Nutrition for the Adolescent Female Cross Country Runner

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Abstract

Scientific understanding of sports nutrition for the adolescent athlete is lagging behind the growing number of adolescent athletes engaged in sports. The potential consequences of inadequate energy and nutrient intake for young female athletes include: poor bone health, fatigue, injuries, menstrual dysfunction, and poor performance. Self-reported dietary records of young female athletes indicate that energy, carbohydrate, and select micronutrient intake may be marginal or inadequate. Adolescent athletes are in an insulin resistant stage during certain periods of maturation (i) different glycolytic and metabolic responses during exercise (ii) a tendency for higher fat oxidation during exercise and (iii) different heat dissipation mechanisms relative to adults. There are also concerns about the possible negative effects of intense training with suboptimal energy balance and nutrient intakes. For some female athletes the pressure to achieve and maintain a low body weight leads to potentially harmful patterns of restrictive eating or chronic dieting. Accordingly, the adolescent female athlete requires different nutritional advice about energy balance for training and competition than do adult athletes. This paper addresses sports nutrition for the adolescent female athlete, taking into account differences in carbohydrate intake and metabolism from the adult athlete and concerns about body image.

Keywords: Energy intake, energy expenditure, anorexia athletica, supplements, health

Introduction

Inadequate dietary intake is the primary nutritional concern regarding the adolescent female cross country runner (the "AFCCR"). Proper nutrition for young athletes is critical not only to their athletic success, but also and more importantly to their growth, development and overall health. Inadequate nutrient intake deprives the body of the energy needed to perform an event, the carbohydrates necessary for glycogen replacement, the protein needed for tissue building and repair, and the micronutrients necessary for normal metabolism and maintenance of body homeostasis (Beals & Manore 1994). The nutrients required for the physically active adolescent female are the same as for women in the general population, but physical activity does influence the amount of specific nutrients required and the optimal timing of their intake.

Young athletes not only need to meet the demands of daily living and physical training, but they also need energy to support growth and development, cope with competition related stress (physical, mental and emotional), enhance recovery from injury, and maintain normal menstrual status (Burke 2007; Rogol et al. 2000). Unfortunately, in order to achieve a desired weight, young female athletes often adhere to diets that result in lower nutrient intake than generally recommended (Thompson 1998;
Martin 1973).

The lack of sound nutritional practices has been stressed by coaches for the AFCCR. Studies have found that dietary practices of young female athletes fail to meet the energy requirements for high performance (Schmalz 1993) and that the AFCCR is at a higher risk for injury and recurrence of injury than adolescent male cross country runners (Rauh et al. 2000). Clearly, nutrition is a very important aspect of cross country running and knowledge of nutritional issues should be one of the main factors influencing dietary habits and food choices (Wiita & Stombaugh 1996; Burke 1995; Perron & Endres

1985). Burke (1999) reported poor knowledge of nutritional issues and bad nutritional practices in many athletes, while other studies have shown poor nutrition resulting from a desire to maintain a specified weight (Brownell et al. 1987). Age, race, climate, and cultural background also influence the nutrition and dietary practices of young female athletes.

The objective of this paper is to examine the nutritional requirements for the average to elite level AFCCR and suggest nutritional guidelines/practices for the AFCCR that will reduce the likelihood of injury, optimize performance and lead to a healthier lifestyle.

History

In the early 1960s, the International Amateur Athletic Federation allowed women to participate in cross country running for the first time. Today, cross country running is the longest distance covered by a male or female in high school athletics. Distances are generally standardized, but courses vary in composition and degree of difficulty. In secondary high schools in California, the standard male and female distance for varsity and junior varsity level is 3.0 miles (although in some states athletes compete at 3.1 miles).

Surprisingly, many of today's dietary recommendations remain similar to those used in the pre-1960s era. The first published dietary guidelines were written in 1894 by W.O. Atwater. Atwater (1894) initiated the scientific basis for connecting food composition, dietary intake, and health, and emphasized the importance of variety, proportion, and moderation in healthful eating (Davis & Saltos 1998). It is also worth mentioning that at this time specific vitamins and minerals had not yet been discovered. Atwater's vision was very similar to today's thinking on nutrition. In 1902 Atwater stated: *"Unless care is exercised in selecting food, a diet may result which is one-sided or badly balanced-that is, one in which either protein or fuel ingredients (carbohydrate and fat) are provided in excess….The evils of overeating may not be felt at once, but sooner or later they are sure to appear-perhaps in an excessive amount of fatty tissue, perhaps in general debility, perhaps in actual disease."* (Atwater 1902).

By the 1950s, nutritional guidelines moved to four food groups know as the "Basic Four" with the focus on getting sufficient nutrients. This concept regarding nutrition was widely used for the next two decades. In the early 1980s, the development of the doubly labeled water (DLW) technique made it possible to determine the validity of dietary assessment methods using external, independent markers of intake in free-living populations (Hill 2001). During the 1990s, the Food Guide Pyramid was released. The pyramid conveyed key concepts regarding variety, proportionality, and moderation (Atwater's words repeated ten decades later).

Over the past 20 years, research has clearly documented the beneficial effect of nutrition on athletic performance. However, in spite of these achievements, very few studies have been conducted on the female athlete and, to an even lesser extent, on the adolescent female athlete. Specific research is needed in this area, since conclusions based on the study of adult or male adolescent endurance runners cannot legitimately be applied to the AFCCR because of her markedly different physiological and hormonal profile. Research shortcomings have lead to controversy in the literature regarding the immediate and long term effects of energy imbalance in the adolescent female runner. Clearly, there is need for more thorough studies of energy balance in adolescent female athletes so that appropriate dietary recommendations can be made. Table 1 shows the energy expenditure of female adolescents using the doubly labeled water method (Black et al. 1996).

Table 1. Energy Expenditure of Adolescent Females using the Doubly Labeled Water Method

Subjects Females	Age (years)	Height (cm)	Weight (kg)	TDEE (kcal/day)	TDEE Kcal/kg	Times BMR
N=11	15-18	161	60.6	2,468	40.9	1.81

Data from Black et al. Human energy expenditure in affluent societies: An analysis of 574 doubly-labeled water measurements. Eur. J. Clin. Nutr. 50:72:92, 1996

Typical Training Patterns in the Sport

The demands of the sport can be extremely challenging for the AFCCR and, like many other athletes in high school, the AFCCR needs to balance a wide range of priorities, including her athletic training, academic requirements and social life.

A high school cross-country season can typically extend for a period of five to six months. Pre-season training begins in July. Weekly mileage during the season can range from 30-50 miles depending on the fitness level of the athlete. The general training schedule for the AFCCR is six days a week and can also include double workouts on certain days. The racing schedule starts in September and ends with the national championships in December (usually only the elite athletes will advance to this level of competition). Athletes can race every week for an entire competitive season and on many occasions race twice in the same week (Murphy unpublished data 2008). Because of the length and intensity of the schedule for the AFCCR, nutrition is critical. The nutritional requirement of the AFCCR is influenced by the demands of her training schedule, competition and her age. Only one study (Eisenmann & Wickel 2007) has estimated the energy expenditure of the AFCCR. Table 2 gives descriptive statistics for estimated energy expenditure from this study.

Table 2. Descriptive Statistics for Estimated Energy Expenditure of Adolescent Distance Runners, Mean (SD), Minimum and Maximum.

P<0.05	Female
Total energy expenditure kcal/kg/d	51.0 (9.8), 41.6-68.3
Total energy expenditure, kcal/d	2467 (425.6), 1843-3050
Activity energy expenditure, kcal/kg/d	21.0 (8.8) 12.5-36.5
Activity energy expenditure, kcal/d	977.0 (269.4) 623-1489

Data: Eisenmann J, & Wickel E. Estimated Energy Expenditure and Physical Activity Patterns of Adolescent Distance Runners. International Journal of Sports Nutrition and Exercise Metabolism; 2007,17,178-188

Energy Balance for the AFCCR

Energy balance for the AFCCR is the amount of energy the athlete consumes (food calories) necessary to balance the amount of energy she expends (activity). The American Dietetic Association has stated (1996) that adequate energy intake during adolescence is vital to support normal growth as well as provide for the extra energy needs of training. However, due to the deficiency in age specific information for young athletes (Giovannini et al. 2000), nutritional recommendations given to the

AFCCR and other young athletes are based on adult findings. Adolescent females require approximately 2200 calories/day; additional intake requirements include fat, calcium, iron, zinc, vitamins, and fiber (Wahl 1999; Allen & Overbaugh 1994). The AFCCR, who is engaged in heavy training, will have higher energy and nutritional requirements than her non-active counterpart (Steiger & Williams 2007). Total energy intake must be sufficient to offset the energy expended during athletic training and performance (Loucks 2004; Bergen-Ciso & Short 1992). Recommendations from the United States Department of Agricultural (USDA) have stated an individual needs 15–26 servings of a variety of foods each day. Table 3 shows the daily food group servings for adequate intake of macro/micronutrients (USDA 2007).

Table 3. United States Department of Agricultural (USDA). Daily Food Group Servings

Group	Servings
Fats, oils & sweets	use sparingly
Milk, yogurt & cheese	2-3
Meat, poultry, fish, beans and nuts	2-3
Fruits	2-4
Vegetables	3-5
Bread, cereal, rice, grains	6-11

Young female athletes spend a great deal of their time and effort maintaining and manipulating energy balance. Manipulating energy balance has extremely important implications for the AFCCR that effect not only her body weight, but also her proportion of fat mass and fat-free mass, carbohydrate stores, bone health, vitamin and minerals status, and menstrual status (Manore 1999). If young athletes are in negative energy balance, chronic under-nutrition may result, leading to compromised skeletal growth and delayed maturation (Malina 1994). Table 4 shows the recommended dietary allowances (RDA) for energy and protein intake for young women (moderately active). However, Friedman (1989) reported that young female athletes have protein needs as high as two times the current RDA for protein.

Table 4. The Recommended Dietary Allowance (RDA) for Energy & Protein in Young Women

Group	Age	Energy intake (kcal/kg/BW/day	Protein (g/kg/BW/day
Females	15-18	40	0.8

How Do We Estimate Energy Balance for the AFCCR?

There are a number of techniques used to estimate the energy balance of any given individual. The most accurate methods are nitrogen balance and doubly labeled water. Assessing energy intake can also be done by using dietary recalls/records and comparing these to the energy expenditure of the athlete through activity diaries or questionnaires (a technique commonly used in the field). However, while self-reported data are easy to obtain and analyze, they have a high possibility of error, which may limit the accuracy of the results. Energy balance for the AFCCR can also be assured by measuring her body weight. A stable body weight over time indicates that she is in a state of energy balance. If energy intake is greater than energy expenditure, the AFCCR is in a state of positive energy balance, which will result in weight gain. If energy intake is less than energy expenditure, the AFCCR is in a state of negative energy balance, which will result in weight loss. To enhance the growth and development of the AFCCR, a neutral or positive energy balance is the desirable state.

Common Nutritional Problems that Arise in the AFCCR

AFCCRs have been identified as a group to be at increased risk for eating disorders and associated co-morbidities (i.e., the female athlete triad), (ACSM 2007; Eisenmann & Wickel 2007). Intense training during adolescence combined with poor nutrition can have negative effects on skeletal growth and maturation (Malina & Bouchard 1991) and lead to alterations in hormone levels affecting reproductive function and metabolism (Nichols et al 2007). For some female athletes, the pressure to achieve and maintain a low body weight leads to potentially harmful patterns of restrictive eating or chronic dieting (AAP 2000; Monore 1999; Houtkooper 1999). Bass & Inge (2006) stated that some individuals may be more at risk of attenuated growth patterns than others. Therefore, the growth and maturation of young athletes should be monitored to identify those individuals, who are at risk, especially those with severe and prolonged energy-restricted diets who are participating in long-term intense training programs. Feicht et al (1978) also reported that in female distance runners, the degree of amenorrhea appeared to correlate with the number of miles run per week.

For some AFCCR's a low body weight is thought to confer a competitive advantage, which may lead to an unhealthy focus on weight. Some of these young women may eventually be diagnosed with a clinical eating disorder, such as anorexia or bulimia nervosa (Baer & Taper 1992). A high proportion of female athletes suffer from pathological eating behaviors and there is an overlap between many features of anorexic patients and highly active female athletes (Constantini & Warren 1994). Anorexia athletica, which involves an intense fear of gaining weight even though the athlete is underweight (typically $\geq$5% less than expected normal weight for her age and height), has become a common disease in female athletes (Beals & Monore 2000). This low weight level is accomplished by a reduction in total energy intake (<1,200 kcal/day), excessive exercising, or both (Beals & Manore 1994). Bingeing, self-induced vomiting, or the use of laxatives or diuretics (in some cases all three) have also been reported by athletes diagnosed with anorexia athletica.

Studies measuring energy intake of female athletes frequently report caloric intakes well below energy expenditure. Mulligan & Butterfield (1990) found that female distance runners, averaging 50km per week, had energy intakes similar to those of female non-runners, yet their energy expenditure was significantly higher than that of the non-runners.

To deal with low body weight/fat in the AFCCR, we need to conduct matters on a one-on-one basis by setting specific goals for each individual athlete. We should track energy availability over a period of time to determine whether energy intake is sufficient to sustain good health in light of energy expenditure. Energy availability = total energy – energy cost of training/competition (ideally this should be > 30 kcal/kg FFM/day).

Example: Adolescent female cross country runner

50 kg, 14% body fat = 43 kg fat free mass.

30 kcal/kg FFM = 1290 kcal (5.4 MJ)

Training = 7 miles/day = 595 kcal/d (85 calories per mile)

Total energy needs = 1885 kcal (8 MJ) Using these guidelines, energy availability should be calculated over time against the energy cost of the daily training schedule of the AFCCR.

Iron Status for the AFCCR

Adolescent endurance athletes may be at risk of iron depletion (Ilich-Ernst 1998; Nickerson et al. 1989). The three main causes of iron deficiency in endurance athletes are; a high iron turnover (based on the physiological demands of cross country), nutrition (maintaining an energy balance with adequate intakes of vitamins and minerals), and high carbohydrate diets (may be high in compounds that inhibit iron absorption). For female runners, sweat iron loss coupled with a low dietary iron intake may result in a negative iron balance (Lamanca et al. 1988). Deakin (2006) stated that a mild depletion in tissue iron status may reduce endurance performance capacity and aerobic efficiency. Plowman & McSwegin (1981) stated that female cross-country runners have a high incidence of iron deficiency that is associated with initially decreased iron stores. Iron deficiency is defined as a serum ferritin level ≤12 ng/ml and a transferrin saturation of ≤16% occurring simultaneously (Nickerson et al 1989). However, Malczewska et al (2000) stated that higher intakes of iron and of nutrients affecting iron metabolism were capable of compensating for possible exercise-induced iron losses.

Because exercise itself alters many of the measures of iron status due to changes in plasma volume or the acute phase response to stress, it is sometimes hard to distinguish between true iron deficiency and the normal effects of strenuous training or competition (Petrie et al. 2004; Frederickson et al. 1983). Early detection of depleted iron stores is critical for the AFCCR as recovery from these conditions can take months. The diet that an AFCCR can follow for the treatment and prevention of iron deficiency is:

Eat iron-rich plant food every day (iron fortified cereal, bread, green leafy vegetables)

Eat lean red meat 3-4 times per week (veal, beef, lamb)

Combine plant foods with food rich in vitamin C and/or meat

Avoid consumption of coffee and strong tea with foods rich in non-haem iron

Analysis of the Physiological Requirements of Training/Competition

Training and competing in cross country will change the acute nutrient needs of the adolescent female. Adequate fluid intake to ensure the replacement of water and minerals (electrolytes) lost through exercise is highly important to the AFCCR. Overall energy needs also increase because of the elevated energy expenditure with a cross country program. Arguably, carbohydrates are the recommended source of energy needs from intense training, although research has yet to be done to show performance benefits in young athletes on a high-carbohydrate diet (Petrie et al. 2004). In the majority of sports, an increased intake of food naturally occurs to accommodate the day-to-day nutritional needs of young athletes and young competitors typically come closer to meeting their requirements for micronutrients than do non-athletes. The role of the nutritional regimen of the AFCCR is to supply her with the fuel and nutrients needed to optimize the adaptations achieved during her training and to ensure recovery between workouts (Burke 2006). The AFCCR's energy requirements are influenced by the energy expenditure of her training load (intensity, frequency and duration) along with her body size, growth and pursuit of weight loss/gain. Specific nutritional strategies for the AFCCR are: carbohydrates >5g/kg/body weight/day to fuel her training and racing; CHO intake ranges of 5 to 7 g/kg/day for general training needs and 7 to 10 g/kg/day for the increased needs of endurance athletes (Burke et al. 2001), fluid and electrolyte consumption of 1.2-1.5 liters for each kg of weight lost for adequate hydration and sodium balance, protein intakes of 1.2-1.4g/kg/body weight/day for repair and adaptation, and carbohydrates and micronutrients (fruits & vegetables) to enhance her immune system (ACSM 2000).

Athletes are advised to enhance their recovery by consuming carbohydrates as soon as possible after completion of a workout/competition. According to Burke et al. (2004), nutritional surveys indicate a slight increase in carbohydrate consumption in the last decade with the average carbohydrate intake of the female athlete equal to approximately 5.8 g/kg/body weight. The highest rates of muscle glycogen storage occur during the first hour after exercise (Ivy et al. 1988). In 2000, The American College of Sports Medicine stated that the optimal glycogen storage is achieved when 1-1.5g of carbohydrates are consumed every hour in the early stages of recovery.

To ensure that fluid balance is achieved, athletes need to consume about 150% of their post-exercise fluid loss over the first 4-6 hours of recovery (Shirreffs et al. 1996; Maughan et al. 1996). Spacing fluid intake over several hours after exercise has been shown to be more effective in restoring fluid balance (because of lower urine losses) than consuming fluid as a large bolus immediately after exercise (Shirreffs & Maughan 2000). The optimal sodium level in a re-hydration drink has been measured at 50-80 mmol/L (Maughan & Leiper 1995).

Due to the fact that adolescents are at a high risk of heat stress during exercise, it is essential that the AFCCR practice appropriate prevention strategies, including fluid replacement during training and competition. Sweat rate, access to fluid, opportunities for drinking, and risks of gastrointestinal discomfort are important factors that the AFCCR needs to take into consideration in her fluid replacement strategy.

Nutritional Strategies, Before, During and After Competition

Promoting Optimum Performance

Carbohydrates are the key energy-providing nutrient that must be optimized during the days leading up to and including the day of competition (IOC 2003). Low carbohydrate intake can result in inadequate glycogen stores, premature fatigue and possible utilization of the body's protein stores for energy. Gleeson et al. (2004) stated that exercising in a carbohydrate-depleted state causes athletes to experience larger increases in circulating stress hormones and a greater perturbation of several immune function indices.

How much to eat, what type of food and when to eat are questions we need to address. Keeping in mind the short duration of a cross country race (<30 minutes), carbo-loading is not required. However, it is important that each athlete has adequate fuel stored in the muscles (muscle glycogen) and adequate hydration to optimize her performance. Therefore, the athlete should drink sufficient fluid with meals on the day before the competition to ensure adequate hydration on the morning or afternoon of her race. The AFCCR should not refrain from drinking water or carbohydrate-containing fluids during the hours (1-6 hrs) leading up to her warm-up. Eating 1-4 g/ kg body weight of carbohydrate during the 6-h period is sufficient (IOC 2003). One of the main 'mistakes' an AFCCR may make is to eat too little carbohydrate (less than 1 g CHO /kg body weight) during the 1-6 h period before her race. An AFCCR's goal is to find her favorite pre-competition meal that will provide her with the extra energy needed during her event; feels right in terms of curbing her hunger and is convenient as well as practical. A variety of food is required to promote optimum recovery. Examples of the type of foods an AFCCR can eat in preparation for competition are as follows. Each provides 140 g CHO in a pre-competition meal (2.8 g/kg for a 50 kg person).

2.5 cups breakfast cereal + milk + large banana

Large bread roll or 3 slices bread + honey or jelly spread

2 cups boiled rice + 2 slices bread or muffin

4 stack pancakes + syrup or cup of fresh fruit

60 g sports bar + 500 ml liquid meal

Attention should also be given to optimizing water and salt levels in the AFCCR's body. It is recommended that approximately 400-700 ml of fluids be ingested during the 60-90 minute period before the start of the event (IOC 2003). This will allow the athlete sufficient time for using the restrooms. Fluid is not usually consumed during the race; however, athletes often benefit by drinking 300-600 ml of fluid during the 15 minute period immediately before the start of the race. Once the race is completed, it is important for the athlete to refuel as soon as possible. A carbohydrate drink/ electrolytes and/or some water soluble fruit are appropriate and easy on the digestive system. When the athlete's stomach has settled, she can then begin to eat more solid foods to replenish her glycogen stores and repair muscle damage. Maughan et al. (1996) reported that post-exercise fluid replacement can be achieved by ingestion of water if consumed in sufficient volume together with a meal providing significant amounts of electrolytes.

Supplements and Ergogenic Aids which may Promote Optimum Performance

Limited research has been conducted on the use of supplements by adolescent athletes; however, the current literature reveals that the most frequently used supplements are vitamins and minerals. Health and illness prevention may be the main reason many people take supplements; however enhancing athletic performance has also been reported as a strong motivational factor (Massad et al. 1995). Females have been found to use supplements more frequently then men (McDowall 2007). Maughan et al. (2004) has stated that a balanced diet with adequate calories can potentially provide the necessary nutrients. Maughan et al. (2004) also reported that not all athletes are able to consume a diet that meets their nutritional needs (e.g., busy schedule, competition, traveling) and thus resort to nutritional supplements with the intention of preventing deficiencies and even enhancing performance.

The most common nutrient deficiencies in adolescent female runners are calcium, which is critical for growth, maintenance of bone mass and muscle contraction; iron which maximizes oxygen-carrying capacity and decreases the likelihood of anemia; vitamin B6, which enhances amino acid synthesis and the production of red blood cells; and folate and zinc, which enhance cell growth and repair (Manore 2002). For vegetarian adolescents, nutritional risks include lack of iodine, vitamin B12, vitamin D, and some essential fatty acids (Nieman 1999). Supplements should only be used when the athlete has been clinically diagnosed as deficient in a particular vitamin and/or mineral. A common mistake made by athletes is to self diagnose which may lead to over-loading on a certain vitamin/mineral with potentially serious repercussions. Eating a nutrient dense diet should provide the AFCCR with all her vitamin and mineral needs.

Utilizing a sports drink before, during and after training/competition may enhance the performance of the AFCCR. Sports drinks may help keep the athlete hydrated and also provide her with the extra calories and electrolytes to sustain and/or recover from her workout or race. Currently, the use and recommendation of ergogenic aids to athletes is controversial. While some health care professionals discourage their use, others suggest they be used with caution. Athletes should carefully examine the product for safety, efficacy, potency, and legality (ACSM et al. 2000).

Summary

The objective of this review was to examine the nutritional requirements for the AFCCR. Guidelines have been suggested in the maintenance of energy balance for the AFCCR that will reduce her likelihood of injury, optimize her performance and empower her in living a healthier lifestyle.

In summary, there is to date a lack of sound nutritional practice and information for the AFCCR. Clearly, nutrition is of primary importance for the cross country runner, and particularly for the AFCCR in light of her desire for weight control and her requirements for (good/proper) nutrition which supports her training and competition schedule. My coaching experience over the past seventeen years confirms that many young athletes have inadequate intakes of various nutrients. This statement is supported by the high incidence of eating disorders, weight control techniques, menstrual dysfunction, injuries and poor performance of young female athletes. Sadly, however, many of the assessment tools used today are not sufficiently accurate to measure the true prevalence of nutritional deficiencies in the young athletes.

Coaches need to be better informed in working with athletes who are at risk for energy imbalance problems. As a brief guideline, coaches may want to examine and share appendix A with their athletes. The AFCCR is influenced by the opinions, suggestions, and actions of her peers, coaches and parents and needs to be strongly educated about the importance of nutrition for optimizing health and performance.

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Appendix A

Meal Planning

Breakfast: 1-2 items from each column of "Morning Carbs". Example: banana, cereal, milk, toast and orange juice (598kcal).

Lunch: 1-2 items from each column of "Lunch & Dinner Carbs" plus one choice from "Lunch & Dinner Proteins." Example: brown rice, broccoli, carrots, mushrooms, chicken and milk (532kcal).

Dinner: 1-2 items from each column of "Lunch & Dinner Carbs" plus one choice from "Lunch & Dinner Proteins." Example: pasta, asparagus, spinach, tomato, salmon and smoothie (663kcal)

Morning Carbs

Column 1	*Column 2*	*Column 3*
strawberries	dry cereal (whole grain)	water
raspberries	oat meal	orange juice
blueberries	cream of wheat	grape juice
bananas	pancakes (whole grain)	nonfat milk
honeydew	waffles (whole grain)	smoothie
cantaloupe	toast (whole grain)	Tea
watermelon	bagels (whole grain)	coffee

Lunch & Dinner Carbs

Column 1	*Column 2*	*Column 3*
potato	asparagus	tomatoes
sweet potato	spinach	mushrooms
yams	broccoli	cauliflower
brown rice	brussel sprouts	carrots
pasta	peas	corn
noodles	green beans	onions
soup (vegetable)	cabbage	squash

Lunch & Dinner Proteins

Column 1	*Column 2*	*Column 3*
salmon	turkey (breast)	soybeans
tuna	chicken (breast)	beans (all)
sea bass	beef (extra lean)	lentils
scallops	veal	rice & beans
snapper		eggs (white)
cod		yogurt
shrimp		dairy products

Snack Foods

Column 1	*Column 2*	*Column 3*
apple	yogurt(non fat)	liquid meals
grapes	pretzels (fat free)	sport drinks
peaches	popcorn	energy bars
Pear	nuts	gels