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Mackie Shilstone's



PERFORMANCE FUEL GUIDE

**TO ENHANCE
PERFORMANCE
BEFORE, DURING
AND AFTER
ATHLETIC COMPETITION**

Dear Athlete,

In order to achieve your objectives in sports and reduce your chance of needless injury, you must be prepared both mentally and physically before you step into practice and competition. Proper nutrition is an important factor in your preparation. Eating the right food at the right time will not only pay off on the playing field, but also in life.

My **Performance Fuel Guide** is designed to teach you which foods are good choices to utilize before, during & after training and competition, as well as, how to monitor the effects of training and competition.

One critical decision any athlete must face is the timing and content of the pre-event meal. New food technology, involving the glycemic index, in conjunction with appropriate nutritional supplementation can not only prolong time to fatigue and accelerate recovery, but can also provide the simple guidelines to assist your overall training strategy and objectives..

As with any program involving manipulation of diet and exercise to enhance athletic performance, **you should check with your personal or team physician for approval.** In addition, you will need to seek advice and guidance from your physician and athletic trainer regarding proper rehydration guidelines based on your scale weight fluctuation during pre- and post-training and competition.

The **Performance Fuel Guide** is a comprehensive food, supplement and rehydration strategy based on my experience in sports training and that of leading experts in the field of sports nutrition. Correctly fueling your body through proper nutrition is the ultimate goal. Supplements, while good, are strictly optional and cannot replace proper eating. You must understand the purpose of each supplement before incorporating them into your training routine.

Remember, when in doubt, use your common sense and practice moderation.

Good Luck and Success in Winning!

Mackie Shilstone

Now that you have a better understanding of proper nutrition and hydration strategies before, during and after athletic competition and training, as well as, recovery strategies in preparation for your next event, I would like to re-emphasize the following:

- When in doubt, first and foremost, check with your personal physician.
- Before you supplement your diet with additional nutrients, implement the what, when and why philosophy before you go forward.
- If an activity hurts, stop and seek the advice of your physician, coach, trainer, etc. before you continue.

Let me conclude with a motto which I have used to prepare my 3,000 + athletes:

“Train like you compete and compete like you train.”

Special Thanks to...

...the following experts in their respective fields for assistance with compiling the material and editing of this booklet. I deeply appreciate their friendship, support and willingness to help athletes everywhere succeed.

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“Sports Nutrition: A Comprehensive Guide to Improving Athletic Performance with Sports Nutrition”

LIFESTYLE FACTORS

Your personal lifestyle can have many repercussions on your body. Not enough sleep - too much stress - everything can affect your body's performance. In order to determine what lifestyle changes you may have to make to obtain optimum performance - use the following charts to see how your lifestyle is affecting your body.

LIFESTYLE FACTORS LOG FOR 2 WEEKS

	DAY						
Week 1	1	2	3	4	5	6	7
No. Hrs. of Sleep							
At Balanced Breakfast							
Skipped Breakfast							
AM Snack							
Lgth. of AM Workout							
Ate Balanced Lunch							
Skipped Lunch							
Lgth. of PM Workout							
PM Snack							
Monitored Heart Rate							
Ate Balanced Supper							
Skipped Supper							
Ate After 8 pm							
Drank 8 Glasses Water							
Week 2	8	9	10	11	12	13	14
No. Hrs. of Sleep							
At Balanced Breakfast							
Skipped Breakfast							
AM Snack							
Lgth. of AM Workout							
Ate Balanced Lunch							
Skipped Lunch							
Lgth. of PM Workout							
PM Snack							
Monitored Heart Rate							
Ate Balanced Supper							
Skipped Supper							
Ate After 8 pm							
Drank 8 Glasses Water							

The A B C's of Proper Nutrition to Enhance Athletic Performance

To obtain peak performance whether in training or competition, you must fuel your body properly. Learning the ABC's of Proper Nutrition and incorporating them into your diet will enhance your performance, because you will be better able to metabolize the food you eat into energy to power your muscles. The ABC's of Proper Nutrition include:

A - Incorporate Fruits and Vegetables

Seeds and nuts are a great source of Vitamin E and essential oils, and fruits and vegetable are good sources of both vitamins A & C. Hard workouts cause more oxidative stress in the body, and the antioxidants delivered by these foods can aid in the body's recovery.

B - Alter Carbohydrate Intake Relative to Your Activity

Before or after activity, try to eat about half the food on your plate from a variety of the "Good Carbs". (see page 4) When not active, reduce your total intake of carbohydrates, and avoid "Poor Carbs" such as: jams, jellies, sweet, sour or teriyaki glazes.

C - Select Lean Protein Sources

Building and repairing of lean muscle is important. "First Choice Protein" has the lowest fat content - 95% lean ground beef or turkey; pork tenderloin; white meat skinless chicken and turkey; white meat tuna in water and egg whites. "Third Choice Protein" has the highest fat content. Athletes have higher protein requirements and need to distribute their protein intake throughout the day to ensure the development of lean body mass. Body composition is more important than scale weight, so don't carry extra weight that doesn't work for you.

PLANNING YOUR MEALS

When it comes to planning a meal prior to competition, no one single food will ensure top performance. Each person is unique and should experiment to learn which foods, and how much of them, work best for their body. Follow the **ABCs of Nutrition** to build a balanced meal plan and supplement regimen, and pay attention to meal timing.

For a large meal to digest, you should eat 3-5 hrs. before the event. For a smaller meal, allow 2-3 hrs., and for a blenderized meal - 1-2 hrs. A small snack will take 30 minutes to 1 hr. to digest. Always eat extra "First Choice Carbs" the day prior to the event, and do little or no exercise so that your muscles can refuel.

For morning events, eat a hearty, high carbohydrate dinner and bedtime snack the night before. Eat a light breakfast to stabilize your blood sugar.

Before afternoon events, eat a hearty breakfast and a light "First Choice" carbohydrate-based lunch. Before evening events, eat a hearty breakfast and lunch, then a light snack 1-2 hrs. before competition.

Remember to keep hydrated during all activities - whether training or competition. Following the ABCs of Nutrition guidelines and augmenting your regimen with the recommended supplements will enable you to enhance your overall athletic ability.

Recommended Protein Intake by Age & Sex

Age	Male	Female	Protein g/kg Lean Body Weight*
7-10	x	x	1.0
11-14	x	x	1.0
15-18	x		0.9
19-41	x		0.8
15-51		x	0.8

*Recommended Dietary Allowances, 10th Edition, Nat'l. Academy Press, Washington, D.C. 1989.

Recommended Protein Intake for Strength & Endurance Athletes

Strength Athletes	1.2 - 2.0g protein / kg - lean body weight ⁽¹⁾
Endurance Athletes	1.2 - 1.4g protein / kg - lean body weight ⁽²⁾

(1) Lemon PWR, Protein & amino acid needs of the strength athlete. Int'l. J Sport Nutr. 1991; 127-145.

(2) Lemon PWR. Effect of exercise on protein requirements in: Williams C. Devlin JT. Editors, Foods, Nutrition & Sports Performance, E & FN Spon. 1992.

TRAINING LOG FOR 2 WEEKS

	DAY						
Week 1	1	2	3	4	5	6	7
Strength Training							
Lgth. of Workout							
Aerobic							
Lgth. of Workout							
Anaerobic							
Lgth. of Workout							
Supplement Amount/Type							
Timing of Supp.							
Water Amt.							
Recovery Period							
Feelings Prior to Workout							
Feelings After Workout							
Week 2	8	9	10	11	12	13	14
Strength Training							
Lgth. of Workout							
Aerobic							
Lgth. of Workout							
Anaerobic							
Lgth. of Workout							
Supplement Amount/Type							
Timing of Supp.							
Water Amt.							
Recovery Period							
Feelings Prior to Workout							
Feelings After Workout							

TRAINING WORKOUTS

If you are a serious athlete, you know the value of regular workouts. You must train sport specific in order to perform at your optimum level. To obtain the maximum benefit from your workout, you should monitor how you feel before, during and after the workout, the timing of the workout and the effects your diet and any supplements utilized may have on your body's ability to perform and recover..

The following charts can help you do just that. Remember that workouts should be a preparation for your sport. Tailor your workout to your sport, but also remember that the entire body and cardiovascular system should be in peak condition to provide optimum performance.

List the type and length of your workouts; the time and amounts you ate prior to and following the activity. The amount, type of supplement and the timing of the supplement, if utilized, is also important. Don't forget hydration - water is essential to good health. Depriving your body of water during exercise is dangerous. Always drink plenty of water and/or sports drink during your workouts as outlined by the ACSM rehydration guidelines.

Your feelings prior to and after your workout are also important. Were you tired before you started your workout - did you fatigue easily - how long was your recovery period? Certainly, if this information is to be used to your advantage, you should also maintain a log of how you felt before and after each session. If necessary, keep a diary in conjunction with these logs to help you see the patterns of your lifestyle.

GENERAL NUTRITION GUIDELINES

1. Include foods rich in vitamins A, C, & E at least once a day. (see list on page 4)
2. Athletes require at least 50% of their foods to be carbohydrates, such as fruits, vegetables, starches and milk. Look at your plate - at least half should be filled with vegetables, starches and fruit. Carbohydrates fuel fitness, exercise and performance. Distribute them throughout the day with 2-3 servings per meal.
3. Remember - carbohydrates can be divided into good and poor choices. Good choices are high fiber, whole grain breads and cereals, and raw fruits and vegetables. Poor choices are sweets and foods with large amounts of refined sugar. (take care that some low fat foods contain large amounts of refined sugar and may not be good food choices.) Limit fiber prior to competition to limit gastric disturbance.
4. Carbohydrates can also be divided into high, moderate and low glycemic foods. The glycemic index of food is an estimated number given to a food's ability to turn into glucose in the bloodstream. The glycemic index is affected by the fiber content, preparation of the food and the amount of food eaten, as well as, by the combination of foods eaten at the same time. In athletes, high glycemic index foods may be used after exercise to replenish glycogen stores. Low and moderate glycemic foods may best be used prior to exercise to increase endurance time in prolonged strenuous exercise.
5. Choose lean protein sources (1st & 2nd choice foods) most often. 6-12 oz. of lean meat per day may satisfy most athlete's protein requirements along with the protein they receive from milk, dried beans and soy products.
6. Moderate use of fats such as mayonnaise, margarine, and sour cream is acceptable, but don't overdo portion size of these foods.
7. Extra calories can lead to an undesirable increase in body fat. Whether these calories are from carbohydrates, fat or protein, the excess leads to body fat.

YOUR FOOD PRIORITY CHART

Take this chart to the grocery store with you!

Vitamin C Rich Foods

Citrus Fruits (oranges, grapefruit, tangerines, mandarins & juices, etc.)
 Watermelon Broccoli / Brussels Sprouts Tomato or V-8 Juices
 Cantaloupe Green / Red Peppers Mango, Papaya, Guava
 Strawberries Cauliflower Kiwi

Vitamin A Rich Foods

Apricots Carrots Cabbage (especially raw)
 Peaches Pumpkin Sweet Potatoes / Yams
 Skim Milk Tomatoes (Paste & Sauce) Dark Green Leafy Vegetables
 Lowfat Yogurt Marinara Sauce / Catsup (collard or turnip greens,
 Eggs Salsa spinach, chard, etc.)
 Green Peas Squash (acorn, winter summer, zucchini, etc.)

Vitamin E Rich Foods

Sunflower seeds or oil Wheat Germ Whole Wheat Flour
 Pumpkin seeds or oil Peanut Butter Mango
 Some fortified cereals Avocado
 Trout Clams, oysters, scallops

GOOD CARBOHYDRATES FOODS - First & Second Choice

Dried Beans / Peas – Red, Kidney, Black, Navy, Lima, Soy, Legumes, Split Peas,
 Pinto Beans, Chick Peas, Garbanzo Beans, Baked Beans, Blackeyed Peas

Pasta – Fettuccini, Egg Noodles, Linguini, Spaghetti, etc. (Wheat or White)

Rice – Brown, Wild or White

Potatoes – Mashed, Boiled New Potatoes, Yams, Sweet Potatoes

Bread – Barley, Rye, Whole Grain, Multi-Grain, Oatmeal, Bagels, Tortilla,
 Muffins - apple, bran, blueberry, carrot, corn or oatmeal

Cereal – Oatmeal, All Bran, Bran Chex, Cheerios, Life, Mini Wheats, Shredded
 Wheat, Special K, Cream of Wheat

Vegetables – Listed in Vitamin A, E & C groups

Fruit – Those listed in Vitamin A, E & C groups (including juices); Cherries, Pears,
 Plums, Blueberries, Apples, Unsweetened Juices, Unsweetened Applesauces,
 Bananas, Grapes, Raisin, Cranberries

Crackers – Rye Crisp, Whole Wheat Crackers or Thins, Popcorn

Soups – Bean, Lentil, Split Pea, Pasta-based

POOR CARBOHYDRATE FOODS - Third Choice - try to avoid

Candy - chocolate or hard Honey Jam/Jelly
 Molasses / Syrup Sweet, Sour or Teriyaki Glazes
 Sweet Soft Drinks or Tea, Kool Aid, Punch, or High Sugar Fruit Drinks

REMEMBER - AVOID JUNK FOOD CALORIES & FAT

WEIGHT MANAGEMENT

With any training or exercise program, your weight will change. Charting body weight changes during pre and post activity is a simple and accurate way to measure fluid loss. Using the chart provided, you can monitor your weight and track your progress. If you see a dramatic and constant drop in weight, and you are not overweight - this could mean that you are overtraining. **Modify your intensity and check with your team physician or your personal physician to determine at what level you should workout.**

WEIGHT MONITORING CHART FOR 2 WEEKS

Morning Weight	DAY													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
250														
245														
240														
235														
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215														
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145														
140														
135														
130														
125														
120														
115														

RESTING HEART RATE (RHR) MONITORING GUIDE FOR 2 WEEKS

RHR	DAY													
	1	2	3	4	5	6	7	8	9	10	11	12	13	14
86														
85														
84														
83														
82														
81														
80														
79														
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HIGH GLYCEMIC FOODS

(Use after exercise and restrict if insulin sensitive)

Shredded Wheat	Baked Potato	Corn Flakes, Rice Krispies
Rice Cakes	Cream of Wheat	Whole Wheat Bread
Watermelon	White Bagel & Bread	Raisins

MODERATE GLYCEMIC FOODS

(OK to use occasionally if insulin sensitive)

Bran Muffins	Bran Chex	Orange Juice
Boiled Potatoes	Instant White Rice	Graham Crackers
Corn	Overripe Banana	Vanilla Wafers

LOW GLYCEMIC FOODS

(Best to use before exercise or if insulin sensitive)

Apples & Pears	Grapes	Pure Protein Bar
Chickpeas	Lima Beans	Green Peas
Sweet Potato	Under Ripe Banana	Lentils
Yogurt	Special K Cereal	Brown Rice

FIRST CHOICE PROTEIN

Dairy: Skim Milk, Fat Free Cheese, Cottage Cheese & Yogurt from Skim, Fat Free Frozen Ice Milk, Yogurt or Pudding (no sugar)

Meats: 95% Lean Ground Beef or Turkey, Trimmed Beef or Pork Tenderloin or Roast, 95 Lean Encased Meats (sausage, hot dog, bologna, etc.), 95% Lean Canadian Bacon or Ham, White Meat Skinless Chicken & Turkey, Venison or Veal, White Meat Tuna in Water, Non Fried Fish & Seafood, Egg Whites

Beans: Beans & Peas, Lentils & Tofu

Grains: Whole Grains, Brewer's Yeast, Fortified Soy, Milk or Egg Protein Isolate

SECOND CHOICE PROTEIN

Dairy: 2% Milk, Low Fat Cheese, Ricotta Cheese, Skim Mozzarella Cheese, Regular Yogurt or Cottage Cheese, Frozen Ice Milk, Low Fat Yogurt & Pudding, Whole Eggs from Flax Fed Hens (Eggland's Best, etc.)

THIRD CHOICE PROTEIN - Restrict Use

Dairy: Whole Milk, Regular Cheese, Ice Cream or Frozen Custard, Whole Eggs

Meats: 75% Lean Ground Beef, Untrimmed Prime Steaks, Encased Meats (sausage, bratwurst, Polish, hot dog, Kielbasa, pepperoni, salami, summer sausage or bologna), Bacon, Ham on the Bone, Beef or Pork Ribs, Fried Chicken, Baked Chicken with skin, Fried Fish or Fried Seafood.

Prepared Foods: Mexican/Italian Food with Heavy Cheese & Meat, Burger w/Cheese & Mayo

MAXIMIZE YOUR PERFORMANCE

The Science of Sports Nutrition deals with the link between food and physical performance. A well-balanced diet helps you perform better, and regular exercise improves the body's ability to utilize the nutrients from food.

Athletes who train intensely on a daily basis, benefit by knowing the best food sources and the most appropriate times for consumption. Recent research suggests that consumption of foods with the appropriate glycemic index before, during and after exercise improves performance. Don't forget water for good athletic performance. Fluid intake is critical before, during and after a workout or event.

The **Performance Fuel Guide** will teach you which **foods** are best for **building lean body mass** without additional fat, in conjunction with proper training.

PERFORMANCE NUTRITION MANAGEMENT CHART

When	Water	Sports Drink	Recovery Drink	Recovery Bar (Optional)
Before Event	X			
During Event	X	X		Energy Bar
After Event	X		X	X

THE WHAT & WHEN OF HYDRATION

According to the **American College of Sports Medicine's position on Exercise and Fluid Replacement** "...It is recommended that individuals consume a nutritionally balanced diet and drink adequate fluids during the 24-hr. period before an event, including the meal prior to exercise, to promote proper hydration before exercise or competition. It is recommended that athletes drink about 17oz. of fluid 2 hrs. before exercise to promote adequate hydration and allow time for excretion of excess ingested water. During exercise, athletes should start drinking early and at regular intervals in an attempt to consume fluids at a rate sufficient to replace all the water lost through sweating, or consume the maximal amount that can be tolerated. Ingested fluids should be between 59-72°F and flavored to enhance palatability and promote fluid replacement. Addition of proper amounts of carbohydrates and/or electrolytes to a fluid replacement solution is recommended for exercise events of duration greater than 1 hr. since it does not significantly impair water delivery to the body and may enhance performance. During intense exercising lasting longer than 1 hr. it is recommended that carbohydrates be ingested at a rate of 30-60

HEART RATE MONITORING

In order for your body to perform at peak performance and burn its fuel efficiently, you should be training in the proper heart rate zone. In order to determine this zone, you should know your resting heart rate.

The resting heart rate should be taken while still in bed. Generally, taking your pulse daily over a period of at least 2 weeks would determine your average resting heart rate. To monitor your pulse, place the index and middle finger together against one of two sites, on your neck, next to the Adam's apple beneath the chin, or on the thumb side of the inside of your wrist. Hold your fingers in position for 15-seconds, while you count the number of beats. Multiply the number obtained by four to obtain your heart rate per minute. This is your resting heart rate.

CAUTION: Pressing too hard, can reduce blood flow and cause the heart to slow down. Be aware that certain medications can alter your body's heart rate response to exercise.

Even while training, you should monitor your resting heart rate every morning. If your resting heart rate is elevated by 10 beats over the previous day's reading, it could mean that you have not recovered fully from the previous day's workout and that your level of intensity during training is too high. It may also indicate that you are dehydrated, so be careful about drinking for adequate hydration. Try moderating your activity and gradually increase the intensity as your body adjusts to tolerate it.

To exercise in the proper zone, you must also know your Maximum Heart Rate. The following heart rate guidelines are "Age Adjusted". This will give you an idea of where your heart rate should be during exercise depending on your goal and your age. Check your heart rate regularly during any workout. **Check with your physician about your heart rate during training.**

AGE ADJUSTED HEART RATE GUIDELINE FORMULA

$$220 \text{ Minus Your Age } \underline{\quad} = \text{Your Max Heart Rate } \underline{\quad}$$

Moderate Activity 50% bpm to 60% bpm

Weight Management 60% bpm to 70% bpm

Aerobic Threshold 70% bpm to 80% bpm

Anaerobic Threshold 80% bpm to 90% bpm

EXAMPLE: 220 - 20 = 200 Max HR

50% of 200 = 100 bpm

80% of 200 = 160 bpm

60% of 200 = 120 bpm

90% of 200 = 180 bpm

70% of 200 = 140 bpm

MINERALS

Minerals are important to the structural integrity of the body and also act as co-factors in many metabolic processes, including some that produce energy. Other minerals act as electrolytes, which are important to muscle contraction during exercise.

Numerous studies have shown that some minerals have to be replaced during muscular activity. Some of these are sodium, chloride, potassium, magnesium, iron, zinc, chromium and copper, etc. Normally, the minerals are replaced through diet, sports drinks, multivitamin and mineral formulas or other ergogenic products. Iron is of major importance, particularly to the female distance runner. Zinc and magnesium are important for muscle growth and recovery. The table below outlines the role of minerals in athletic performance. **Check with your doctor for mineral recommendations.**

MINERALS & ATHLETIC PERFORMANCE

MINERAL	FUNCTION
Calcium	Glycogen breakdown, muscle contraction, bone strength.
Chromium	Part of GTF (glucose tolerance factor), which promotes insulin use.
Copper	Oxygen transport and utilization, works with iron.
Iron	Oxygen transport by RBC, oxygen utilization in the muscle cell.
Magnesium	Muscle contraction, glucose metabolism in the muscle cell.
Phosphorous	Formation of ATP and CC, release of oxygen from the red blood cell, maintains acid-base balance of blood
Potassium	Muscle contraction, glycogen storage, nerve impulse transmission.
Sodium	Muscle contraction, water balance, nerve impulse transmission.
Zinc	Energy production within muscle cell

g/hr. to maintain oxidation of carbohydrates and delay fatigue. This rate of carbohydrate intake can be achieved without compromising fluid delivery by drinking 600-1200ml/hr. of solutions containing a 4-8% carbohydrates. They can be sugars (glucose or sucrose) or starch (maltodextrin). Inclusion of sodium (.5-.7g/liter of water) in rehydration solution ingested during exercise lasting longer than 1 hr. is recommended since it may be advantageous in enhancing palatability, promoting fluid retention, and possibly preventing hyponatremia in certain individuals who drink excessive quantities of fluid."

American College of Sports Medicine, Position Stand on Exercise and Fluid Replacement, Md. Sci Sports Exerc., Volume 28, Number 1, ppi-vii January 1996.

SPORTS DRINKS

Fluid replacement during endurance and muscle sprint events is absolutely essential. If the event, or workout, lasts longer than an hour, then a carbohydrate-based fuel becomes critical to maintaining optimal levels of performance.

Hydration prevents the body from overheating and the carbohydrate allows the body to keep going at a meaningful level.

Also, during periods of peak physical exertion, electrolytes (sodium, potassium, chloride, calcium and magnesium) and selected vitamins are essential to performance. Fluid, carbs, electrolyte and vitamin requirements can easily be met through the use of sports drinks.

Experience has shown that a combination of glucose polymers and fructose, with electrolytes and co-factors can significantly elevate energy, extend endurance, delay fatigue and maintain hydration. The drink should be between 4-8% carbohydrate concentration and between 80 and 150 calories. Glucose polymers are absorbed directly into the blood and provide an immediate source of energy. Fructose (crystalline and NOT HIGH FRUCTOSE CORN SYRUP) is processed by the liver, prior to being used as an energy source. As such, fructose is excellent for extending endurance and replenishing liver glycogen stores.

Some drinks contain phosphates, phosphagen, lactate, bicarbonate, citrates, aspartates and perhaps several amino acids such as, L-Leucine, L-Arginine, L-Carnitine, etc., in an endeavor to enhance performance by reducing lactic acid and ammonia, while improving the body's energy systems (see above).

Sports drinks are invaluable to performance. A good drink will

accelerate the absorption of water, provide immediate and sustained energy, prevent overheating and dehydration, inhibit cramping and muscle pulls, prevent “bonking”, or “hitting the wall”, while keeping the athlete’s legs under them in the fourth quarter. A good sports drink will also provide for accelerated recovery. There is no doubt that water is great but some sports drinks are great as well. **If diabetic or hypoglycemic, please check with your physician for an appropriate sports drink.**

RECOVERY DRINKS

Recovery drinks are not only necessary, but are imperative to performance. Recovery is right along side energy and training as a key element for achieving optimal training and performance goals. Should these drinks be predominantly carbohydrate or protein?

We don’t want to get the cart before the horse, but the answer is both. In actuality, it is selected amino acids and carbohydrates that the body needs to inhibit muscle breakdown and establish in the anabolic environment necessary for healing, repair and building.

In brief, an amino acid, peptide or fast acting protein e.g. whey, with carbohydrate can be taken immediately following the workout. How much protein and carbohydrate?

We suggest an amino acid complex based drink. The use of amino acids or peptides eliminates the need for large quantities of protein i.e. 30 grams, which means faster absorption, uptake, utilization and nitrogen retention and the reestablishment of protein homeostasis.

If a protein powder based product is selected, then a whey isolate and/or concentrate is the best bet for use immediately following a workout or competition.

Within twenty minutes of the completion of the event, or exercise, a recovery drink consisting of protein and a 20-25% carbohydrate solution, should be ingested. If the drink contains vitamins, minerals and other nutrients, so much the better.

For marathoners, triathletes or athletes who have just completed a draining competition or training session, the process should be repeated. **If diabetic or hypoglycemic, please check with your physician before you utilize a recovery beverage.**

VITAMINS

According to Sport Nutrition, A Comprehensive Guide to Improving Athletic Performance with Sports Nutrition by John Williams, vitamins regulate numerous metabolic processes and performs as co-enzymes for energy production (B vitamins); anti-oxidants (A, C, and E); and as a hormone (D) to regulate calcium metabolism.

Vitamins are not used as energy sources, but aid in the release of energy from fat and carbohydrate, and enhance the energy support of substrate systems (Kreb’s cycle). The table below lists some of the functions of vitamins, as they relate to exercise. Recent research has indicated that athletes have higher requirements than sedentary people, particularly during periods of intense physical activity (B vitamins).

A vitamin deficiency will affect performance almost immediately, and to repeat, it is a lack of the B vitamins that will cause the noticeable depreciation in performance. The B vitamins are critical to carbohydrate metabolism. Also, several conclusive studies have been completed on the advantages of taking vitamin E at high altitude (5,000 TO 25,000 feet). Oxygen uptake was improved while oxidation of red-blood cell membranes was prevented and lactic acid accumulation reduced. **Check with your doctor for vitamin recommendations.**

Vitamins and Exercise	
Vitamin	Use
A Retinol	Antioxidant, immune system functioning
Beta Carotene	Prevention of red blood cell damage (RBC)
D Ergocalciferol Cholacalciferol	Calcium metabolism, builds bones
C Ascorbic Acid	Antioxidant, iron absorption, formation of epinephrine, aerobic energy production, healing, connective tissues
E Tocopherol	Antioxidant, aerobic energy production, prevention of RBC damage.
K Phytonadione	None determined
B ¹ (Thiamine)	Energy release from carbohydrate, nervous system, muscle coordination
B ² (Riboflavin)	Energy release from carbohydrate and fat
B ³ (Niacin)	Both aerobic and anaerobic energy release from carbohydrate, blocks release of fatty acids from adipose.
B ⁵ (Pantothenic acid)	Energy production from fat and carbohydrate, hormone formation
B ⁶ (Pyridoxine)	Energy release from carbohydrate, amino acid metabolism nervous system
B ¹² (Cyanocohalamin)	Red blood cell production
Folic Acid	Red blood cell production
Biotin	Carbohydrate and fat metabolism