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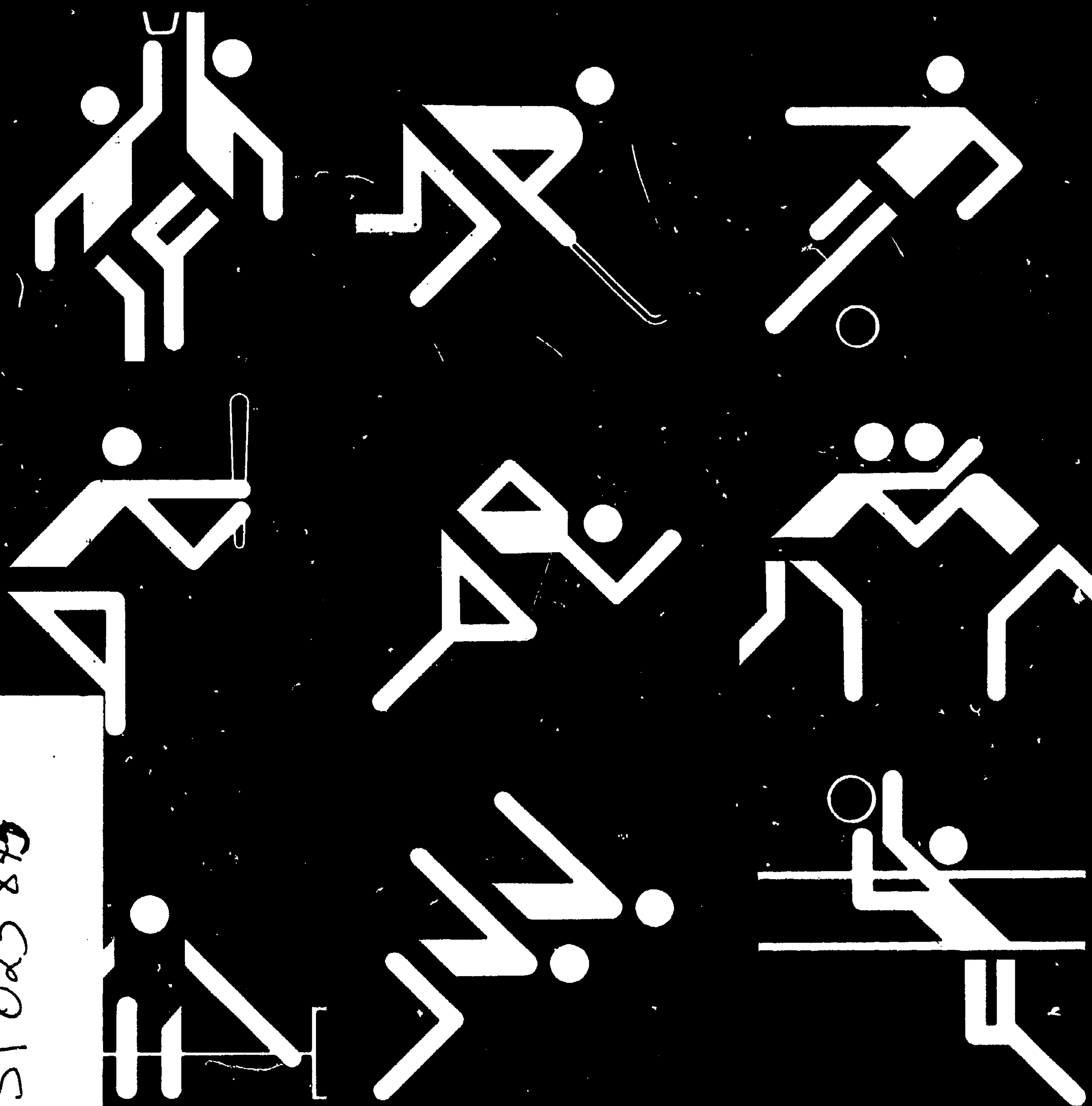
ABSTRACT

This guidebook presents basic facts about nutrition, focusing upon the nutritional needs of athletes. Information is given on: (1) the importance of water, salt and other electrolytes, and treating and preventing heat disorders; (2) nutrition for training and performance, the best diet, caloric and energy requirements for various and specific sports, carbohydrates, protein, fats, vitamins and minerals, dietary excesses and changes, and carbohydrate loading; (3) achieving competitive weight, body composition: fat vs. lean, bulking up, slimming down, making weight; (4) supplements and drugs, proteins, vitamins and minerals, non-nutritive substances, steroids, alcohol, mood modifiers, tranquilizers, and antihistamines; (5) eating and athletic meals, pregame meals, training and conditioning sessions, intermittent competition, and long-term competition; (6) new life style diets, eating out, and vegetarian diets; and (7) health problems, the athlete with a chronic health condition, diabetes mellitus, convulsive disorders (epilepsy) and heart conditions, lung disorders, nutrition-related health problems in sports, and menstrual disorders. A glossary of terms and suggested readings are included. (JD)

NUTRITION



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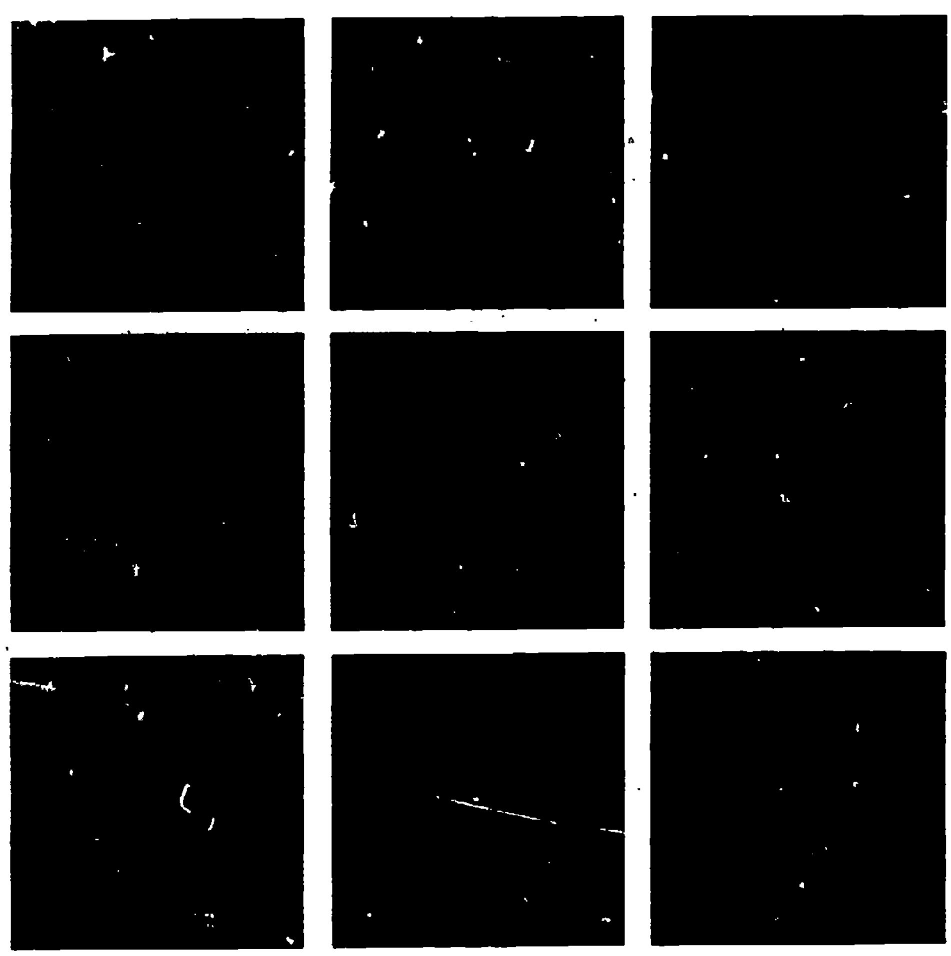
NUTRITION FOR SPORT SUCCESS



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Preface

An expert Advisory Committee appointed by The Nutrition Foundation and the National Association for Sport and Physical Education was convened by The Nutrition Foundation to review the scientific knowledge, public understanding and/or lack of understanding and evident misinformation concerning nutrition, food and athletic performance. The Advisory Committee also examined existing sources of information available to coaches and participants and designed the subject matter and direct information in this book to provide a practical and scientifically and medically sound guide.

Members of the Advisory Committee prepared scientific background summaries on subjects in their areas of expertise. These summaries have been edited and redrafted by the Editorial Committee, read and criticized by coaches, nutritionists, physicians and others and reviewed by members of the Advisory Comitttee.

The sound information and guidance contained in the book is due to the excellent counsel provided by the Advisory Committee and to them we are most grateful.

National Association for Sport and Physical Education

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Introduction

Food, the Fuel of Performance

Good performance doesn't just happen. It requires knowledge to interweave many factors. Good nutrition is one of the more important factors, but less frequently understood and applied. The better the athletes and the faster the competition, the more important is the individual's nutritive state. For the last "split second," that last 2.5 centimeters, or the late game super effort in performance — good nutrition can make the difference.

Scientists who understand athletic training and performance, nutritionists who understand the food-fuel needs of athletes and educators who know how to transfer information from one group to another have combined forces to produce this book, *Nutrition for Sport Success.*

The state of optimum nutrition is not achieved by the pregame meal or even the eating pattern followed during the last few days before the contest. Optimum nutrition is the result of longstanding food habits. It is easily gained by following the principles and applying the facts presented in this book. The dietary habits that are recommended for good athletic performance are also good for lifetime health and longevity.

The first rule is that there is no magic food or set of foods that will correct inadequacies in training or ability, but, among comparable athletes, the individual's knowledge and practice of good nutrition can be the factor that determines the winner.

Food consists of all the solid or liquid materials we ingest by mouth, except drugs. Thus, all beverages, even plain water, as well as bread, meat, vegetables and fruits should be considered as food. All are sources of something essential in the body's metabolism — energy (calories), carbohydrate, protein (amino acids), fat (essential fatty acids), vitamins, salts (electrolytes), minerals, trace elements and water. Adequate intake is absolutely necessary to good health. Water constitutes more than half of the body weight. Water provides the medium within which chemical (metabolic) reactions occur in cells It is a source of ions for chemical reactions, and controls physiological distribution among cells and different compartments in the body (within and out of vessels and cells). It also preserves the physiological distribution among cells and different compartments in the body (within and out of vessels and cells). It also preserves the physiologic functioning of cells and organs (heart, muscles, blood vessels, kidneys, gastrointestinal tract).

This book is designed to give you the facts and to suggest ways to use them. Here are the Basics — stick with them.

1. Eat a variety of foods every day in proper amounts to maintain designed weight.
2. Be aware of the vital role of water. Drink 6-8 glasses of water daily — more when exercising in hot weather.
3. Select foods in portions so that carbohydrates, fats and proteins are approximately the proportions indicated in this book.

How to Make a Champion

The great physician Sir William Osler said it best:

> There is a master word that makes a champion a winner. For a little one, the master word looms large indeed. It is the open sesame to every portal. The great equalizer in the world. True philosopher's stone which transmutes all the base metal of humanity into pure gold — The stupid it will make bright; the bright brilliant, and brilliant steady. To youth it brings hope and accomplishments, to the middle-aged, confidence, to the aged, repose. It is directly responsible for all the advancements in medicine and sports in the past 50 years. Not only has it been touchstone of progress there, but it is the measure of success in every day life.
>
> And the master word is "WORK."

Water

TABLE 1
Expected Weight Loss (In Pounds) During a 90-Minute Practice For a 180-210 lb. Athlete[1,2]

DEGREES F	80-100% HUMIDITY	60-80% HUMIDITY	40-60% HUMIDITY	BELOW 40% HUMIDITY
100	**7½ - 8**	**7 - 7½**	**6½ - 7**	**5½ - 6½**
95	7 - 7½	6½ - 7	6 - 6½	5 - 6
90	**6½ - 7**	**6 - 6½**	**5½ - 6**	**4½ - 5½**
85	6 - 6½	5½ - 6	5 - 5½	4 - 5
80	**5½ - 6**	**5 - 5½**	**4½ - 5**	**3½ - 4½**
75	5 - 5½	4½ - 5	4 - 4½	3 - 4
70	**4½ - 5**	**4 - 4½**	**3½ - 4**	**2½ - 3½**
65	4 - 4½	3½ - 4	3 - 3½	2 - 3
60 or less	**1 - 3**	**½ - 2½**	**0 - 2**	**0 - 1½**

[1]The rate of water loss varies with practice time, less for shorter periods and greater for longer periods. Add or subtract 10% from expected figures for weights above or below range shown. If the athlete is performing or practicing in cool or cold water (swimming, water polo, etc.), the above figures are not applicable.

[2]Adapted from *Man, Sweat and Performance*, Becton, Dickinson and Company, 1969.

WATER REPLACEMENT

Amount of Weight Lost	Amount of Water Needed to Replace Loss
1 Pound	Two 8 oz. glasses
4 Pounds	Eight 8 oz. glasses
8 Pounds	Sixteen 8 oz. glasses

Salt and Other Electrolytes

One of the persistent myths of athletics is that salt tablets and/or electrolyte solutions are needed. Almost every training room has salt tablets available and many have electrolyte drinks as well. These not only are unnecessary, but also can be harmful. Salt tablets are irritating to the stomach and gut, can increase the danger of dehydration and may cause diarrhea which further contributes to dehydration. So, please, forget the salt tablets! The athlete's need is for water and lots of it.

Many "sports beverages" are promoted as sources of available sodium, potassium and sugar. Replacement needs for sodium and potassium can be met much better by eating a diet that includes a variety of foods and supplies these and other nutrients — including proper amounts of water. If the athlete uses any of the "sports beverages" or commercial preparations, they should be diluted with water to decrease the concentration of sugar and thus decrease the time the fluid stays in the stomach. Recommended dilutions are given below.

Heat Disorders

Heat stress occurs when the body's cooling mechanism can not keep up with heat production. It can be fatal. One of the major physiologic functions of water is its role in maintaining body temperature. When the athlete has plenty of water, the cooling mechanism can operate maximally. Our bodies are not too different from a car and its cooling system. When a car's cooling system is low on water, the engine overheats. It is the same with the human body whose cooling system also operates on water. Water moves from the gut to the blood vessels, from the blood vessels to the sweat glands, from the sweat glands to the skin where it evaporates, producing its cooling effect.

DILUTION FACTOR

The following replacement fluids should be diluted:

Fruit Juices	1 part juice: 3 parts water
Soft Drinks	1 part pop: 3 parts water
Vegetable Juices	1 part juice: 1 part water
Gatorade®	1 part drink: 1 part water
Pripps Pluss®	1 part drink: 3 parts water
Quickick® (orange flavor)	1 part drink: 3 parts water

But Remember—Water Is the Best Replacement Fluid

When body temperature rises excessively, performance deteriorates. If the body temperature continues to rise, heat exhaustion and heat stroke result. In either condition, the athlete will have elevated body temperature and may have flushing, cramps, headache,

If extra salt is needed, the best source is salt added to food.

rapid pulse, weakness and fainting. Don't waste time trying to distinguish between heat exhaustion and heat stroke. A heat disorder is acutely dangerous and must be treated as an emergency. Seven out of ten athletes suffering from heat stroke will die. When either condition is suspected, emergency treatment should be started immediately. Obviously, steps should be taken to prevent heat disorders and never permit the athlete to reach either stage.

Once heat problems are suspected, call for medical assistance immediately, but don't wait to start treatment. Cool the athlete as rapidly as possible; do so by placing him or her in a cold shower or a cold whirlpool bath. Remove the uniform at the earliest possible moment; if need be, cut it off after the athlete is in the whirlpool or under the shower. If conscious, the athlete should be encouraged to drink cold water. If the athlete fails to respond, continue to cool with ice packs, ice massage, ice applied to the neck (carotid arteries) or any means available to cool the body. Alert the nearest hospital and promptly take the athlete there.

PREVENTING HEAT DISORDERS

Drink Water before, during and after practice sessions and competition. Schedule rest and water breaks. Move to shade. Wear light, loose clothing that allows free circulation of air. Remove outer clothing when it gets wet — wet clothing reduces the skin's ability to cool.

Prevention

Heat exhaustion and stroke can be prevented. Don't hold events or practice sessions during the hottest part of the day. Light, loose clothing that allows free circulation of air should be worn. Insist that *rest* and *water* breaks be scheduled and adhered to.

Temperature and humidity conditions appropriate for different levels of exertion can be determined by the WBGT Index (Wet, Black Globe Temperature Index) or by using a psychrometer.

Other measures for preventing heat disorders include appropriate dress (leaving as much of the body as possible uncovered to maximize evaporation: net jerseys, cut-offs and low socks), limiting physical activity and monitoring nude weight before and after the event. The *most important* thing is to drink enough water *before* and *during* practice sessions and events (see **pages 1-2**). Cool, cold and even ice water can be taken by most people without any difficulty.

The American College of Sports Medicine's Position Statement gives additional information on prevention of heat injuries during distance running (see **pages 24-25**).

WET BULB TEMPERATURE GUIDE*

Under 60°	No precaution necessary.
61-65°F	Alert all participants, especially heavy weight losers, encourage fluids.
66-70°F	INSIST that appropriate amounts of water be taken.
71-75°F	Alter practice schedule to provide rest periods every 30 minutes, plus above precautions.
76°F and up	Practice in coolest part of the day — if at all. Schedule frequent rest breaks, force water intake and restrict clothing.

Whenever relative humidity is 97% or higher, greater precautions should be taken.

To measure the relative humidity of the atmosphere, a sling psychrometer is used on the athletic field at least twice during practice. Operation of the psychrometer depends upon the comparative readings of two similar thermometers, with the bulb of one kept wet so that it is cooled as a result of evaporation. It usually shows a reading lower than the dry-bulb thermometer. The difference between the two readings constitutes a measure of dryness or wetness of the surrounding air. The **relative humidity** (RH) is calculated from the difference between the dry- and wet-bulb readings. RH measures the percentage of moisture present as compared with the air's capacity to hold water at any given dry-bulb temperature; e.g., if a given volume of air can hold 100 grains of water and its actual content is only 70 grains, the RH is 70%.

*Adapted from Murphy, R. J. and Ashe, W. F.: JAMA, 194:180 (Nov 8) 1965.

TREATING HEAT DISORDERS

If a heat problem is suspected:

1. Cool the victim immediately by whatever means available:
   - Ice massage or ice packs, especially to the outsides of neck (carotid arteries), abdomen, groin, armpits, back of knees, bend of the elbow
   - cold shower
   - cold water to drink (if victim can drink)
   - fan
   - remove outer garments
2. While cooling the victim, send someone to call a physician
3. Get the victim to the hospital

Nutrition for Training and Performance

The Best Diet

The better the nutritional status of the athlete the better he/she is able to perform. But what constitutes good nutrition for an athlete? What is a good diet?

A good diet is one that provides adequate energy (calories) and all other nutrients (carbohydrate, protein, fat, vitamins, minerals, water) in the needed amounts. Adequate calorie (energy) intake is that level which allows the athlete to maintain ideal body weight. The calories should be provided by a variety of foods. No one food or beverage contains all of the nutrients in the amounts necessary to promote health. Eating a variety of foods and beverages ensures that all needed nutrients — carbohydrates, fats, protein, vitamins, minerals, water — are obtained. A *variety* means a wide range of foods from the protein group such as meat, poultry, fish, eggs, cheese, dried beans and peas, as well as several different kinds of fruits, vegetables, cereals and grains and milk products.

Sources of calories are an important consideration for the athlete. In general, the diet that provides the best performance for the athlete is a variety of foods providing 45-55% of the calories from carbohydrate, 12-15% of the calories from protein and 30-40% of the calories from fat. A meal of fried chicken, turnip greens and corn bread is as nutritious as a steak, salad and dinner roll. A tostado with beans, cheese and lettuce will supply the same nutrients as a cheeseburger and coleslaw. Variety is the key.

In addition to carbohydrates, fats and protein, another source of calories is alcohol. The subject of alcohol in athletics is discussed on p. 19. It should be noted here, however, that alcoholic beverages should not be consumed by young athletes. Any athlete of any age who wants to achieve a high level of performance must know the effects of alcohol use, both in the amount of time it takes to clear the body and the quantity that can be tolerated.

Caloric Requirements for Various Sports

The energy cost of a sport depends on the intensity of physical activity demanded, the length time of intense exertion (whether intermittent or continuous) and the total time of participation.

Almost any moderate sport can become one of high energy need if it is carried on intensively for a long time (for instance, the prolonged tennis match, or the extensive practice of the champion athlete).

Energy Requirements of Specific Sports

"How many calories will I use up if I run two miles?" is a frequently asked question. The truth of the matter is, there is no simple answer. it depends on how much the runner weighs, how fast the pace and whether running is uphill, downhill or on level ground. To give some idea of the *comparative* caloric requirements for various activities, Table 2 illustrates the number of calories burned per hour for two persons, one weighing 205 pounds and the other 125 pounds, each engaging in various types of sports.

SOURCES OF CALORIES IN THE DIET

Carbohydrate
Protein
Fat

TABLE 2
Approximate Calories Used Per Hour

ACTIVITY	205 LB. PERSON	125 LB. PERSON
Archery	420	268
Baseball—infield or outfield	382	234
—pitching	488	299
Basketball—moderate	575	352
—vigorous	807	495
Bicycling—on level, 5.5 mph	409	251
13.0 mph	877	537
Canoeing—4 mph	565	352
Dancing—moderate	341	209
—vigorous	464	284
Fencing—moderate	409	251
—vigorous	837	513
Football	678	416
Golf—twosome	443	271
—foursome	332	203
Handball or hardballl—vigorous	797	488
Horseback riding—walk	270	165
—trot	551	338
Motorcycling	297	182
Mountain Climbing	820	503
Rowing—pleasure	409	251
—rowing machine or sculling 20 strokes/min.	1116	684
Running— 5.5 mph	887	537
— 7 mph	1141	669
— 9 mph level	1269	777
— 9 mph 2.5% grade	1480	907
— 9 mph 4% grade	1564	959
—12 mph	1606	984
—in place 140 count/min.	1993	1222
Skating—moderate	465	285
—vigorous	837	513
Skiing—downhill	789	483
—level, 5 mph	956	586
Soccer	730	447
Squash	849	520
Swimming—backstroke - 20 yds./min.	316	194
- 40 yds./min.	682	418
—breaststroke - 20 yds./min.	392	241
- 40 yds./min.	786	482
—butterfly	956	586
—crawl - 20 yds./min.	392	241
- 50 yds./min.	869	532
—sidestroke	682	418
Tennis—moderate	565	347
—vigorous	797	488
Volleyball—moderate	465	285
—vigorous	797	489
Walking—2 mi./hr.	286	176
—110-120 paces/min.	425	260
—4.5 mph	540	331
—downstairs	544	333
—upstairs	1417	869
Water Skiing	638	391
Wrestling, Judo or Karate	1049	643

Carbohydrates

Carbohydrates (sugars and starches) are the most readily available source of food energy. Although this primary source of energy is very widely distributed in foods, it cannot be stored in large amounts by the body and, therefore, is an important part of the daily diet. Starches and all sugars are digested and broken down in the body to glucose, the simple sugar in the blood (hence, commonly called blood sugar). Glucose is used by the body cells, including those of the nervous system, to provide energy.

Significant food sources of starch are root vegetables (potatoes) and grains (wheat, oats, corn, rice) and grain products (breads, cereals, pastas). Dry beans and peas are also good sources of starch. All of these foods provide many other nutrients; for example, beans and peas are also good sources of protein and grain products contain proteins, some B vitamins, iron and fiber. The starch content of other vegetables (leafy greens, green beans, broccoli) is relatively low.

One source of sugar in the diet is table sugar (sucrose). Sucrose, or white sugar, as it is sometimes called, is made from sugar cane or sugar beets and is used in jellies, jams, cakes, pies, pop, candy and other products. Cane or beet sugar is also used to make powdered sugar and brown sugar. There are many sources of sugar other than sucrose, such as lactose in milk and fructose in fruits and fruit juice. Sugars (sucrose, fructose, glucose) are also added to many foods during processing; for example, in canning fruits Many sugar-containing foods also provide other nutrients, although table sugar, soft drinks, molasses, honey and some candies contain no or insignificant amounts of other nutrients.

If carbohydrates are consumed in quantities greater than the body's immediate need for energy and if stores of glycogen (the body's storage form of carbohydrate) are full, any excess carbohydrate in the diet is converted to and stored as fat.

Protein

Protein is needed on a daily basis to maintain growth and promote normal functioning and repair of all body tissues — not just for muscles, but for skin, organs (such as the liver, kidney, eyes, brain and nervous system), blood and body fluids, bones, teeth, cartilage and other structural tissues. Protein is necessary in the production of antibodies that fight infections; hormones and enzymes that coordinate and regulate body functions and neuromuscular functioning.

Protein in foods is the body's source of amino acids. Foods from animal sources (meat, fish, poultry, eggs, milk, cheese) provide the athlete with all of the essential amino acids (those that the body cannot synthesize); vegetable foods (dried peas and beans, nuts, cereals, breads, pastas) are important sources of protein, but most vegetable proteins are lacking in certain essential amino acids. Therefore, a combination of foods from animal and vegetable sources assures meeting the needs of all essential amino acids, as well as of other nutrients. Special problems of a vegetarian diet are discussed on **page 27**.

The recommended dietary allowance for a 200 pound male is 73 grams (g) of protein per day. A 200 pound athlete who is "bulking up" (increasing weight through increased muscle mass), however, may need about 91 g/day. Studies on the dietary habits of athletes show that this increased requirement is easily met by the athlete's normal diet and no protein supplementation is necessary. Protein consumed in excess of energy and repair needs is converted to body fat and stored the same as excess calories from other sources.

Fats

Carbohydrates, fat and protein are the only nutrients that can provide energy (calories). Fat is the most concentrated source of energy. It contains twice as much energy per unit of weight as either carbohydrate or protein.

PROTEIN CONTENT OF FOODS

FOOD	GRAMS
4 oz. chicken	27
1 egg	6
4 oz. fish	25
6 oz. beef, pork, lamb	45
1 glass milk	9
1 slice bread	2 - 3
1 serving cereal	1 - 2
1 oz. cheese	5 - 7
1/2 cup pasta	2
1/2 cup cooked dried peas or beans	8
2 Tbsp peanut butter	8
2 Tbsp peanuts	8
1/2 cup cooked vegetables	1 - 3

Note Training table portions are often two to four times larger than those listed above.

In athletic performance, carbohydrate and fat are the primary energy sources; protein is seldom used. At rest, and during light or moderate exercise, fat and carbohydrate contribute about equally to the energy supply. During moderately heavy work for several hours a greater portion of the energy is provided by fat.

In addition to supplying energy, fats are the only source of linoleic acid (an essential nutrient the body cannot synthesize). Linoleic acid is present in high amounts in vegetable oils such as safflower oil, corn oil and soybean oil. Peanut oil and peanut butter also contain fair amounts of linoleic acid. Fats serve as the "carrier" (transports) for fat soluble vitamins. The fat soluble vitamins are vitamins A, D, E and K (see next section). Fat also adds flavor to food and enhances satiety by keeping food in the stomach longer.

Although some fat is necessary in the athlete's diet, a high fat diet is not recommended.

Vitamins and Minerals

Vitamins are nutrients required in very small (micro) amounts: they are widely present in foods. As little as 15 mg per day of niacin can prevent pellagra and it takes only 1.5 mg of thiamin per day to prevent beriberi. These amounts and more are obtainable from foods. All of the vitamins needed by the human body can be obtained in adequate amounts by consuming a varied diet — there is no benefit to taking more. Vitamins are essential to health; however, the indiscriminate taking of concentrated or mega dose supplements of vitamins can be dangerous.

Vitamins are necessary for the operation of a large number of bodily functions. Some vitamins play a role in the conversion of carbohydrate, fat or protein to energy; others have physiological functions such as absorbing calcium or iron and resisting infection. Vitamins contain neither energy nor calories. In all of these processes, the presence of levels higher than those provided by the Recommended Dietary Allowance (RDA) does not further enhance performance. This fact is contrary to the belief of many that "if a little is good, more is better." While it is essential for optimal performance that the athlete's diet provide needed vitamins in the appropriate amounts, vitamins taken in excess

Vitamins do NOT contain energy.
Vitamins do NOT contain calories.
Extra vitamins will not provide more energy.

of need will either be stored in the body (fat soluble vitamins) or excreted in the urine (water soluble vitamins). The extra amounts will *not* function to provide *more* energy or to enhance performance. Vitamin supplements are of no further value to the athlete consuming an adequate diet and, in fact, some vitamins can be toxic when taken in large amounts.

Vitamins are divided into two types:

1. *Fat soluble* — A, D, K, E. When excess amounts of these vitamins are ingested, they are stored in body fat and can result in toxic levels.
2. *Water soluble* — B vitamins and C. When excess amounts of these vitamins are ingested, they are not stored above a maximum concentration and the excesses are merely excreted in urine. Adequate, but not excessive, amounts of these vitamins should be consumed daily.

Minerals function in the body as builders, activators, regulators, transmitters and controllers.

Minerals are classified as macrominerals (need more than 100 mg/day) or microminerals (need less than 100 mg/day). Macrominerals include such minerals as calcium, phosphorus and magnesium. The microminerals are often called "trace minerals" or "trace elements" and include such minerals as iron, zinc, copper, iodine and manganese. Excessive intake of some minerals can be toxic (see page 17).

Calcium and phosphorus are major constituents of bones and teeth. Sulfur is a component of protein, cobalt is found in vitamin B_{12} and iron is a component of hemoglobin. Some minerals function as components of enzymes and hormones, such as iodine in thyroxine and zinc in insulin. Minerals are also important in a number of regulatory functions such as maintenance of body fluid balance (see **pages 1-2**), clotting of the blood and regulation of muscular contraction. Minerals are important regulators of physiological processes involved in physical performance.

A varied diet, sufficient in amount to satisfy the energy needs of an active athlete, will provide adequate vitamins and minerals. Many of today's foods are "fortified" with vitamins and minerals, thus adding to daily intake. If vitamin and mineral supplements are used, a *single* daily multivitamin (with or without minerals) that provides a maintenance level (100% of the RDA for each nutrient) is preferable to therapeutic level supplements (provide greater than 100% of the RDA). For the Recommended Dietary Allowance of some vitamins and minerals see Table 3.

TABLE 3
Recommended Daily Dietary Allowances

Adapted from Food and Nutrition Board, National Academy of Sciences - National Research Council. Revised 1980

	CHILDREN	MALES					FEMALES				
AGE (YEARS)	7-10	11-14	15-18	19-22	23-50	51+	11-14	15-18	19-22	23-50	51+
Weight											
(kg)	28	45	66	70	70	70	46	55	55	55	55
(lb)	**62**	**99**	**145**	**154**	**154**	**154**	**101**	**120**	**120**	**120**	**120**
Height											
(cm)	132	157	176	177	178	178	157	163	163	163	163
(in)	**52**	**62**	**69**	**70**	**70**	**70**	**62**	**64**	**64**	**64**	**64**
Protein (g)	34	45	56	56	56	56	46	46	44	44	44
Fat Soluble Vitamins											
Vitamin A (μg RE)	700	1000	1000	1000	1000	1000	800	800	800	800	800
Vitamin D (μg)	**10**	**10**	**10**	**7.5**	**5**	**5**	**10**	**10**	**7.5**	**5**	**5**
Vitamin E (mg α-TE)	7	8	10	10	10	10	8	8	8	8	8
Water Soluble Vitamins											
Vitamin C (mg)	45	50	60	60	60	60	50	60	60	60	60
Thiamin (mg)	**1.2**	**1.4**	**1.4**	**1.5**	**1.4**	**1.2**	**1.1**	**1.1**	**1.1**	**1.0**	**1.0**
Riboflavin (mg)	1.4	1.6	1.7	1.7	1.6	1.4	1.3	1.3	1.3	1.2	1.2
Niacin (mg NE)	**16**	**18**	**18**	**19**	**18**	**16**	**15**	**14**	**14**	**13**	**13**
Vitamin B-6 (mg)	1.6	1.8	2.0	2.2	2.2	1.8	1.8	2.0	2.2	2.0	2.0
Folacin (μg)	**300**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**	**400**
Vitamin B-12 (μg)	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0
Minerals											
Calcium (mg)	800	1200	1200	800	800	800	1200	1200	800	800	800
Phosphorus (mg)	**800**	**1200**	**1200**	**800**	**800**	**800**	**1200**	**1200**	**800**	**800**	**800**
Magnesium (mg)	250	350	400	350	350	350	300	300	300	300	300
Iron (mg)	**10**	**18**	**18**	**10**	**10**	**10**	**18**	**18**	**18**	**18**	**10**
Zinc (mg)	10	15	15	15	15	15	15	15	15	15	15
Iodine (μg)	**120**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**	**150**

Dietary Excesses and Changes

When teams travel, change is the "order of the day" — changes in:

time of meals;
volume and content of foods ingested;
time and intensity of practice sessions; and
availability of water.

Some travel areas may expose the athlete to increased risk of acute food-borne attacks of disabling diarrheal disease.

Unless plans are organized well before the trip, all may be lost for the want of understanding of food and nutrition. To lessen the chance of having the vomiting and diarrhea of travelers . . . follow these simple directions:

1. Eat only at appointed places — do not patronize street and stadium vendors.
2. Wash hands thoroughly before every meal.
3. In unfamiliar foreign areas, do not eat uncooked (raw) foods.
4. Salads, especially those made in advance with mayonnaise or salad dressings that may be poorly refrigerated (egg, chicken, tuna, ham), are especially high risk foods!
5. Similarly, avoid tempting desserts — cream cakes and cream pies, eclair and cream puffs.
6. Drink only milk that has been pasteurized or boiled and avoid ice cream and frozen confections sold by vendors or dispensed, except at the safe team mess.
7. Do not overeat; eating large amounts of food to which one is unaccustomed can cause diarrhea or nausea.
8. Use only clean utensils (knives, forks, glasses, chopsticks).
9. Investigate whether the water is safe to drink. If it is questionable, avoid it and avoid ice made from it. Use only bottled water where indicated. Carbonated drinks, especially those of recognized brands, are safe.
10. Avoid unfamiliar foods. New foods (especially new or unaccustomed fruits) should not be tried for the first time when traveling to athletic competition — wait until afterward.

Carbohydrate Loading

Glycogen is the form in which carbohydrate is stored in limited amounts in muscle and liver. Carbohydrate loading (also called glycogen loading) is the process of manipulating the diet and amount of exercise in an effort to increase glycogen stores in the muscles. There is much misunderstanding concerning glycogen storage and the practice of carbohydrate loading, which may be both useful and hazardous.

In the 1960's, several researchers reported that there is a significant decrease in muscle glycogen after prolonged exercise. Investigators then *theorized* that at high aerobic (occurring in the presence of oxygen) workloads, the amount of glycogen stored in the exercising muscles will influence the capacity for prolonged strenuous work. In 1973, researchers testing three trained male cyclists reported that the availability of muscle glycogen was important in determining work time to exhaustion on a bicycle ergometer.

The effects of exercise and diet manipulation on glycogen deposition and utilization have also been studied. In the early 1970's, two studies demonstrated benefits of carbohydrate loading on runners in a 19-mile race and skiers in an 85-kilometer (approximately 53 miles) cross-country race. In a more recent study, however, glycogen loading did not improve performance of trained runners competing in a 13-mile race.

What does this mean to the competing athlete? For some athletes performing *continuous*, long, exhausting exercise (such as long-distance running), carbohydrate loading may be beneficial. It is of no value for short time competition, no matter how intensely exhausting the effort. It has been found that a high carbohydrate (70% carbohydrate) diet may also be beneficial when performing at high altitudes (over 8,000 feet); however, this is of little practical importance to most athletes, as few game sites are at such altitudes.

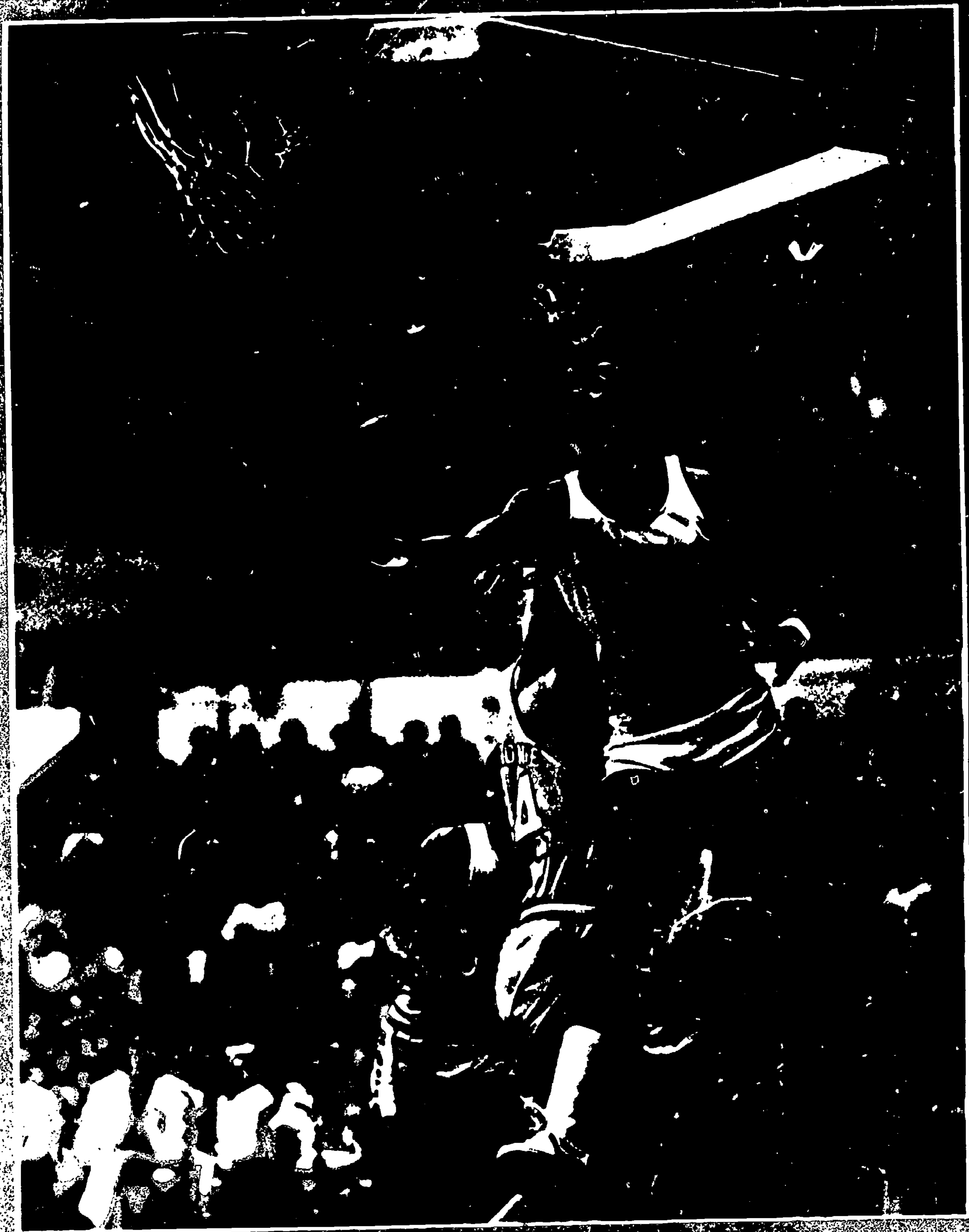
There is no known advantage of carbohydrate loading in events lasting less than 1.5 to 2.0 hours of *continuous, non-interrupted* effort. It is also important to recognize that the maximum storage of glycogen is limited and that during prolonged effort the body must also use other energy sources. Hence, at best, carbohydrate loading is of limited value to performance. In addition, it can have undesirable effects that reduce performance, particularly for short periods of competition.

Coaches and athletes should be aware of the possible detrimental effects of carbohydrate loading. When glycogen is stored in the muscle — so is water. For each gram of glycogen, approximately 2.7 grams of water also are stored. Athletes have reported stiffness from glycogen loading due to the deposition of water in the muscle. Stiffness and a resulting loss of flexibility can be a detriment in some sports.

Any new diet plan or even a new food should not be tried just before an important competition. Some people react adversely to alterations in food intake. If you carbohydrate load, experiment early in the season, not prior to the big event.

Carbohydrate loading has not been shown to be effective for athletes participating in events requiring less than 1.5 to 2.0 hours of continuous, non-interrupted effort.

Achieving Competitive Weight



Body Composition: Fat vs. Lean

When describing leanness, body weight can be separated into two components: *fat weight* and *lean body weight*. Fat weight includes fat deposits surrounding certain vital organs to hold them in position and protect them from physical shock and the fat in bone marrow, muscles, organs and nervous tissue. Lean body weight includes muscle, bone and other non-fat tissues.

Some body fat is needed for energy, insulation and protection. The complete absence of body fat is neither possible nor desirable. Various articles and charts which report body composition of given samples of athletes often are regarded as recommendations. These charts, however, delineate *averages* and should not be interpreted to apply exactly to any given individual. Body composition is influenced by heredity and many other factors. Reducing total body fat too severely may limit performance and even result in illness.

Body fat can be estimated by many methods. The accuracy and reliability of any method depends on the training and capabilities of the measurer. Some methods involve measuring the circumference of certain body parts (such as upper arm, thigh, calf) with a measuring tape, while others require measuring the thickness of a pinched fold of skin and subcutaneous fat at various sites on the body. Sites most often used are the back of mid-upper arm (tricep), abdomen (waist) and the back (below the scapula). These measurements are made with a "skinfold caliper" and are called "skinfold measurements." Weighing underwater is another method.

Athletes are on the average leaner than non-athletes. For example, the average college-age female is 26% body fat, while most women athletes are between 12% and 20%, with some distance runners below 10%. Most college-age male athletes are between 8% and 12% body fat as compared to an average of 15% for non-athletic men. Some male distance runners have been assessed as low as 4% body fat. An athlete will do better if he or she selects the sport most suitable for his or her body type, capabilities and interest rather than undertake drastic efforts to "make weight," slim, or gain weight, or change body composition.

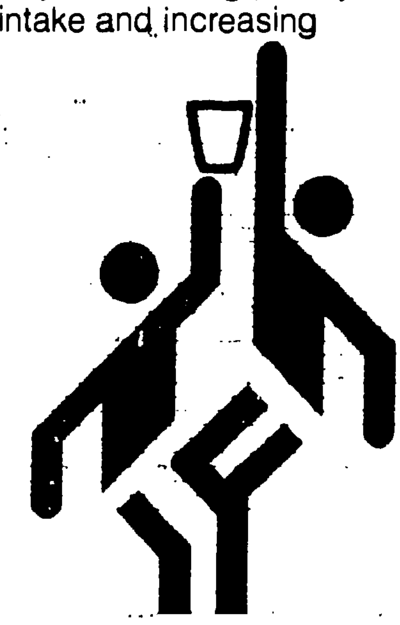
The widely held concept that leanest body composition automatically leads to better performance is unproven.

Bulking Up

Muscle size increases only after weeks of work. A muscle must be exercised beyond 70% capacity several times a week to increase in size and strength. Muscle size cannot be increased by simply consuming large amounts of calories and/or protein; the stimulation of training, particularly heavy resistance training, is required. Increases in weight without proper training will probably be fat gain, not muscle gain. Monitoring with skinfold measurements or underwater weighing can be helpful in evaluating weight gain. A person trained in taking skinfold measurements or underwater weighing should be used.

Slimming Down

The most effective way to lose weight is by decreasing caloric intake and increasing



output. If energy output is increased by walking briskly one-half hour a day, one will lose approximately one-half pound a week. A one pound weight loss will occur every time caloric output exceeds intake by 3,500 calories. The recommended rate of weight loss is 1-2 pounds per week, which calls for a caloric deficit of 500-1000 calories per day. Weight loss in excess of this may reflect loss of water or of lean body mass. Starvation or diets limited to only a few food items are not recommended. These drastic measures are health hazards. They may cause nutritional deficiencies and dehydration, leave athletes energy deficient and unable to train properly

TIPS FOR WEIGHT LOSS

1. Check weight weekly. Small weight gains are easier to control.
2. Know the caloric content of foods and beverages (including alcoholic beverages). Restrict high calorie items, increase low calorie items.
3. Instead of two or three large meals, eat five or six smaller ones. Don't "bolt" your food. Eat slowly.
4. Drink plenty of water.
5. Take servings one-half or two-thirds the usual.
6. If the plate is already served, leave one-third or one-half of it uneaten. Don't feel compelled to "clean your plate."
7. Exercise — burn more calories than you eat daily.

TO LOSE WEIGHT AND STILL GET THE NUTRIENTS YOU NEED . . .

- Restrict high calorie foods
- Increase low calorie foods
- Eat a variety of foods including:
  - milk (2% or skim)
  - lean meat, fish, poultry, eggs
  - dark green or deep yellow vegetables
  - citrus and other fresh fruits
  - breads, cereals, pastas, potatoes, rice, grains and legumes
- Increase daily calorie output

and do not promote eating habits for maintenance of the desired weight category. Weight loss and the reduction of total body fat may be two different things. Losing weight means simply that — losing pounds. Reducing fat mass may or may not be accompanied by an equivalent reduction in weight and, in fact, can even be accompanied by a temporary increase in total body weight because of retention of water that temporarily replaces the lost fat. This shift of body composition usually ends after a few days at which time there is a rapid loss of weight accompanied by an increased loss of water that may be noted as increased urination (diuresis).

Making Weight

Athletes who compete in sports that have weight classes often attempt to gain advantage over opponents by competing in a weight class that is lighter than their normal body weight. Often they end up competing against someone who has done the same! Many athletes believe that a strong man at 180 pounds is still a strong man at 150 pounds . . . but "it ain't necessarily so." Rapid weight loss may put the athlete at a severe disadvantage. The potential for decrements in performance are nowhere more prevalent than in the process of "making weight."

Many "weight-making" techniques simply dehydrate the body. The true weight loss is water loss, which is temporary and may impair performance (p. 1-2). An athlete cannot perform at his/her best when the body is dehydrated.

Studies measuring the effects of starvation and semi-starvation on performance indicate a decrease in work performance, as reflected by decreases in oxygen utilization, aerobic power, speed, coordination and judgment. It may take as long as three days of refeeding to bring performance back to maximum.

Athletes will find that they have more power, endurance and speed for competition if they reduce to their best competitive weight (when fully hydrated) early in the season and remain at that weight throughout the season. Establishing a stabilized condition avoids the undesirable effects of temporary dehydration or starvation and allows the athlete to train and condition effectively and perform maximally.

Weight loss in wrestlers is the topic of a position paper by the American College of Sports Medicine.

AMERICAN COLLEGE OF SPORTS MEDICINE

POSITION STAND ON

Despite repeated admonitions by medical, educational and athletic groups, most wrestlers have been inculcated by instruction or accepted tradition to lose weight in order to be certified for a class that is lower than their preseason weight. Studies of weight losses in high school and college wrestlers indicate that from 3-20% of the preseason body weight is lost before certification or competition occurs. Of this weight loss, most of the decrease occurs in the final days or day before the official weigh-in with the youngest and/or lightest members of the team losing the highest percentage of their body weight. Under existing rules and practices, it is not uncommon for an individual to repeat this weight losing process many times during the season because successful wrestlers compete in 15-30 matches/year.

Contrary to existing beliefs, most wrestlers are not "fat" before the season starts. In fact, the fat content of high school and college wrestlers weighing less than 190 pounds has been shown to range from 1.6 to 15.1 percent of their body weight with the majority possessing less than 8%. It is well known and documented that wrestlers lose body weight by a combination of food restriction, fluid deprivation and sweating induced by thermal or exercise procedures. Of these methods, dehydration through sweating appears to be the method most frequently chosen.

Careful studies on the nature of the weight being lost show that water, fats and proteins are lost when food restriction and fluid deprivation procedures are followed. Moreover, the proportionality between these constituents will change with continued restriction and deprivation. For example, if food restriction is held constant when the volume of fluid being consumed is decreased, more water will be lost from the tissues of the body than before the fluid restriction occurred. The problem becomes more acute when thermal or exercise dehydration occurs because electrolyte losses will accompany the water losses. Even when 1-5 hours are allowed for purposes of rehydration after the weigh-in, this time interval is insufficient for fluid and electrolyte homeostasis to be completely reestablished.

Since the "making of weight" occurs by combinations of food restriction, fluid deprivation and dehydration, responsible officials should realize that the single or combined effects of these practices are generally associated with 1) a reduction in muscular strength; 2) a decrease in work performance times; 3) lower plasma and blood volumes. 4) a reduction in cardiac functioning during submaximal work conditions which are associated with higher heart rates, smaller stroke volumes, and reduced cardiac outputs; 5) a lower oxygen consumption, especially with food restriction; 6) an impairment of thermoregulatory processes; 7) a decrease in renal blood flow and in the volume of fluid being filtered by the kidney; 8) a depletion of liver glycogen stores; and 9) an increase in the amount of electrolytes being lost from the body.

Since it is possible for these changes to impede normal growth and development, there is little physiological or medical justification for the use of the weight reduction methods currently followed by many wrestlers. These sentiments have been expressed in part within Rule 1, Section 3, Article 1 of the *Official Wrestling Rule Book* published by the National Federation of State High School Associations which states, "The Rules Committee recommends that individual state high school associations develop and utilize an effective weight control program which will discourage severe weight reduction and/or wide variations in weight, because this may be harmful to the competitor . . .". However, until the National Federation of State High School Associations defines the meaning of the terms "severe" and "wide variations," this rule will be ineffective in reducing the abuses associated with the "making of weight."

Therefore, it is the position of the American College of Sports Medicine* that the potential health hazards created by the procedures used to "make weight" by wrestlers can be eliminated if state and national organizations will:

1. Assess the body composition of each wrestler several weeks in advance of the competitive season. Individuals with a fat content less than five percent of their certified body weight should receive medical clearance before being allowed to compete.
2. Emphasize the fact that the daily caloric requirements of wrestlers should be obtained from a balanced diet and determined on the basis of age, body surface area, growth and physical activity levels. The minimal caloric needs of wrestlers in high schools and colleges will range from 1200 to 2400 kcal/day; therefore, it is the responsibility of coaches, school officials, physicians and parents to discourage wrestlers from securing less than their minimal needs without prior medical approval.
3. Discourage the practice of fluid deprivation and dehydration. This can be accomplished by:
   a. Educating the coaches and wrestlers on the physiological consequences and medical complications that can occur as a result of these practices.
   b. Prohibiting the single or combined use of rubber suits, steam rooms, hot boxes, saunas, laxatives, and diuretics to "make weight."
   c. Scheduling weigh-ins just prior to competition.
   d. Scheduling more official weigh-ins between team matches.
4. Permit more participants/teams to compete in those weight classes (119-145 pounds) which have the highest percentages of wrestlers certified for competition.
5. Standardize regulations concerning the eligibility rules at championship tournaments so that individuals can only participate in those weight classes in which they had the highest frequencies of matches throughout the season.
6. Encourage local and county organizations to systematically collect data on the hydration state of wrestlers and its relationship to growth and development.

*The services of the American College of Sports Medicine are available to assist local and national organizations in implementing these recommendations.

and Drugs

Protein

Protein supplements (pills, powder, etc.) are neither needed by athletes nor beneficial to performance. In fact, an excessive amount of protein in the diet can be detrimental. When protein is broken down, nitrogen is excreted. A large intake of protein makes the kidneys work overtime to excrete the excess nitrogen, which requires the use of more water. Maintenance of sufficient water balance (p. 1-2) may be difficult, even without the added requirement imposed by excessive protein intake.

Consuming large amounts of protein can cause a gout-like condition in susceptible individuals which, of course, interferes with performance.

The athlete should get protein from food — by eating a normal diet with protein from a variety of sources as described on page 7.

Vitamins

A varied diet, as already discussed, assures an adequate intake of vitamins. There is no evidence that greater intake improves athletic performance.

Large amounts of some vitamins can cause symptoms of serious toxicity. Examples of these are:

Vitamin A — Headache, nausea, vomiting, muscle stiffness, sleepiness, irritability, depression, double vision, dry scaly inflammation of the skin, loss of hair, liver damage, bleeding, even death. These develop gradually.

Vitamin D — High blood pressure, calcification (hardening) of normally soft tissue (arteries, kidneys), kidney damage or failure, even death.

Vitamin E — Nausea, vomiting, fatigue, blurry vision, prolonged clotting time.

Vitamin C — False negative tests for sugar in urine with glucose oxidase method, false negative tests for blood in urine/stool and false positive urine test with Clinitest®. Reverses effects of anticoagulants and high doses may produce kidney stones.

Niacin — Flushing of the skin, itching, nausea, vomiting, heartburn, diarrhea, liver damage.

Vitamin B_6 — Unsteady walk, numbness and clumsiness of the hands.

REMEMBER

- Vitamins do not supply energy
- "More" is not better
- High levels of vitamins can hurt an athlete and his/her performance

Minerals

Minerals are essential elements for humans and must be provided in the diet. Like all nutrients, minerals work with other nutrients to promote health; however, "more" isn't "better." Minerals taken in large amounts may inhibit absorption and/or affect the utilization, metabolism and/or excretion of other nutrients, including other minerals. The National Academy of Sciences Food and Nutrition Board in their Recommended Dietary Allowances have specified adequate and safe levels (see Table 4) for some of the trace elements. Although minerals are essential for life, they can also be toxic. For information on the recommended intake of additional minerals, see Table 3, page 9.

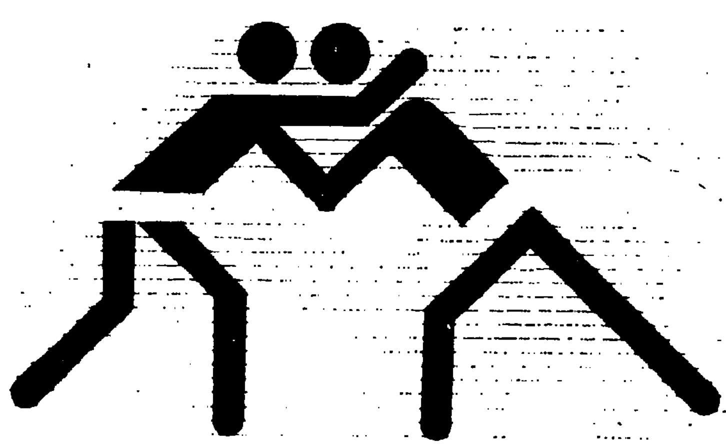


TABLE 4
Adequate and Safe Daily Levels for Some Minererals

Zinc	15 mg
Copper	2-3 mg
Selenium	[illegible]
Manganese	2.5-5.0 mg
Fluoride	[illegible]
Chromium	0.05-0.2 mg
Molybdenum	[illegible]
Sodium	1100-3300 mg
Potassium	[illegible]
Chloride	1700-5100 mg

Non-Nutritive Substances

Pangamic acid, commonly called "vitamin B_{15}," is *NOT* a vitamin. Several different chemicals are being promoted and sold as "vitamin B_{15}," some at extremely high priçes. Pangamic acid, pangamate and B_{15} are names being given to these chemicals that have no nutritional or therapeutic value. The compounds being sold under these names will not benefit an athlete or anyone else.

Bioflavonoids, sometimes called "vitamin P," are another example of non-vitamin or non-nutritive substances. Hesperidin, rutin and citrin (citrus bioflavonoids) are bioflavonoids frequently found in supplements promoted for athletes. Although these substances may be found in naturally occurring foods, they have no demonstrated nutritional value and are not considered essential nutrients for humans or animals.

Steroids

A steroid is a chemical compound that is similar in structure to cholesterol. Many hormones, including sex hormones, are steroids. The use of the term "steroid" in sports refers specifically to the male sex hormone, testosterone, produced by the testes.

The physiological activity of testosterone is of two types: anabolic and androgenic. Anabolic means "tissue building" and androgenic means "masculinizing." The "anabolic" activity is associated with some masculinizing effect, especially noticeable when given to females. The development of a synthetic anabolic steroid has made the drug readily available and inexpensive and it has become widely used by athletes.

The use of steroids has become a fad among athletes who *believe* it will make them stronger and heavier and improve their athletic performance. The increased weight it produces, however, is largely due to retained water, *not new muscle* . . . increased muscle size comes only from repeated work done at a level of activity of at least 70% of the muscle's maximum work capacity.

While testosterone, working in conjunction with other naturally occurring body hormones (pituitary, adrenal, etc.), influences the development in adolescents of muscle and heavy frame characteristic of the male physique, it must be noted that the testicles continue to produce testosterone from puberty to the late years of life, but muscles do not continuously increase in size and strength throughout life. The body tends to keep a constant serum level of hormones, including testosterone. If added testosterone or the synthetic anabolic steroid is administered to a male athlete, that individual's testes will produce less of the natural hormone in order to maintain the normal level in the body.

The taking of synthetic anabolic steroids, or testosterone, for long periods can result in decreased production of testosterone and increased dependency upon the external source. In most young people this is a reversible phenomenon.

Synthetic anabolic steroids produce another undesirable side effect. They tend to make the continued user irritable and aggressive to the point of being difficult to get along with. There have been some reports of true psychoses developing in steroid users; also an increase in tumors. Giving anabolic steroids before puberty and during early adolescence may stunt growth by inducing early closure of the epiphyses (growth line) of the long bones.

Continued large doses of anabolic steroids in women produce secondary male sexual characteristics — male facial hair distribution, deeper voice and, when given to young females, it will enlarge the clitoris.

The individuals — male or female — who use these drugs over a period of time not only appear to undergo a personality change, but also appear to have increased evidence of gastric ulcers and primary tumors in the liver.

Borderline diabetics and borderline psychotics are definitely adversely affected by these steroids.

Alcohol

Alcohol decreases inhibitions and depresses the central nervous system. The moderate social use of alcohol by disciplined adults has no immediately demonstrable harmful effects. Problems arise when this drug is used in quantities exceeding the body's ability to metabolize it or when used in excess, especially over long periods of time. The body has a limited ability to metabolize and dispose of alcohol. When this rate of metabolism is exceeded, alcohol rapidly accumulates in blood and tissues and produces intoxication. As an example of the limitation, a 170 lb. man can metabolize only one-half to three-fourths ounce (15 to 22.5 grams) of alcohol per hour and persons of lighter weight metabolize less. Two ounces of 100 proof distilled beverage, for example, equal one ounce (30 grams) of pure alcohol, the ingestion of which will lead to a blood level of 0.05 mg/100 ml in the 170 lb. adult. Consumption of four ounces of pure alcohol produces a blood level of 0.2 mg/100 ml —a state of severe intoxication. The legal level of intoxication is 0.1 mg/100 ml of alcohol in the blood.

Levels much less than intoxication have effects that reduce maximum performance. Alcohol is a depressant that interferes with coordination, vision and judgment. Even small amounts, less than those associated with intoxication, lower alertness, slow reaction time, expand the peripheral blood vessels and increase both the amount of blood that the heart pumps (cardiac output) and the blood pressure. Even moderate amounts of alcohol increase the resistance of blood flow to the visceral vessels and may produce motor disturbances and impaired perception, especially as the dose increases. Long, continued heavy intake may lead to many undesirable changes in the cardiovascular system and the nervous system. Repeated use of alcohol can produce a dependency.

Alcohol does *not* contribute to excellence of athletic performance. It may, because of immediate effects noted above, actually decrease the capability of athletes, even when taken in quite small amounts. These facts are counter to much of the promotional imagery portrayed by some of the beverage producers' advertising, which implies that consumption of alcoholic beverages by athletes is beneficial in sports. Consuming alcoholic beverages shortly before or during athletic competition or practice sessions should be discouraged, as it reduces the performance ability of the athlete.

In addition to the depressant drug effect of alcohol, it, and beverages containing it, are sources of energy. Each gram of alcohol metabolized by the body produces 7 kcal of energy (1 g of carbohydrate produces 4 kcal; 1 g of protein, 4 kcal; and 1 g of fat, 9 kcal per g). This energy intake contributes additional unneeded calories.

The American College of Sports Medicine's Position Statement on The Use of Alcohol in Sports can be found on **page 20**.

Mood Modifiers

The actions of these drugs vary with individuals and with the amounts taken. Reactions may vary either within the same person or from person to person. The effects are not always predictable. Combining alcoholic beverages and the drugs listed below may be fatal.

Psychomotor Stimulant Drugs:

AMPHETAMINE or COCAINE

Central nervous system stimulants which stimulate the brain and cardiovascular system.

These drugs cause:

- euphoria
- hyperactivity
- excitation
- interference with judgment
- allayed fatigue
- insomnia
- depressed appetite
- increased pulse and blood pressure

Long-term use may produce:

- addiction
- confusion
- delusions
- hostility reaction
- hallucinations
- toxic psychosis

Tranquilizers

"Tranquilizers" seldom make an athlete tranquil. They do dull the athlete's sharp competitive edge and may interfere with judgment. Many drugs of this type are excreted slowly so that they have a lingering effect and are detectable in body fluids 48-72 hours after ingestion. Their calming effect is sometimes used to steady the hand of shooter, but may adversely affect concentration.

Antihistamines

Antihistamines may decrease alertness, induce drowsiness and cause blurred vision in some individuals. When combined with alcohol, these symptoms can be intensified. Antihistamines can also interfere with the sweating mechanism. Because of this reaction, antihistamines should be used cautiously by athletes, if at all.

oxygen uptake (Vo_{2max}), total glycogen depletion in the leg muscles was not affected by alcohol. Moreover, one group of researchers have shown that although alcohol does not impair lipolysis or free fatty acid (FFA) utilization during exercise, it may decrease splanchnic glucose output, decrease the potential contribution from liver gluconeogenesis, elicit a greater decline in blood glucose levels leading to hypoglycemia, and decrease the leg muscle uptake of glucose during the latter stages of a 3-h run. Other studies have supported the theory concerning the hypoglycemic effect of alcohol during both moderate and prolonged exhaustive exercise in a cold environment. These studies also noted a significant loss of body heat and a resultant drop in body temperature and suggested alcohol may impair temperature regulation. These changes may impair endurance capacity.

In one study, alcohol has been shown to increase oxygen uptake significantly during submaximal work and simultaneously to decrease mechanical efficiency, but this finding has not been confirmed by others. Alcohol appears to have no effect on maximal or near-maximal Vo_2.

The effects of alcohol on cardiovascular-respiratory parameters associated with oxygen uptake are variable at submaximal exercise intensities and are negligible at maximal levels. Alcohol has been shown by some investigators to increase submaximal exercise heart rate and cardiac output, but these heart rate findings have not been confirmed by others. Alcohol had no effect on stroke volume, pulmonary ventilation, or muscle blood flow at submaximal levels of exercise, but did decrease peripheral vascular resistance. During maximal exercise, alcohol ingestion elicited no significant effect upon heart rate, stroke volume and cardiac output, arteriovenous oxygen difference, mean arterial pressure and peripheral vascular resistance, or peak lactate, but did significantly reduce tidal volume resulting in a lowered pulmonary ventilation.

In summary, alcohol appears to have little or no beneficial effect on the metabolic and physiological responses to exercise. Further, in those studies reporting significant effects, the change appears to be detrimental to performance.

3) The effects of alcohol on tests of fitness components are variable. It has been shown that alcohol ingestion may decrease dynamic muscular strength, isometric grip strength, dynamometer strength, power and ergographic muscular output. Other studies reported no effect of alcohol upon muscular strength. Local muscular endurance was also unaffected by alcohol ingestion. Small doses of alcohol exerted no effect upon bicycle ergometer exercise tasks simulating a 100-m dash or a 1500-m run, but larger doses had a deleterious effect. Other research has shown that alcohol has no significant effect upon physical performance capacity, exercise time at maximal levels, or exercise time to exhaustion.

   Thus, alcohol ingestion will not improve muscular work capacity and may lead to decreased performance levels.

4) Alcohol is the most abused drug in the United States. There are an estimated 10 million adult problem drinkers and an additional 3.3 million in the 14-17 age range. Alcohol is significantly involved in all types of accidents—motor vehicle, home, industrial, and recreational. Most significantly, half of all traffic fatalities and one-third of all traffic injuries are alcohol related. Although alcohol abuse is associated with pathological conditions such as generalized skeletal myopathy, cardiomyopathy, pharyngeal and esophageal cancer, and brain damage, its most prominent effect is liver damage.

5) Because alcohol has not been shown to help improve physical performance capacity, but may lead to decreased ability in certain events, it is important for all those associated with the conduct of sports to educate athletes against its use in conjunction with athletic contests. Moreover, the other dangers inherent in alcohol abuse mandate that concomitantly we educate our youth to make intelligent choices regarding alcohol consumption. Anstie's rule, or limit, may be used as a reasonable guideline to moderate, safe drinking for adults. In essence, no more than 0.5 ounces of pure alcohol per 23 kg body weight should be consumed in any one day. This would be the equivalent of three bottles of 4.5% beer, three 4-ounce glasses of 14% wine, or three ounces of 50% whiskey for a 68-kg person.

Eating and Athletic Events

Pregame Meal

There is no magic to the food of a pregame meal. Performance during an event or workout is more dependent on food consumed hours or even *days* prior to the event. The most significant consideration regarding the pregame meal is that it should not interfere with the physiological stresses associated with athletic performance.

Food preferences and individual tolerance are the two main considerations when selecting a pregame meal. The pregame meal should consist of items the athlete likes and that "set well" with him or her. Tension or pregame stress can decrease blood flow to the stomach and small intestine, cause nausea and vomiting, increase motion of the lower intestinal tract and diarrhea. These physiological changes produce less interest in and tolerance of foods and liquids and increase the importance of selecting pregame meal foods that the individual tolerates well and likes. *Individual differences should be taken into account.* The following guidelines can serve for all athletes until each finds the pregame meal that works best:

Timing of Eating	Two or three hours before the event
Size of Meal	Small; 500 to 1000 calories
Type of Food	Foods the athlete likes; moderately high carbohydrate, low fat and moderate protein; sparingly of concentrated sweets

Several commercial liquid products are being promoted for pregame meals. For the athlete who finds these products acceptable and satisfying, they offer certain advantages. They leave the stomach rapidly, are low in residue, provide substantial calories and are convenient.

Training and Conditioning Sessions

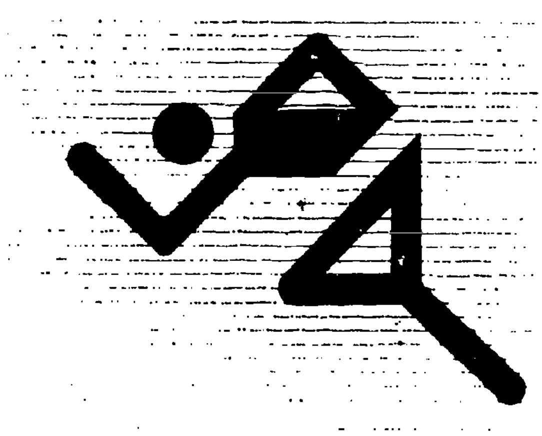
Eating before a training and conditioning session should be given the same general considerations as the pregame meal, although tension or pregame stress is usually absent. There is less likelihood, therefore, of gastrointestinal distress due to altered gastric emptying time, motion of the lower intestine, etc.

Intermittent Competition

In tournaments or meets (such as wrestling, swimming, tennis, or gymnastics), the athlete may be required to compete in several events over several hours, with rest breaks of different lengths between heats or matches. Foods and beverages that the athlete likes, taken in small amounts throughout the day, can ward off hunger, provide needed calories and help maintain blood sugar levels and fluid balance. Items such as sandwiches ("heavy on the bread, light on the spread"), cakes, breads and certain types of cookies are easy to carry and do not require refrigeration or preparation. Dilute fruit juices (see **p. 2**) provide calories in the form of carbohydrates and also serve as a source of fluid. Of special importance on such days is the athlete's need for water. Water should be consumed in liberal amounts throughout the day.

Long-Term Competition

Athletes participating in long-term activities such as distance running, marathons, ultra marathons and long distance cycling can benefit from a weak, sugar-containing fluid. The water in such fluids will help prevent or reduce the severity of dehydration that can



occur from heavy sweating for a long period of time. Preventing or reducing the severity of dehydration will reduce the stress placed on the circulatory system by maintaining an adequate blood volume. The possibility of heat disorder is reduced by preventing dehydration. Sugar from these fluids can help maintain normal blood glucose levels.

A source of calories, other than a weak sugar solution, is not necessary for the athlete participating in a marathon or long distance cycling event and, in fact, can be detrimental to performance. Sugar solutions should contain less than 2.5 grams of glucose per 100 milliliters (approximately 5 teaspoons sugar per quart) of water. For information on diluting various beverages see page 2.

The possibility of heat injury exists for any athlete, but especially those participating in hot weather. The incidence of heat injury is especially high in distance running because of the large number of people now participating in this sport. In an effort to help prevent heat injuries in runners, the American College of Sports Medicine released a position statement.

AMERICAN COLLEGE OF SPORTS MEDICINE

POSITION STATEMENT ON

Running

The Purpose of this Position Statement is:

(a) To alert local, national and international sponsors of distance running events of the health hazards of heat injury during distance running, and

(b) To inform said sponsors of injury preventive actions that may reduce the frequency of this type of injury.

The recommendations address only the manner in which distance running sports activities may be conducted to further reduce incidence of heat injury among normal athletes conditioned to participate in distance running. The Recommendations Are Advisory Only.

Recommendations concerning the ingested quantity and content of fluid are merely a partial preventive to heat injury. The physiology of each individual athlete varies; strict compliance with these recommendations and the current rules governing distance running may not reduce the incidence of heat injuries among those so inclined to such injury.

Research Findings

Based on research findings and current rules governing distance running competition, it is the position of the American College of Sports Medicine that:

1) Distance races (>16 km or 10 miles) should *not* be conducted when the wet bulb temperature—globe temperature (adapted from Minard, D. Prevention of heat casualties in Marine Corps recruits. *Milit. Med.* 126:261, 1961. WB-GT=0.7 [WBT] +0.2 [GT] +0.1 [DBT]) exceeds 28°C (82.4°F).

2) During periods of the year, when the daylight dry bulb temperature often exceeds 27°C (80°F), distance races should be conducted before 9:00 A.M. or after 4:00 P.M.

3) It is the responsibility of the race sponsors to provide fluids which contain small amounts of sugar (less than 2.5 g glucose per 100 ml of water) and electrolytes (less than 10 mEq sodium and 5 mEq potassium per liter of solution).

4) Runners should be encouraged to frequently ingest fluids during competition and to consume 400-500 ml (13-17 oz.) of fluid 10-15 minutes before competition.

5) Rules prohibiting the administration of fluids during the first 10 kilometers (6.2 miles) of a marathon race should be amended to permit fluid ingestion at frequent intervals along the race course. In light of the high sweat rates and body temperatures during distance running in the heat, race sponsors should provide "water stations" at 3-4 kilometer (2-2.5 mile) intervals for all races of 16 kilometers (10 miles) or more.

6) Runners should be instructed in how to recognize the early warning symptoms that precede heat injury. Recognition of symptoms, cessation of running, and proper treatment can prevent heat injury. Early warning symptoms include the following: piloerection on chest and upper arms, chilling, throbbing pressure in the head, unsteadiness, nausea, and dry skin.

7) Race sponsors should make prior arrangements with medical personnel for the care of cases of heat injury. Responsible and informed personnel should supervise each "feeding station." Organizational personnel should reserve the right to stop runners who exhibit clear signs of heat stroke or heat exhaustion.

It is the position of the American College of Sports Medicine that policies established by local, national, and international sponsors of distance running events should adhere to these guidelines. Failure to adhere to these guidelines may jeopardize the health of competitors through heat injury.

The requirements of distance running place great demands on both circulation and body temperature regulation. Numerous studies have reported rectal temperatures in excess of 40.6°C (105°F) after races of 6 to 26.2 miles (9.6 to 41.9 kilometers). Attempting to counterbalance such overheating, runners incur large sweat losses of 0.8 to 1.1 liters/m²/hr. The resulting body water deficit may total 6-10% of the athlete's body weight. Dehydration of these proportions severely limits subsequent sweating, places dangerous demands on circulation, reduces exercise capacity and exposes the runner to the health hazards associated with hyperthermia (heat stroke, heat exhaustion and muscle cramps).

Under moderate thermal conditions, e.g., 65-70°F (18.5-21.3°C), no cloud cover, relative humidity 49-55%, the risk of overheating is still a serious threat to highly motivated distance runners. Nevertheless, distance races are frequently conducted under more severe conditions than these. The air temperature at the 1967 U.S. Pan American Marathon Trial, for example, was 92-95°F (33.6-35.3°C). Many highly conditioned athletes failed to finish the race and several of the competitors demonstrated overt symptoms of heat stroke (no sweating, shivering and lack of orientation).

The above consequences are compounded by the current popularity of distance running among middle-aged and aging men and women who may possess significantly less heat tolerance than their younger counterparts. In recent years, races of 10 to 26.2 miles (16 to 41.9 kilometers) have attracted several thousand runners. Since it is likely that distance running enthusiasts will continue to sponsor races under adverse heat conditions, specific steps should be taken to minimize the health threats which accompany such endurance events.

Fluid ingestion during prolonged running (two hours) has been shown to effectively reduce rectal temperature and minimize dehydration. Although most competitors consume fluids during races that exceed 1-1.5 hours, current international distance running rules prohibit the administration of fluids until the runner has completed 10 miles (16 kilometers). Under such limitations, the competitor is certain to accumulate a large body water deficit (−3%) before any fluids would be ingested. To make the problem more complex, most runners are unable to judge the volume of fluids they consume during competition. At the 1968 U.S. Olympic Marathon Trial, it was observed that there were body weight losses of 6.1 kg, with an average total fluid ingestion of only 0.14 to 0.35 liters. It seems obvious that the rules and habits which prohibit fluid administration during distance running preclude any benefits which might be gained from this practice.

Runners who attempt to consume large volumes of sugar solution during competition complain of gastric discomfort (fullness) and an inability to consume fluids after the first few feedings. Generally speaking, most runners drink solutions containing 5-20 grams of sugar per 100 milliliters of water. Although saline is rapidly emptied from the stomach (25 ml/min), the addition of even small amounts of sugar can drastically impair the rate of gastric emptying. During exercise in the heat, carbohydrate supplementation is of secondary importance and the sugar content of the oral feedings should be minimized.

New Life Style Diets

Eating Out

Franchise food outlets, commonly called fast food establishments, are a popular part of life in the United States today and are an appreciable contributor to the diet of the athlete. How do fast foods rate nutritionally?

The foods offered by fast food establishments differ from establishment to establishment. Most offer meat (beef, pork, chicken, fish) and bread (bun or other bread) prepared in one or another manner. Cheese may be added, as to cheeseburgers or pizzas. A relatively limited array of vegetables will be available in coleslaw, potatoes, potato salad, baked beans, as well as lettuce, tomatoes and pickles used to garnish sandwiches An increasing number of fast food outlets provide fruit and vegetable juices and salad bars. Milk, milk shakes and ice cream or similar dairy products are available at most establishments. Soft drinks, coffee or tea also are usually available.

Properly selected meals from this selection of foodstuffs can be nutritious. The choice is up to the customer. Eating a variety of foods (meats, milk, fruits, vegetables, breads) is the best way for an athlete to make certain to get the nutrients needed for health and top performance.

Nutritional analyses of some samples of so-called "fast foods" are given in Table 5.

These foods, of course, provide the same nutrients whether eaten as meals or snacks. For many people, between-meal snacks may contribute 25% or so of the daily intake of nutrients. It is of interest to see the percent of the recommended allowances contributed by certain foodstuffs or combinations often taken as fast foods. These are illustrated in Figures 1-5.

These figures illustrate the importance of selecting appropriate *combinations* of foodstuffs in order to assure that a meal or snack is "balanced." They illustrate, as well, that properly selected "fast food" or "snack-like" meals can be well-balanced.

Vegetarian Diets

While the majority of athletes prefer meals containing meat, fowl, or fish, properly selected vegetarian diets are not incompatible with athletic performance. Ancient Greek athletes trained on vegetarian diets and displayed amazing ability in competitive athletics. In Sparta, the basic diet was barley, wheat bread, porridge, fruits, vegetables, olive oil, honey, eggs and goat cheese (a lacto-ovo-vegetarian diet).

EXAMPLES OF COMPLEMENTARY COMBINATIONS

beans/wheat	baked beans and brown bread or pinto beans and wheat tortillas
beans/rice	refried beans and rice
dry peas/rye	split pea soup and rye bread
peanut butter/wheat	peanut butter sandwich
cornmeal beans	cornbread and kidney beans
legumes/rice	black-eyed peas and rice
beans/corn	pinto beans and cornbread
legumes/corn	black-eyed peas and cornbread

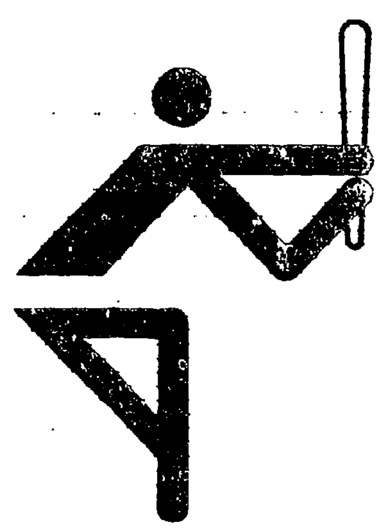
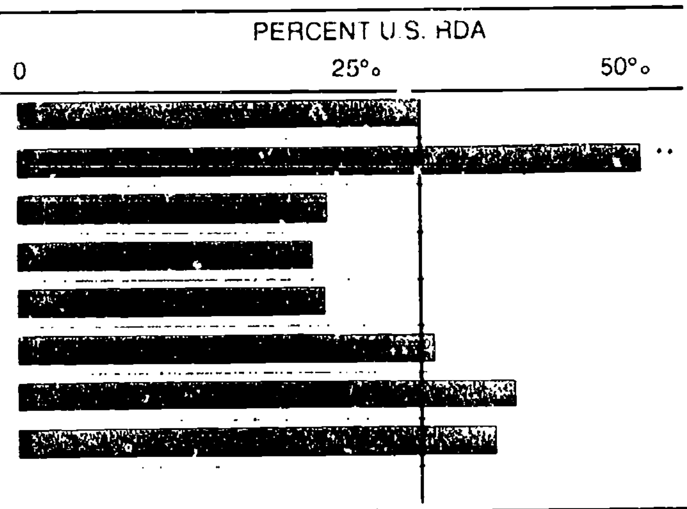


FIGURE 1
Pizza Profile Graphically Illustrating Nutritional Contribution of this Favorite Family Food*

NUTRIENT	AMOUNT
Energy	599 05 kcal
Protein	37 13 g
Vitamin A	1235 20 IU
Vitamin C	14 49 mg
Thiamin	0 37 mg
Riboflavin	0 53 mg
Niacin	7.06 mg
Calcium	337 66 mg
Iron	5 34 mg



*Pizza Pepperoni, Sausage, Vegetables (¼ of 14" pie)
**67

Figures 1 5 are adapted from Hansen, R G , Wyse, B W , Sorenson A W Nutritional Quality Index of Foods Westport, CT AVI Publishing 1979

There are people who, for various reasons, avoid meat or animal foods. The strict vegetarian avoids all meat products; but, lacto-ovo-vegetarians will eat eggs, milk or milk products. Lacto-vegetarians exclude eggs and meats, while the pure vegetarian or vegan diet excludes all foods of animal origin. An uncommon type of vegetarian diet, the fruitarian diet, may include only fruits, nuts, seeds, honey and vegetable oil.

Are vegetarian diets nutritionally adequate? If care is taken to include sufficient variety of allowed foods and to combine nutritionally complementary foods, vegetarian diets, except the fruitarian diet, can be nutritionally adequate Because of the high nutrient density of eggs, milk, and cheese, the lacto-ovo- and lacto-vegetarian diets are very similar in nutrient content to diets containing meat. Such diets can supply all the nutrients essential to health and performance.

The strict vegetarian, however, must find alternate sources of a few missing nutrients. Vitamin B_{12} is not found in plant foods. Animal products are the only dietary source of this vitamin Therefore, the pure vegetarian not consuming animal products should use soybean milk fortified with vitamin B_{12} or a vitamin B_{12} supplement. Meatless diets are likely to be of marginal content in calcium, iron, zinc, riboflavin and vitamin D. Meat enhances

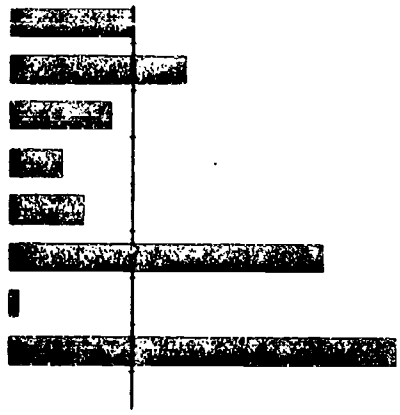
TABLE 5
Nutritional Analysis of Fast Foods

	Wt (g)	Energy (kcal)	PRO (g)	CHO (g)	Fat (g)	Chol (mg)
Hamburger	**91**	**244**	**11**	**29**	**9**	**27**
Cheeseburger	104	290	14	29	13	39
French Fries (sm.)	**68**	**250**	**2**	**20**	**19**	**0**
Fish Filet	179	547	21	46	31	43
Milk Shake (12 oz)	**336**	**380**	**13**	**60**	**10**	**40**
Fried Chicken (white)	100	327	21	10	23	—
Fried Chicken (dark)	**100**	**305**	**22**	**7**	**21**	**—**
Regular Taco	83	189	8	15	11	22
Ham & Cheese Omelette	**174**	**425**	**21**	**32**	**23**	**355**
Pancakes	232	626	16	79	27	87
Scrambled Eggs	**267**	**719**	**26**	**55**	**44**	**259**
Big Mac	204	563	26	41	33	86
Apple Pie	**85**	**253**	**2**	**29**	**14**	**12**
Hot Fudge Sundae	164	310	7	46	11	18
Pizza (Cheese)	**—**	**340**	**19**	**42**	**11**	**22**
Pizza (Pepperoni)		370	19	42	15	27
Coffee*	**180**	**2**	**tr**	**tr**	**tr**	**—**
Tea*	180	2	tr	-	tr	—
Orange Juice	**183**	**82**	**1**	**20**	**tr**	**—**
Whole Milk	244	159	9	12	9	27
Cola	**246**	**96**	**0**	**24**	**0**	**—**

Dashes indicate no data available
x Less than 2 US RDA
tr Trace

FIGURE 2
Nutrient Profile for Whole Milk*

NUTRIENT	AMOUNT	PERCENT U.S. RDA (0 — 25%)
Energy	158 60 kcal	
Protein	8 54 g	
Vitamin A	341 60 IU	
Vitamin C	2 44 mg	
Thiamin	0 07 mg	
Riboflavin	0 42 mg	
Niacin	0 24 mg	
Calcium	287 92 mg	
Iron	0 00 mg	



*Whole Milk ...

VITAMINS								MINERALS							
A (IU)	B_1 (mg)	B_2 (mg)	Nia (mg)	B_6 (mg)	B_{12} (g)	C (mg)	D (IU)	Ca (mg)	Cu (mg)	Fe (mg)	K (mg)	Mg (mg)	P (mg)	Na (mg)	Zn (mg)
114	**0.17**	**0.16**	**2.7**	**0.16**	**0.26**	**1.2**	**—**	**45**	**0.08**	**[illegible].0**	**208**	**9**	**106**	**—**	**1.6**
267	0 18	0 2'	2 8	0 17	0.36	1.2		132	0 08	2 2	218	9	202	—	1.9
0	**0.07**	**0.04**	**1.7**	**—**	**0**	**11.5**	**—**	**9**	**0.16**	**0.7**	**473**	**16**	**62**	**—**	**<0.1**
400	0 23	0 22	2 7	0 04	0 10	1.0		145	0.04	2.2	271	19	302	—	1.2
387	**0.10**	**0.66**	**0.5**	**0.1**	**1.77**	**0**	**—**	**497**	**—**	**0.3**	**622**	**40**	**392**	**—**	**1.3**
160	0 10	0 18	7 2			0.7	—	94	—	1.00	136	—	—	498	—
140	**0.10**	**0.27**	**5.3**	**—**	**—**	**1.0**	**—**	**15**	**—**	**1.3**	**206**	**—**	**—**	**475**	**—**
356	0 07	0 08	1 8	0 14	0 5	<0.9	6	116	0.11	1.2	264	36	150	460	1.3
766	**0.45**	**0.70**	**3.0**	**0.18**	**1.44**	**<1.7**	**64**	**200**	**0.14**	**4.0**	**237**	**29**	**397**	**975**	**2.3**
488	0 63	0 44	4 6	0 19	0 56	26 2	23	105	0 12	2.8	237	36	633	1670	1 9
694	**0.69**	**0.56**	**5.2**	**0.34**	**1.31**	**<12.8**	**80**	**257**	**0.24**	**5.0**	**635**	**65**	**483**	**1110**	**3.0**
530	0 39	0 37	6 5	0 27	1 8	2.2	33	157	0 18	4 0	237	38	314	1010	4 7
<34	**0.02**	**0.02**	**0.2**	**0.02**	**<0.04**	**<0.8**	**2**	**14**	**0.05**	**0.6**	**39**	**6**	**27**	**398**	**0.2**
230	0 07	0 31	1 1	0 13	0 7	2 5	16	215	0 13	0.6	410	35	236	175	1 0
600	**0.45**	**0.51**	**4**	**—**	**—**	**X**	**—**	**500**	**—**	**3.6**	**190**	**—**	**—**	**900**	**—**
700	0 45	0 43	4			X		400		3 2	225			1000	
0	**0**	**tr**	**0.5**	**—**	**—**	**0**	**—**	**4**	**—**	**0.2**	**65**	**—**	**7**	**2**	**—**
0	0	0 04	0 1			1		5		0 2			4		
366	**0.17**	**0.02**	**0.6**	**—**	**—**	**82.4**	**—**	**17**	**—**	**0.2**	**340**	**18**	**29**	**2**	**—**
342	0 07	0 41	0 2			2 4	100	188		tr	351	32	227	122	
—	—	—	—	—	—	—	—	—	—	—	—	—	40	20†	—

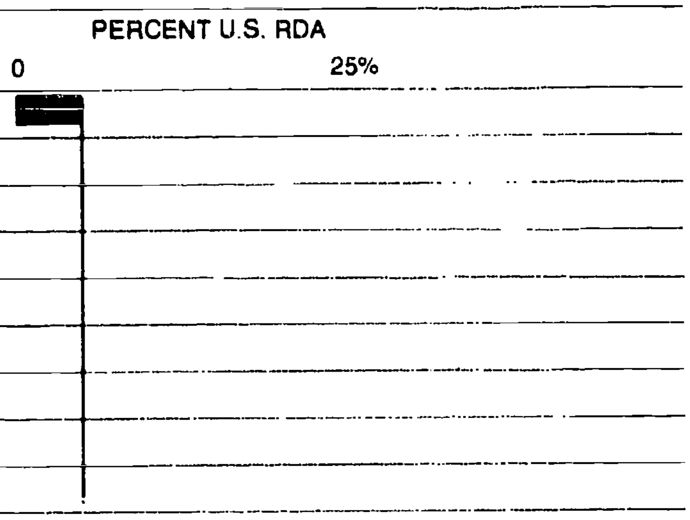
... for 8 oz serving

... average sodium content (12 mg 8 oz) ...

... Ross Timesaver Vol 21 No 3, May June 1981 Columbus, OH Ross Laboratories.

FIGURE 3
Nutrient Profile for the Contribution of Eight Ounces of Carbonated Beverage Illustrating Energy and Nutrient Contribution Using 2,000 kcal and U.S. RDAs for Standards*

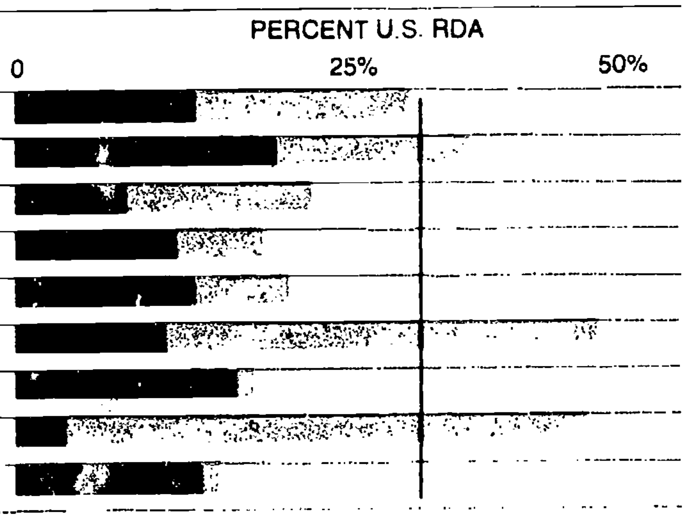
NUTRIENT	AMOUNT
Energy	95.94 kcal
Protein	0.00 g
Vitamin A	0.00 IU
Vitamin C	0.00 mg
Thiamin	0.00 mg
Riboflavin	0.00 mg
Niacin	0.00 mg
Calcium	0.00 mg
Iron	0.00 mg



*Cola Carbonated Beverage (8 ounces)

FIGURE 4
Nutrient Profile of a Hamburger and a Milkshake Illustrating That Combinations of Food Can Complement Individual Strengths and Weaknesses of Individual Foods

NUTRIENT	AMOUNT
Energy	637.38 kcal
Protein	24.44 g
Vitamin A	1218.30 IU
Vitamin C	10.08 mg
Thiamin	0.31 mg
Riboflavin	0.71 mg
Niacin	3.80 mg
Calcium	408.49 mg
Iron	2.59 mg



Hamburger with lettuce, tomato & catsup
Milkshake (12 oz.)

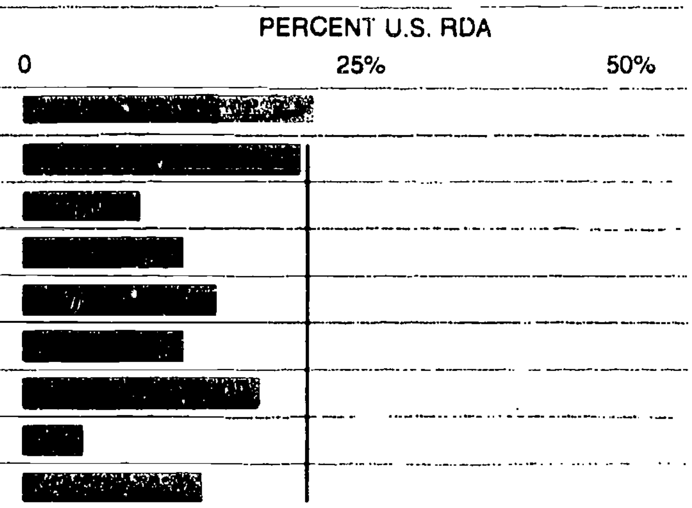
the absorption of iron; iron from some vegetable sources is absorbed less efficiently.

Careful planning of the vegetarian diet is required to include sources of nutrients that are especially important during childhood, adolescence and pregnancy. Calcium and riboflavin can be obtained from milk and milk products and dark green leafy vegetables. Soy milk fortified with riboflavin can be a good source of riboflavin and a fair source of calcium. Iron can be supplied by enriched bread and cereals, legumes, grains and nuts. Vitamin D can be supplied by vitamin D fortified products, such as milk. When the body is exposed to sunlight, vitamin D is formed in the skin.

In planning adequate vegetarian diets, consideration must be given to the protein quality. Protein is made up of amino acids, some of which the body cannot synthesize. These are "essential amino acids" that must be obtained from food. A food protein that does

FIGURE 5
Nutrient Contribution of a Hamburger and a Carbonated Beverage

NUTRIENT	AMOUNT
Energy	432.36 kcal
Protein	13 66 g
Vitamin A	433.70 IU
Vitamin C	7.39 mg
Thiamin	0.22 mg
Riboflavin	0.20 mg
Niacin	3.53 mg
Calcium	52.99 mg
Iron	2.45 mg



Hamburger with lettuce, tomato & catsup
Carbonated Beverage (12 oz.)

not contain all of the essential amino acids is called an incomplete protein. Foods of animal origin are complete proteins; most foods of plant origin are incomplete. Incomplete proteins differ from one another according to the amino acids they lack or have in short supply.

Foods of plant origin can complement each other i.e , those lacking in certain essential amino acids may have amino acids that other plant foods are missing. Hence, incomplete protein foods can be combined to "fill in" the essential amino acids missing from each. For example, legumes (beans) are low in two amino acids that corn is high in, while corn is low in an amino acid which is high in legumes. Therefore, beans and corn complement each other and, when in combination, supply the essential amino acids.

Health Problems

The Athlete with a Chronic Health Condition

Individuals with chronic (constant) health conditions are being encouraged to participate in competitive sports within the limits of their physical capabilities. Participation brings enhanced self-esteem, acceptance by peers, parents and others in the school community and regular exercise (within their physical limitations) often improves general fitness. Coaches and program leaders, when properly informed, can feel comfortable and secure with these participants on their teams and can contribute to the enrichment of the participant's life style.

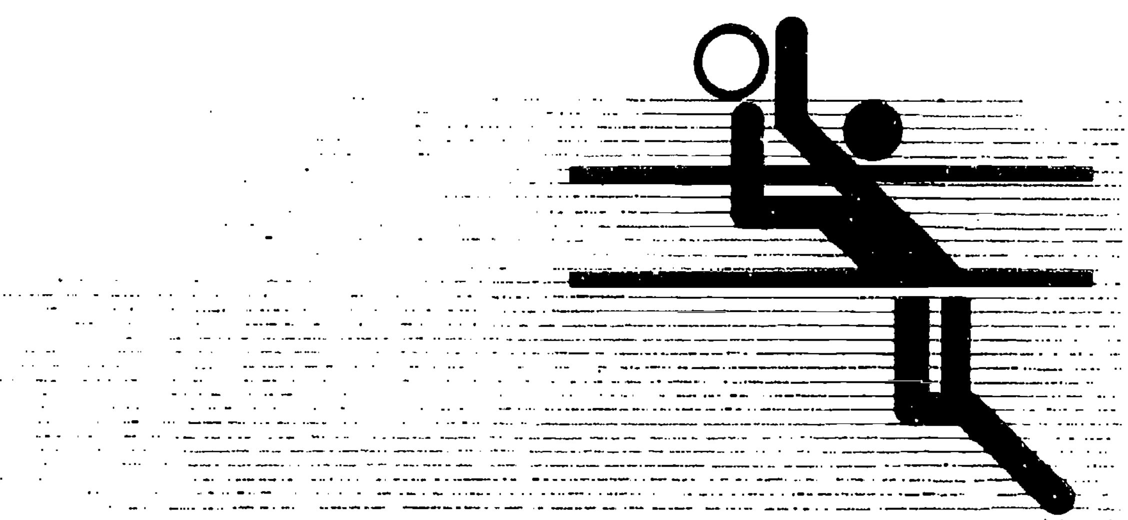
Commonly encountered chronic health problems found in otherwise healthy young people who desire to participate in sports programs are diabetes, allergies (asthma, hay fever), dermatitis, seizure or convulsive disorders (epilepsy), lung disease and heart disease. Very specific and well documented permission for specific sport participation should be obtained from both physician and parent prior to enrolling the person in a sports program. Appropriate restrictions will be recognized by the responsible physician and should be stated to the coach in writing. In most instances the young person, through training and competition, can determine his or her own limitations of activity or make other necessary adjustments.

Diabetes Mellitus

The athlete with diabetes can be very effectively motivated to manage and control his or her diabetes in order to be a better athlete. Such self-motivation is infinitely more effective than the continual attentions of physician and parents.

The individual with diabetes knows that physical exercise reduces the requirement for insulin. With some guidance from a health professional, along with frequent testing of the blood and/or urine, the athlete will learn to adjust insulin dosages and food intake in relation to the intensity of exercise during training and competition.

The only significant complication of diabetes that is of major concern for those in charge of a sports program is hypoglycemia (low blood sugar or insulin reaction). Any time the diabetic athlete experiences unusually small or irregular intakes of food or missed meals, followed by intense exercise, there is an increased risk of developing hypoglycemia. Such conditions can develop during the day-long meets or the two or three day trips away from home. If the individual fails to make an appropriate reduction in insulin dosage or fails to take in adequate kinds or amounts of food when exercising vigorously, blood sugar may fall to low levels and produce moderate to severe symptoms of hypoglycemia. This complication is the only acute (sudden) one that may be experienced during sport participation. The young diabetic and the responsible adult should be able to recognize symptoms of hypoglycemia and provide the necessary, simple, immediate treatment. It is necessary for the coach to be familiar with the symptoms of hypoglycemia and insulin reaction, as even the most well-informed diabetic patient will at times be unaware that the problem is developing.



The following is an expected sequence of symptoms that should alert coaches and teammates to a developing insulin reaction (hypoglycemia).

1. Sudden change in performance and behavior, such as short temper, irritability, inappropriate anger, or lack of attention
2. Shakiness, wobbling or "weak" knees
3. Pale and sweaty with a rapid weak pulse
4. Bizarre behavior such as inappropriate laughing or crying, ignoring coaching commands, picking fights
5. Lethargy (drowsiness or indifference) and sleepiness
6. Convulsions and unconsciousness

Don't Confuse This Problem With Heat Illness

The athlete with diabetes will learn to prevent most insulin reactions and hypoglycemia through the proper use of food before and during exercise, by the regular timing of workouts and by using proper sites for insulin injections. Coaches and teammates, however, should be able to recognize the above symptoms of developing hypoglycemia and be prepared to initiate the following important treatment measures immediately:

1. At the first suspicion, or concern, stop the activity and rest the athlete for ten to fifteen minutes. Keep the athlete under observation.
2. Be prepared at all times to give some source of simple sugar such as fruit juice, sugar cubes, sugar candy (e.g., jelly beans), or soft drink (*not* a diet drink).

A source of sugar should *always* be in the emergency kit that is *always* on the field or court at every practice and every game. Four to six ounces of a soft drink or juice, or two to six sugar cubes will provide an adequate intake of sugar to correct and reverse most developing hypoglycemia episodes. Sugar candy such as jelly beans or hard candy mints can also be used. Liquids such as soft drinks or juice should *NEVER* be given to an unconscious person as it may cause choking.

The athlete who has suffered from an attack of hypoglycemia while participating in sports will be more embarrassed than actually harmed by the attack. Reassurance by the coach and warm, sincere acceptance back to the team are important parts of good management of this health program.

Convulsive Disorders (Epilepsy) and Heart Disease

Young persons with a convulsive disorder such as epilepsy or with heart disease are being encouraged to participate in sports for both the physical and psychological benefits derived from a properly selected and supervised program. There are no specific nutrition-related dietary concerns for these individuals. Both groups, however, may be at risk of unfortunate complications from large intakes of salt. The use of salt tablets or "athletic drinks" containing salt is to be avoided. The athlete with heart disease who ingests an excessive amount of salt may suffer water retention and overload the circulatory system and weaken or decrease heart function. In the epilepsy patient, water retention can cause a seizure.

Lung Disorders

Young persons with various chronic lung diseases, such as asthma or cystic fibrosis, benefit from participation in sports activities — as goalies on hockey or soccer teams, in the martial arts and even as coxswains on rowing teams. They often have very high energy expenditures in normal day to day activities because of the constant increased effort involved in breathing. When involved in a sports program, these special athletes may need more frequent meals and prepractice or pregame snacks to maintain energy balance. The understanding coach can make a powerful contribution to the growth and maturation of these individuals by enabling and encouraging them to become involved in athletics.

Nutrition-Related Health Problems in Sports

Mild iron deficiency (anemia) occurs frequently among adolescent girls and women of childbearing age. Because of low caloric intakes, it often is impossible to get sufficient iron from food intake alone. Iron demands associated with normal menstrual iron losses can make females at risk of iron deficiency after the onset of menstruation. A mild deficiency may limit hemoglobin production, resulting in anemia and, thereby, reduce work output. Fortunately, most athletes have caloric intakes large enough to ensure adequate iron intake as long as wise food choices are made. Some athletes (gymnasts, figure skaters), however, need to pay more attention to food choices because of their relatively low caloric intakes. Selecting foods high in iron becomes increasingly important if the total number of calories ingested daily is below 2,500. To assure good intake and utilization of iron, the daily diet should include 1-2 servings of meat, green leafy vegetables and fresh fruit. Vitamin C rich foods, such as citrus fruits and tomatoes, eaten with foods containing iron, will increase iron absorption. One meal a week containing liver adds significantly to the average dietary intake. The use of enriched cereals and breads also provides additional iron.

Menstrual Disorders

Menstrual disorders are common among exercising girls and women. Some of these disorders are associated with the level of nutrition and the balance of energy intake and expenditure. Young, vigorously training ballet dancers, competitive swimmers, marathon runners in training and others with regularly high energy expenditures whose food intake level maintains their weight at or below 85-90% of the average, frequently experience delayed menarche (age of onset of menstruation) as compared to girls who do not regularly exercise vigorously. One study reports that 10% of young ballet dancers had menarche delayed to roughly 18 years of age, in contrast to the average onset of menses (menstruation) of about 12.9 years for non-athletic girls.

In addition, women athletes, especially those whose percent of body fat is low, may experience irregular menses or prolonged periods without menstruation.

All of these changes seem to be associated with the loss of body fat, whether due to deliberate rigid restriction of food intake in an effort to maintain thinness, or due to poor eating habits, anorexia nervosa, induced vomiting, or excessive energy expenditure. When the body fat of women athletes decreases to less than 22% of total body weight, amenorrhea (absence of menstruation) is likely to develop. When the percent of body fat returns to normal, menstruation is usually reestablished.

Changes in body fat may be accompanied by alterations in hormonal levels in the blood. These changes are reversible and their long-term significance is not yet understood. Knowledge and understanding of the occurrence of these menstrual irregularities is significant to the participant who experiences them. When they occur, energy (caloric) intake may need adjustment. There are many causes for cessation of menstruation or for irregular menstruation, not the least of which is emotional stress or anxiety, which can also cause changes in hormonal levels. Physicians often can identify the cause of menstrual disorders in women athletes and should be consulted when they occur.

Glossary

Antihistamines A drug which counteracts the action of histamine Commonly used in the treatment of allergies. Produces dry mouth.

Calorie A unit of energy used to measure the energy value of food

Cardiovascular System -- The heart and the blood vessels.

Carotid Artery The principal artery of the neck (branches to two arteries on both sides of neck).

Circulatory System --- The veins, arteries and vessels that blood flows through.

Dehydration Condition resulting from excessive loss or restriction of fluid.

EKG -- An abbreviation for electrocardiogram, which is a graphic representation of the varying somatic electric currents resulting from cardiac activity

Electrolyte -- An inorganic salt that, in solution, conducts an electric current. Some of the minerals that function as electrolyies are sodium, potassium, chloride, magnesium and calcium.

Glucose The form in which sugars are transported in the blood stream; also called blood sugar

Glycogen The storage form of carbohydrate in man, found in most tissues of the body, especially the liver and muscular tissue. it is converted into glucose

Heat Exhaustion—Failure of the body's cooling system marked by symptoms of extreme prostration.

Heat Stroke—The end stage of heat exhaustion when sweating stops.

Ketosis—A condition in which ketone bodies accumulate in the blood and appear in the urine; characterized a sweetish acetone odor of the breath. Ketosis can be caused by uncontrolled diabetes, by a dietary intake quite low in carbohydrate but very high in fat (as in ketogenic diets), or by starvation. Uncontrolled ketosis leads to acidosis.

Psychrometer—A form of hygrometer in which the relative humidity of the atmosphere is determined by a comparison of the readings of a dry-bulb and a wet-bulb thermometer.

RDA—Recommended Dietary Allowances

Vascular System—The entire system of arteries, veins and capillaries.

WBT—Wet-Bulb Temperature.

Additional Reading

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The National Association for Sport and Physical Education is the national professional association devoted exclusively to improving the total sport and physical education experience in America. Its membership includes over 25,000 coaches, athletic directors, athletic trainers, physical educators, sport researchers, and sports medicine specialists. NASPE is concerned with the development of sport programs that range from youth sports to international competition. Major efforts of NASPE's are to interpret significant research findings that may influence sport performance and to establish guidelines and standards for sport and physical education programs. NASPE is an association of the American Alliance for Health, Physical Education, Recreation, and Dance.

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