have been part of efforts to lose weight.

F. Conclusions.

1. Many athletes do not consume proper proportions of protein, CHO and fat.
2. Adolescent athletes may need as much as 1.5 to 2 grams of protein/kg body weight/day.
3. Many tackle football athletes consume excessive amounts of protein and fat.
4. Athletes involved in sports that require lean builds tend to eat diets that do not supply enough calories.
5. Athletes consume too many calories in the form of "_____(Slide 11)." Most athletes' diets are deficient in a least some minerals, such as calcium, iron, and zinc.

III. Wrestling: Special Considerations. Wrestlers often practice unhealthy weight loss procedures as they attempt to drop weight to compete in a lighter category. _____ _____ (Slide 12); each gallon of water weighs seven pounds.

A. _____ _____(Slide 12). Short-term effects of repeated bouts of extreme weight loss can result in strength loss, _____ (Slide 13), etc. Repeated episodes of rapid weight loss may interfere with an adolescent's normal growth and development.

B. In 1989 the state of Wisconsin instituted the Wrestling Minimum Weight Project (WMWP) to reduce unhealthy weight-loss practices among high school wrestlers. To participate in wrestling, athletes were allowed to lose no more than 3 lbs. of weight/week and their level of body fat had to be at least 7%.

1. Trained volunteers tested athletes and provided nutrition education for coaches. The initial response of coaches to the program was very positive.

C. The National Federation of State High School Associations (NFSH) modified its wrestling rule 1-3-1 to state, "An ideal program would be one where a medical professional would assist in establishing a minimum weight through the use of checking body fat and hydration. The recommended minimum body fat should not be lower than 7%." See Appendix 4 for the American College of Sports Medicine's position statement regarding weight loss in competitive wrestling.

IV. Educating Athletes: What Can the Coach Do? Athletes often consider the coach to provide guidelines concerning proper diet. Most coaches, however, lack any formal nutrition training.

A. _____ _____ (Slide 16). Coaches earning a major or minor in physical education or a related field may be required to take at least one such course.

B. Coaches can attend in-service meetings, professional conferences, or community education courses in sports nutrition or subscribe to professional journals that contain articles on nutrition.

C. To locate a nutrition expert in their area, coaches can contact the American Dietetic Association. Coaches may also contact nutrition or sports medicine faculty at local universities for nutrition information.

D. _____ _____ (Slide 17). This record should be periodically reviewed by someone knowledgeable about nutrition. When working with children, coaches should discuss the nutritional needs of athletes with parents. The USDA's Nutrient Data Laboratory web site is a source of information about the nutrient content of foods. The USDA's Center for Policy and Promotion web site offers an online dietary analysis program.

V. General Dietary Guidelines for Athletes.

A. Daily Diet (Nutritional Maintenance). An athlete's nutritional program should be based on the physical characteristics of the athlete and the demands of the sport.

1. According to Brotherhood, the three goals of a sports nutrition program are _____ _____ (Slide 18).

2. Experts recommend that _____ (Slide 19) of dietary calories be supplied from protein, _____ (Slide 19) by fat, and the remainder from CHO.

3. Even highly active athletes only need _____ (Slide 19) gm of protein/kg body weight each day. Diets with excessive protein may produce unwanted side effects, particularly dehydration.

4. If athletes consume well-balanced diets, there is little need for vitamin/mineral supplements.

a. Athletes complaining of chronic fatigue, loss of fitness, or inability to perform should be tested for low blood-iron levels that can lead to anemia.

5. Nutritional information for young athletes should be presented in simple, easy-to-understand terms, e.g., using the Food Guide MyPlate at www.MyPlate.gov. Computerized dietary analyses can be useful to compare actual intake with recommendations.

B. Precompetition Diets. _____ _____ (Slide 21). Precompetition diets should consist of low-fat, easily digestible foods eaten a minimum of _____ (Slide 21) prior to the event.

1. Liquid meals contribute to hydration, and are less likely to cause bloating or feeling "heavy" as can solid meals.

2. Precompetition diet should provide _____ (Slide 21) grams of carbohydrate or 3 to 5 grams/kg body weight, particularly for athletes involved in endurance and power sports.

C. Nutrition During Competition. CHO consumption during activity can be beneficial. During long-duration exercise (_____(Slide 22)), CHO consumption enables active muscles to rely on blood glucose for energy.

1. Recommended dosage is ____ (Slide 22)oz. of a _____ (Slide 22) CHO solution taken every _____ (Slide 22)

VI. Weight vs. Fat Management.

A. Body weight is comprised of _____ (Slide 23). Water is a major component of nearly every tissue in the body. Skeletal muscles comprise most lean tissue. Majority of body fat is under the skin (subcutaneous) and is the main storage form of excess calories.

1. Per unit volume, muscle tissue is denser and weighs more than the same volume of fat tissue.

2. When more calories are consumed than needed for activity, the excess is converted to fat and stored. When an athlete fails to consume enough calories to meet needs, fat is metabolized for energy.

3. _____ _____ (Slide 23).

4. Frequent weighing has limited value because weight often fluctuates from day to day, especially in women. Weighing once a week, at the same time of day, and after going to the bathroom is sufficient for athletes.

5. Rapid weight fluctuations involve dehydration, and significant water losses can have serious consequences. Wrestlers should determine their healthy body weight in the off-season and achieve that weight by the time the next season begins.

B. Minimal Competitive Weight. _____ _____ (Slide 24).

1. For male athletes, it is recommended that body fat should _____ (Slide 24)% of total body composition. For female athletes, body fat _____ (Slide 24)% of body composition. Skin-fold measurements are often used to determine body composition, but a properly trained person must take such measurements.

2. Once the percentage of body fat has been determined, **lean body weight** (**LBW**) is calculated by the following formula: LBW = total body weight – fat weight

Example

A 135 lb. male athlete has 14% body fat. To determine his fat weight, multiply his total body weight by .14 (14%).

135.0 lb. x .14 = 18.9 lb. of fat

The athlete's LBW is calculated by subtracting fat weight from total body weight.

135.0 lb. - 18.9 lb. (fat weight) = 116.1 lb. (LBW)

To calculate his minimal competitive weight (which is at least 5% body fat), divide his LBW by .95 (95% lean weight).

Minimal Competitive Weight = 116.10/0.95 = 122.21 lb.

A 115 lb. female athlete has 12% body fat. To determine her fat weight, multiply her total body weight by .12 (12%).

115 lb. x .12 = 13.8 lb. of fat

The athlete's LBW is calculated by subtracting fat weight from total body weight.

115.0 lb - 13.8 lb. (fat weight) = 101.20 lb. (LBW)

To calculate her minimal competitive weight (which is not less than 8% body fat), divide her LBW by .92.

Minimal Competitive Weight = 101.20/0.92 = 110.00 lb.

VII. Nutrition and Injury Recovery. Proper nutrition is vital to tissue healing and recovery.

A. Weight gain that results from forced inactivity often is a major concern of the injured athlete.

1. If possible, athletes should be encouraged to engage in some form of alternative activity. For example, _____ _____ (Slide 26).

2. _____ _____ (Slide 26).

VIII. Supplements and Ergogenic Aids. _____ (Slide 27) are popular among athletes of all ages and categories. Many athletes believe supplements will help them achieve goals of being bigger, stronger, and faster than their competitors, and as a result, they spend significant amounts of money on these products.

A. Supplements may be referred to as ergogenic aids. An **ergogenic aid** has the potential to increase an athlete's work output.

B. Table 6.2 on page 79 shows examples of ergogenic aids, indicates perceived benefits and potential adverse effects of taking the product, and classifies the aid _____ _____ (Slide 27).

1. Although the FDA banned the stimulant ephedra, the supplement, which is often combined with caffeine, is available illegally. Ephedra use has been suspected in the deaths of athletes.

2. Testosterone precursors such as androstenedione (andro) and DHEA are popular as a method of increasing muscle bulk. Use of these drugs, however, can lower the body's testosterone production. In females, using an estrogen inhibitor along with testosterone precursors can lead to an increase in male characteristics.

3. Athletes may take creatine to increase energy. The substance is naturally found in cells and helps convert ADP to ATP. Some studies support the use of creatine for enhancing energy; other studies do not show any positive effects for athletes. _____ _____ (Slide 28). Adverse effects can include kidney damage, fluid retention, and diarrhea.

4. Amino acids and β-hydroxy-β-methylbutyrate (HMB) are marketed for building and repairing muscle, but these compounds have not been shown scientifically to be useful for such purposes. A well-balanced diet provides the amino acids that most people need. Athletes are encouraged to eat more food during training and conditioning to obtain amino acids.

5. Herbals can have stimulatory or relaxation effects. Combining herbs with OTC or prescription drugs can reduce or enhance the action of both the herb and the drug in the body.

6. Although physicians can legally use anabolic steroids to heal muscle damage, athletes illegally obtain and use anabolic steroids to build large muscles. Improper use of anabolic steroids can damage the body.

7. Erythropoietin (EPO) is produced by the kidneys to stimulate red blood cell production. Endurance athletes may take this drug to increase their number of circulating red blood cells so they can compete longer. If too many red blood cells form, heart failure and death can result.

8. Stimulants increase a person's energy level when they are tired. Taking ephedra, caffeine, or prescription stimulants can result in heat injury or fatigue problems for athletes.

9. Gammahydroxybutyrate (GHB) is an illegal substance also called "date rape drug" that induces the deep sleep phase of the sleep cycle sooner than when the drug is not taken. Human growth hormone is released during the deep sleep phase; this hormone stimulates muscle growth. GHB, however, can be lethal, and its use should be discouraged.