The Healthy Eating Pyramid—A newer, improved pyramid

In 2001, Dr. Walter Willett and other researchers from the Harvard School of Public Health presented their version of an updated food pyramid in their book Eat, Drink and Be Healthy. The pyramid is referred to as the “Healthy Eating Pyramid.” The goal of this pyramid is to take current research and present a more updated and comprehensive approach to healthy eating. Its recommendations include lifestyle and dietary changes that are known to improve health and reduce the risk of chronic disease. The main messages of the pyramid are:

**Daily Exercise and Weight Control**

Weight control is an important factor in controlling your risk of developing chronic diseases such as cardiovascular disease, cancer, and diabetes. Exercising everyday, when combined with healthy eating behaviors, can help decrease/or maintain a healthy weight through increased energy expenditure.

**Whole Grain Foods (at most meals)** Whole grains are at the bottom of the pyramid to emphasize the important role they play in decreasing your risk of developing many chronic diseases. Examples of whole grains are: brown rice, whole-grain breads and pastas, kasha, whole oats, barley, and bulgur.

**Plant oils, including olive, canola, soy, corn, sunflower, peanut, and other vegetable oils** Plant oils contain many healthful vitamins and nutrients and are high in unsaturated fats, which can lower the risk of cardiovascular and other chronic diseases.

**Vegetables (in abundance) & Fruits (2 – 3 times/day)** Fruits and vegetables, long known to contain many healthful nutrients (fiber, vitamins, and minerals) also contain newly discovered compounds, called phytonutrients (isoflavones & phy- tosterols) that are known to help protect against cardiovascular disease, cancer, eye diseases, and many other chronic diseases.

**Nuts, Legumes (1 – 3 times/day)** Nuts are a great source of unsaturated fats, protein, and antioxidants; while legumes are a great source of fiber, protein, vitamins, and minerals. These should be incorporated daily.

**Fish, Poultry, Eggs (0 – 2 times/day)** According to the researchers, these protein sources are not necessary to meet daily protein requirements. While these foods are lower in saturated fat and cholesterol compared to many meat and dairy products, they are still sources of saturated fat and cholesterol. Taking in your protein from vegetables, legumes, and nuts is more likely to decrease your risk of developing chronic diseases and boost your intake of healthful nutrients.

**Dairy or Calcium Supplement (1 – 2 times/day)** Calcium is an important mineral for our bodies and plays important roles in bone-building, blood pressure maintenance, and possibly weight control. The pyramid encourages adequate calcium intake, but offers non-dairy sources and/or calcium supplements as viable alternatives for meeting calcium needs.

**Red Meat; Butter (use sparingly)** Red meat and butter are high in saturated fat and cholesterol. Diets high in saturated fat and cholesterol are major determinants for developing cardiovascular disease.

**White Rice, White Bread, Potatoes, and Pasta; Sweets (use sparingly)** These are at the top of the pyramid and should be used sparingly. These grain sources are refined, processed carbohydrates, which have fewer nutrients than whole grains and virtually no fiber.
Multiple Vitamins for Most
The pyramid recommends a daily vitamin for most, but emphasizes that this practice should not replace a healthy diet.

Alcohol in Moderation (unless contraindicated) Small amounts of alcohol can help prevent heart disease and strokes. However, if you do not drink it is not recommended to start just for these benefits.

References

About the Author
Debra Wein, MS, RD, LDN, NSCA-CPT is on the faculty at The University of Massachusetts Boston and Simmons College. She chairs the Women’s Subcommittee of the Massachusetts’ Governor’s Committee on Physical Fitness and Sports and is the President of The Sensible Nutrition Connection, Inc. (www.sensiblenutrition.com).
The Fat Burning Zone: Fact or Fiction?

We have all used a treadmill or exercise bike at the gym with a chart on it showing us how hard to exercise to achieve certain goals. The “fat-burning/aerobic” zone that many of us are so concerned with usually lies somewhere in the range of 60 – 70% of maximum heart rate (HRmax). But where does this number come from, and is it really the best intensity to exercise at if you are trying to lose weight?

To answer this question, first we must understand how the energy we consume (fat, carbohydrate, and protein) is actually used as fuel. In the general resting state, the average person burns approximately 60% fat, 35% carbohydrates, and 5% protein. Once activity (exercise) begins, relative fat metabolism decreases and carbohydrate usage increases. We use the fat/carbohydrate model because protein generally is not a substantial source of energy except in extreme conditions (starvation, etc.). The trend continues as intensity increases to where at “all-out” maximum exercise, the fuel used is almost 100% carbohydrates. Therefore, it is true that lower intensity exercise elicits a greater relative contribution of fats, and hence that “green fat-burning zone” we always see on the chart.

However, as exercise intensity decreases, so too does caloric expenditure. Remember, weight loss occurs when daily caloric expenditure exceeds caloric intake, so it makes sense to burn as many calories as possible through exercise. First of all, those additional carbohydrates you burned because you exercised harder now will not be stored as fat (the common storage form of most carbohydrates once glycogen reserves are filled in the liver and muscle). Second, even though relative fat metabolism decreases with increasing intensity, the absolute amount of fat burned increases. The following table illustrates this idea for a 30-year-old who weighs 200 pounds and exercises for 30 minutes on a treadmill at three different intensities:

<table>
<thead>
<tr>
<th>Speed (mph)</th>
<th>Walking</th>
<th>Jogging</th>
<th>Running</th>
</tr>
</thead>
<tbody>
<tr>
<td>3.5</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5.0</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6.5</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Activity</th>
<th>Work Level</th>
<th>Avg. HR (bpm)</th>
<th>Intensity (% HRmax)</th>
<th>Calories Burned</th>
</tr>
</thead>
<tbody>
<tr>
<td>Walking</td>
<td>Low</td>
<td>114</td>
<td>60</td>
<td></td>
</tr>
<tr>
<td>Jogging</td>
<td>Moderate</td>
<td>143</td>
<td>75</td>
<td></td>
</tr>
<tr>
<td>Running</td>
<td>High</td>
<td>171</td>
<td>90</td>
<td></td>
</tr>
</tbody>
</table>
Although these values are approximations, this table should highlight two points. First, the total calories burned are tripled from walking to running (even though duration is unchanged). Second, although the relative contribution (%) of fat is markedly decreased from walking to running, the absolute amount of fat burned (grams) is still greater at the high intensity.

Even though most Americans exercise aerobically to burn fat/lose weight, the primary goal should be cardiovascular improvement as underscored by the current epidemic of heart disease in the United States. In general, for the average healthy person who is normotensive (blood pressure < 120/80 mm/Hg), cardiovascular benefit increases as intensity increases to an upper limit of about 90% of maximal heart rate (HRmax). Beyond 90% HRmax, little research exists to indicate further cardiovascular enhancement.

NSCA’s Performance Training Journal

Currently, for improvements in cardiorespiratory fitness, the American College of Sports Medicine recommends performing aerobic exercise 3 – 5 days per week for 20 – 60 minutes each day (continuous or intermittent) at an intensity of 55/65% to 90% HRmax. Obviously, sedentary or older people will begin at the lower ranges and endurance athletes will be at the upper end. So if you plan on devoting 30 minutes to aerobic exercise, why not crank up the intensity? Sure, it will be harder, but you will burn more calories, more fat, and your heart will thank you in the long run.

Note: Anyone planning to begin an exercise program (aerobic or otherwise) should consult a physician for medical clearance prior to engaging in regular exercise.

References

About the Author
Joe Warpeha, MA, is an exercise physiologist and strength coach and is currently working on his PhD in exercise physiology at the University of Minnesota-Minneapolis. His main area of research is conducted at the St. Paul Heart Clinic and involves left-ventricular dyssynchrony in heart failure and its assessment with ECHO tissue Doppler imaging. Joe is also actively involved in vascular biology research at the University of Minnesota, particularly as it relates to endothelial dysfunction. He is an instructor at the University of Minnesota and teaches beginning weight training in addition to the advanced weight training and conditioning class. Joe has certifications from the NSCA, ACSM, USAW, ASEP, and YMCA and is a two-time national bench press champion in the 165-pound class with multiple national and state records to his credit.
Recovery Nutrition for Athletes

Paul Goldberg, MS, RD, CSCS

The ability of athletes to perform at peak levels can be limited by several things, one of them being how quickly their muscles recover and repair themselves after strenuous workouts, practices, and competitions. Although many factors contribute to recovery, nutrition may be the most important. However, it is often the most neglected and misunderstood component.

In the last decade, research coming out of leading laboratories has given us a greater understanding of how nutrition can enhance recovery and performance. Athletes who put the latest knowledge into practice will have a distinct advantage over their competitors who do not.

Window for Recovery

Workouts, practices, and competitions greatly deplete athletes’ muscle glycogen stores and damage muscle cells, resulting in lingering muscle fatigue, soreness, and compromised function. Among other factors, the ability to perform at a high level several days per week is limited by how well the body recovers its glycogen stores and repairs muscle tissues after strenuous work.

It is now well established that the key to maximizing recovery is to consume carbohydrates and proteins immediately after exercise. Research indicates that the ideal recovery nutrition is a meal or liquid supplement containing high-glycemic carbohydrates and quality proteins in approximately a 4:1 ratio, that include 10 – 20% of the athlete’s total daily caloric intake of these two macronutrients.

Timing is essential, because the muscle cells are highly insulin receptive after exercise. Of course, insulin is the hormone that is responsible for transporting glucose and amino acids into the muscle cells and stimulating glycogen and muscle protein synthesis, it also greatly reduces muscle protein breakdown. When high-glycemic carbohydrates and proteins are consumed immediately after exercise, these recovery processes occur much faster than at any other time. But this window of opportunity is only open for about 45 minutes. This is due in part to a rapid decline in the levels of plasma membrane glucose transporters, which increase during exercise. If you wait too long to eat or drink recovery nutrition, not only will your muscles no longer be insulin receptive, but they will in fact become insulin resistant and their recovery will be severely compromised.

In a Vanderbilt University study, researchers looked at the effect of a carbohydrate-protein supplement on protein synthesis following a one-hour workout. Subjects were given the supplement immediately after exercise or three hours later. Protein synthesis was almost three times greater when the supplement was given immediately after the workout. Other studies have shown a similar pattern with respect to muscle glycogen replenishment.

Still other studies have looked at the effect of proper recovery nutrition on performance in a subsequent workout. For example, in one study athletes performed a hard workout and were then fed either a regular sports drink or a carbohydrate-protein recovery drink during a one-hour recovery period. After the one-hour recovery period, the subjects performed a second hard workout. Those that had taken the carbohydrate-protein recovery supplement outperformed the others by 20%. These results have clear implications for how athletes should approach nutrition at times when they are working out or competing more than once a day.

Maintaining Strength and Health

When proper recovery nutrition is administered on a daily basis, important long-term benefits begin to accrue to athletes. Specifically, they build more strength and muscle and experience fewer injuries. This first of these benefits was demonstrated in a study published in the Journal of Physiology. Subjects were given a carbohydrate-protein supplement either immediately after exercise or two hours later while participating in a 12-week strength-training program. In subjects receiving a carbohydrate-protein mixture immediately after each exercise session, muscle size increased 8 percent and strength improved 15 percent. When the supplement was given two hours later, there was no
muscle growth or improvement in strength.
Until recently, no study had looked at the long-term health effects of regular post-exercise protein and carbohydrate consumption. But a new study led by researchers at Iowa State University did investigate these effects, and produced some very interesting results. Marine recruits representing six platoons were assigned to one of three treatment protocols during 54 days of basic training. Each day after exercise, subjects received either a non-caloric placebo, a control supplement containing carbohydrate and a little fat, or a supplement containing carbohydrate and protein plus a little fat. The investigators reported that, compared to the placebo and control groups, the carbohydrate-protein group had an average of 37% fewer muscle and joint injuries, almost certainly due to superior muscle recovery.

Several Ounces of Prevention
Exciting new research has even shown that consuming carbohydrate and protein during a workout can reduce muscle damage and improve performance in a subsequent workout. This means recovery nutrition can actually begin before the recovery period itself does.
In a study performed at James Madison University, 15 male cyclists completed a stationary ride to exhaustion while drinking either a conventional carbohydrate sports drink or a sports drink containing carbohydrate and protein in a 4:1 ratio. The following day, the cyclists completed a second ride to exhaustion at a higher intensity, this time without drinking anything. Before they began the second ride, a blood sample was taken and its concentration of creatine phosphokinase (CPK), a biomarker of muscle damage, was measured.
On average, the subjects were able to cycle 29% longer in the first ride and 40% longer in the second ride when given the carbohydrate-protein drink than when given carbohydrate-only drink. In addition, the carbohydrate-protein drink was found to reduce CPK levels by an amazing 83%, indicating significantly less muscle damage.
An open question is whether the same type of supplement will have similar effects in anaerobic workouts such as weightlifting. To date there is no published research on this topic, but preliminary results from an ongoing study at the University of Texas indicate that with respect to muscle damage the answer is yes, a carbohydrate-protein supplement used during weightlifting will reduce muscle damage more than a conventional sports drink (J. Ivy, personal communication, August 13, 2004).
Although the exact mechanism by which protein consumed during exercise reduces muscle damage remains undetermined, two theories have been suggested. The protein in the sports drink may be used preferentially for energy during extended exercise, resulting in less breakdown of muscle protein. The protein may also raise amino acid and insulin levels in the blood. Elevated levels of blood amino acids and insulin have been shown to reduce muscle protein breakdown...

The Bottom Line
The bottom line is that proper recovery nutrition has the potential to make a tremendous difference. Athletes who are serious about their performance should consume a high carbohydrate-moderate protein meal (with fluid) or recovery drink after every workout, practice, and competition. It is also best advised to consume carbohydrate and protein with fluid during exercise and/or immediately post exercise. If you do so, you will be rewarded with less muscle damage, faster glycogen replenishment, improved performance in subsequent exercise, greater strength gains, and fewer injuries.

References

About the Author
Paul Goldberg is the Strength & Conditioning Coach and Registered Dietitian for the Colorado Avalanche, a position he has held since 1999. He earned his BS in Physiology at the Western State College of Colorado and his masters degree in nutrition and exercise at Colorado State University. Before joining the Avalanche training staff, Goldberg served as assistant strength coach at Colorado State for four years and as head strength coach at Eastern Michigan University for one year. Paul is certified by the American Dietetics Association as a registered dietician, the National Strength & Conditioning Association, and USA Weightlifting Club Coach.
Will adding protein to your carbohydrate beverage improve your endurance and reduce muscle damage?

Recently researchers from James Madison University in Harrisonburg, Virginia examined the effects of consuming a carbohydrate and protein beverage on endurance cycle performance and post-exercise muscle damage. Fifteen male cyclists were tested on two occasions that were designed to compare the effects of a carbohydrate-only beverage with a carbohydrate and protein beverage. During both testing sessions, supplement beverages were consumed every 15 minutes during the exercise bout. The performance test consisted of one ride to fatigue performed at 75% of VO2max, with a second ride being performed at 85% of VO2max, 12 – 15 hours after the completion of the first ride. The results of the study revealed that the subject rode 29% longer during the first ride when they consumed the carbohydrate and protein beverage when compared to the carbohydrate-only beverage. During the second ride the subjects who consumed the carbohydrate and protein beverage rode 40% longer when compared to the carbohydrate-only supplement. Additionally, the use of a carbohydrate and protein beverage resulted in 83% less muscle damage when compared to the carbohydrate-only beverage. Based upon these data it might be warranted to recommend that endurance cyclists consume supplements that are composed of a mix of carbohydrates and proteins while performing their exercise bouts. This supplementation regime could result in significantly enhanced exercise performance while decreasing the muscle damage that would be associated with the exercise bout.

A Closer Look at Creatine Monohydrate

Douglas Kalman MS, RD, CCRC

Creatine monohydrate has been used as an ergogenic aid since the early 1970’s. In the United States, the use of creatine monohydrate surged in the 1990’s. This also correlated with scientific evidence demonstrating that supplemental creatine monohydrate has ergogenic (performance enhancing) properties in athletes. One recent survey indicated that 37.5% of male college athletes use creatine monohydrate. By virtue of its sales and known efficacy, it is the most popular dietary supplement among strength athletes today.

Creatine is found in the diet and can be synthesized by the liver, pancreas, and kidneys. The daily turnover of creatine monohydrate is about 2 g for a 70 kg person. The body will synthesize about one-half of a person’s daily creatine needs from amino acids. The remaining daily need of creatine is obtained from the diet. Meat or fish are the best natural sources. For example, there is about 1 g of creatine in 250 g (half a pound) of raw meat. However the primary way that athletes “load” the muscle with creatine is through supplementation with synthetic creatine monohydrate.

Review of the Science

Creatine exists in the body in free and in phosphorylated forms (phosphocreatine/creatine phosphate). Creatine is mostly stored in muscles (95%) where it is used as a buffer. When we exercise there is a concomitant increase in the need for energy. During increased energy demands, phosphocreatine provides phosphate to adenosine diphosphate (ADP) to produce adenosine triphosphate (ATP), the body’s energy currency. Exercise that demands short bursts of energy relies upon both ATP and phosphocreatine for energy.

Figure one denotes when during exercise creatine is most needed. Supplementing with creatine monohydrate will increase creatine phosphate stores (as well as circulating creatine levels). Thus the person who uses creatine monohydrate and exercises at high intensity will have the “extra” creatine readily available so that the body can exercise harder and recover quicker.

Figure 1. Dominant Energy Pathways for Exercise of Differing Durations

ANAEROBIC

Exercise Time

Creatine monohydrate has typically been used by both athletes and in research by including loading and maintenance doses. Loading is the ingestion of a total of 20 grams per day for five to seven days. This format will increase muscle creatine levels by about 25%. Recent research has found that a daily creatine monohydrate dose of 2 grams over a 30-day period will result in the same amount of muscle creatine content increase as a five-day loading period. Thus there may not be a need to creatine monohydrate load and to take maintenance doses (typically 5 grams daily) if a person does not have an immediate need to do so.

Muscle creatine monohydrate absorption and uptake is mainly mediated by the initial creatine content of the muscle. Subjects with the lowest muscle creatine levels absorb the greatest amount of creatine monohydrate, and it appears that creatine monohydrate absorption is enhanced when combined with ~50 grams of a carbohydrate/protein combination.

NSCA’s Performance Training Journal

Creatine monohydrate supplementation appears to be less effective in the following situations:

- When less than 20 g per day is used for 5 days or less (no loading).
- When low doses (2 – 3 g per day) are used without an initial high-dose loading period.
- In crossover studies with insufficient time (less than 5 weeks) to allow washout of the creatine.
- And when repeated sprints were performed with very short or very long recovery periods between sprints. It is also possible that subject variability in response to creatine monohydrate supplementation may account for the lack of ergogenic benefit reported in these studies. Consequently, although most studies indicate that
creatine monohydrate supplementation may improve performance, creatine monohydrate supplementation may not provide ergogenic value for everyone.

In controlled laboratory studies, oral creatine monohydrate supplementation has been shown to be ergogenic in repeated stationary cycling sprints, weight training, repetitive muscle contractions such as knee extensions, kayak ergometry, swimming, and rugby. These positive studies may not have application to all forms of sports, but one should realize the ergogenic effect of creatine monohydrate might only be in those types of sports that last between two seconds and 90 seconds, or involving repeated bouts.

**Side Effects and Concerns**

The only side effect reported from clinical studies in preoperative and post-operative patients, untrained subjects, and elite athletes has been weight gain. However, a number of concerns about possible side effects of creatine monohydrate supplementation have been mentioned in lay publications, supplement advertisements, and on the Internet. It should be noted that these claims of “unsafe” have not been substantiated in any prospective creatine monohydrate study. Unfortunately, many of these concerns have recently received significant media coverage thus they are worthy of discussion.

Since creatine is an amino acid, it has been suggested that creatine monohydrate supplementation may affect kidney and/or liver function. However, no studies have reported clinically significant elevations in kidney function markers or liver enzymes in response to creatine monohydrate supplementation. No study has found that creatine monohydrate supplementation has any negative effects on athletes (medical markers of safety) who participate in outdoor summer-type sports.

There have been some reports that creatine monohydrate supplementation may promote a greater incidence of muscle strains or pulls. No study however has found this to be true.

**Conclusion**

To date, there are over 500 studies on this ergogenic aid. Current thought includes using creatine monohydrate to augment gains in muscle size and strength. Short-term creatine monohydrate supplementation (e.g. 20 g/day for 5 – 7 days) has typically been reported to increase total creatine content by 10 – 30% and phosphocreatine stores by 10 – 40%. In addition creatine monohydrate supplementation has been reported to improve maximal power/strength (5 – 15%), work performed during sets of maximal effort muscle contractions (5 – 15%), single-effort sprint performance (1 – 5%), and work performed during repetitive sprint performance (5 – 15%).

Creatine monohydrate supplementation during training has been reported to promote significantly greater gains in strength, fat free mass, and performance primarily of high intensity exercise tasks. Not all of the studies examining athletic uses demonstrate an ergogenic effect; approximately 30% do not support the agent, although some report non-significant positive effects or influence of creatine monohydrate. Future research will determine what dose may be best for athletic uses.

**References**