

5 SOS

*Secrets of Success
for Endurance Fueling*



Fuel Right, Feel Great!®

Guaranteed since 1987!

5 SOS

Secrets of Success for Endurance Fueling



This book is the distillation of Hammer Nutrition's knowledge, gained through decades of helping thousands of athletes learn to fuel successfully for every imaginable endurance endeavor. We are as passionate about serving our clients'

needs as we are about our personal athletic pursuits. You name it, we've done it or helped other athletes do it. By following the knowledge revealed in this book, you will experience the joy of becoming the best athlete you can be.

Informed by rigorous science and proven in use, our methods and products are simply the best way to fuel properly and guarantee optimal performance every time. We love to share what we've learned with everyone, so we have gone ahead and written the book on it, literally! This is why more and more "experts" are now singing our tune and championing our philosophy.

We're here to serve you. If you have questions about about your personal fueling needs, please ask one of our Hammer trained experts at your favorite retailer or contact us directly!

Brian Frank

Brian Frank, Owner

QUESTIONS?

1.800.336.1977 / www.hammernutrition.com

ON THE COVER:

TOP : James Lawrence enjoys the roads of Utah for his February training. Photo : Tyler Cloward. BOTTOM : Hannah Reidl Hammer's the course at the Speedgoat 55K. Photo : Myke Hermsmeayer

CONTENTS

OUR PHILOSOPHY

3 **Less Is Best**

To fuel successfully, less is better!

THE SECRETS

5 **Proper Hydration**

What you need to know to stay in the flow!

8 **Calories Count**

What and how much to consume during exercise can make the difference between a PR and a DNF.

12 **Electrolyte Replenishment**

Replenish these critical chemicals correctly to finish strong.

16 **Pre-Exercise Fueling**

What and when to eat before your workouts and races.

19 **Post-Exercise Fueling**

For a better performance tomorrow, recover right today.



Our Philosophy

LESS IS BEST

To fuel successfully, less is better than more!

Our recommendations

Based on scientific evidence and our experience working with thousands of athletes for more than two decades, we have determined the following ranges to be ideal for most athletes, most of the time, to achieve and maintain optimal exercise performance:

Fluids	Electrolytes	Calories
20-25 ounces/hour	2 Endurolytes, 1-2 Endurolytes Extreme, or 1-2 Endurolytes Fizz/hr (with 100-600 mg sodium chloride/hr)	120-180* calories/hour <i>*Rare circumstances may require slightly more.</i>



*Cheers to Hammer Nutrition prior to the start of the Hood to Coast Relay.
Photo : Trisha Drobeck*

The safe rule of thumb is to replenish at about one-third of loss values.

Hammer Nutrition has been advocating the “less is best” approach for more than 25 years. Proper fueling is achieved by consuming the least amount necessary to keep your body doing what you want it to do hour after hour. That philosophy guides all of our recommendations for fluid, calorie, and electrolyte intake during exercise. What makes us so sure we’re right? Scientific research and 25+ years working with thousands of athletes have proven it! Follow this approach, and you too will reach your full potential as an athlete and feel great during the downtime, too.

Why you should replenish, not replace!

Many “experts” advise athletes to replace what they expend during exercise in equal or near-equal amounts, hour after hour. They cite data such as “you lose up to 2 grams of sodium per hour, burn up to 900 calories hourly, and sweat up to 2 liters an hour” to defend their position. Sadly, athletes who follow this advice typically experience poorer-than-expected results.

The “replacement” guide to fueling does NOT work. **Your body cannot replace fluids and nutrients at the same rate it depletes them.** When you exercise, even at an easy aerobic pace, your metabolic rate

increases and your body goes into “survival mode.” Blood is routed to working muscles, fluids are used for evaporative cooling, and oxygen is routed to your brain, heart, and other internal organs.

During prolonged exercise, you must cooperate with your body’s innate survival mechanisms. Attempting to replace the calories, fluids, and electrolytes lost during exercise will only interfere with these systems, causing cramping, bloating, GI distress, swelling, and bonking. The more effective and safer approach is to replenish your body with what it can reasonably absorb and process.

The safe rule of thumb is to replenish at about one-third of loss values, adjusting as conditions dictate. For most athletes, most of the time, that means 20-25 ounces of fluid/hour; 120-180 calories/hour; and a full-spectrum of electrolytes with no more than 100-600 milligrams of sodium chloride/hour. Your body’s remarkably efficient survival safeguards will very capably deal with the differences between what is lost during exercise and what can be effectively replaced.

We’re sure that when you get away from those 500-700 calorie, a gram or two of salt, and 1 liter of fluid per hour regimens, your body will perform much better, you’ll feel better, and you’ll get the results that you train so hard to attain. **HN**

Secret #1

PROPER HYDRATION

What you need to know to stay in the flow.

Our recommendations

For optimum health and best performance: **drink 0.5-0.6 ounces of fluid per pound of body weight daily** in *addition* to what you drink while training or racing. **During exercise, drink 20-25 ounces per hour.**



Participants stay well-hydrated on the course of the Hammer-sponsored Pengelly Double-Dip. Photo : Myke Hermsemyer

Daily hydration: Foundation for success

Adequate daily hydration will help you stay strong and healthy before, during, and after exercise. Aim for 0.5-0.6 ounces of fluid per pound of body weight daily in *addition* to what you drink while training or racing. You can include coffee and tea in this amount, but make it mostly pure, clean water.

100 lbs.	50-60 oz.
110 lbs.	55-66 oz.
120 lbs.	60-72 oz.
130 lbs.	65-78 oz.
140 lbs.	70-84 oz.
150 lbs.	75-90 oz.
160 lbs.	80-96 oz.
170 lbs.	85-102 oz.
180 lbs.	90-108 oz.
190 lbs.	95-114 oz.



Water is the most critical of all exercise fueling needs. It cools your body and transports nutrients. But many athletes have trouble gauging how much fluid to drink. Attempting to replace all of the ounces they've lost as sweat, they often over-hydrate—which can have harmful, and even fatal, consequences.

The fact is, you can finish a race or training session with up to 2% weight water loss and still be okay. Forget advice to “drink to replace” or “drink even when you're not thirsty.” It's just plain wrong. Here's what every athlete needs to know about hydration for best performance and optimum health:

- **Your body simply can't absorb fluids at the same rate that it loses them.** You lose about 1 liter (about 34 ounces) of fluid per hour during exercise, on average, and more than that in extreme heat and humidity. With acclimatization and training, you can reduce fluid loss by up to 50%. But you *can't* replenish fluids at the same rate you lose them during the event.
- **Drinking too much water during exercise will impede performance and could make you seriously ill.** According to Dr. Tim Noakes who collected data for 10 years from some 10,000 ultrarunners, hyponatremia (low blood sodium) was more prevalent among athletes who hydrated excessively. When blood sodium concentration becomes too dilute, you can develop severe cardiac symptoms leading to collapse. Lesser degrees of impairment occur frequently from excess fluid intake. Noakes believes an intake of 1 liter (33.8 ounces) of low-electrolyte fluids per hour will likely cause water intoxication and dilutional hyponatremia.
- **Research has shown the optimal water intake for an average athlete during exercise to be about one water bottle (20-25 ounces) per hour**—give or take a

few ounces, depending on your size and the weather conditions. The goal with hydration during exercise is to support natural fluid stores by consuming the amount your body can process. Dr. Noakes's research showed that endurance athletes who consumed 16-24 fluid ounces per hour (approximately 475-710 ml) typically replenished as much fluid as is efficiently possible. According to Ian Rogers, MD, the author of several scientific articles on the dangers of over-hydration for endurance athletes, about 17-25 ounces (500-750 ml) per hour will fulfill most athletes' hydration requirements under most conditions. "Like most things in life, balance is the key," says Dr. Rogers.

- **Good hydration starts before you even get moving.** For regular daily (non-exercise) hydration needs, aim for a fluid intake of 0.5-0.6 fluid ounces of pure, clean water per pound of your body weight. That amount is in *addition* to the amount you drink during exercise.

Bottom line: By hydrating properly—taking in no more than 20-25 ounces (or slightly more in rare circumstances) of fluids per hour, you'll attain peak performance with less fatigue, bloating, and cramping. And you'll feel better before, during, and after your workout or race. **HN**

How much fluid should you drink hourly during exercise?

DON'T DRINK TOO MUCH!

To avoid the performance and health problems associated with low blood sodium, your fluid intake should not routinely exceed 25 oz/hr.

Exceptions: heavier athletes, those exercising at extreme levels or in severe conditions.

Heavier athletes or hotter temps

Up to 28 oz.
(approx. 830 ml)

Average athletes, average temps

20-25 oz.
(approx. 590-740 ml)

Lighter athletes or cooler temps

16-18 oz.
(approx. 473-532 ml)

Secret #2

CALORIES COUNT

What and how much you consume during exercise can be the difference between a PR and a DNF.

Our recommendations

For most athletes during exercise:

- Consume 120-180 calories per hour
- Fuel with complex carbohydrates, such as maltodextrin, not simple sugars or a blend
- After 2 hours, your fuel should include protein in a ratio of about 8:1 carbs to protein.

*Aussie triathlete Kira Flanagan
keeps her calories close at hand.
Photo : Paparazzi On The Run*



Like every aspect of athletic success, proper nutrition requires planning and practice, if you wish to reap the benefits on race day. Here's the inside track on proper fueling for best performance and superior health.

Carbohydrates

Athletes know “carbs are king” when it comes to fueling for endurance exercise. But you can't consume just any carbohydrate at any time. Here's what works:

- **Complex carbohydrates: steady, usable energy without stomach distress** - Products containing simple sugars—typically sucrose, fructose, and/or glucose (dextrose)—must be extremely diluted or your body can't digest them. That's due to “osmolality,” a chemical measure of the concentration of a solution's dissolved particles that can permeate a cell membrane. (For more details on this important factor, see *The Endurance Athlete's Guide to Success*.) The trouble is, at this weak concentration (6-8%), not enough energy is available for working muscles. To obtain enough calories during exercise, you would have to consume about two bottles of fuel per hour, increasing your risk of fluid intoxication.

In contrast, complex carbohydrates can be digested readily at a much higher concentration. At a solution concentration of up to 18%, complex carbohydrates can pass efficiently from the digestive tract to the liver. The liver then converts some of the fuel to glycogen for storage and some of it directly to glucose for immediate use by muscles. Complex carbohydrates (including the maltodextrin in Hammer Nutrition's *HEED* and *Hammer Gels*) allow you to absorb more calories for use as energy than you can from simple sugars.

- **Maltodextrin: fast energy without the crash** - With a glycemic index (GI) of about 100 (the same as glucose), maltodextrin elevates blood sugar level rapidly, and that's

Fast facts:

Complex carbohydrates like maltodextrin allow you to absorb more calories for energy use than you can from simple sugars.

Maltodextrin raises blood insulin more effectively than simple sugars, without the rapid drop common with simple sugars.

Replenish calories in amounts that support efficient energy production and that don't interfere with the use of fatty acids for fuel: 120-180 cal/hr.

After about 2 hours of exercise, about 5-15% of calories used comes from protein (whether from fuel or muscles).

Soy is the preferred protein for use during exercise because its metabolization doesn't readily produce ammonia, a factor in fatigue.

For 2-3-hour events in challenging conditions (e.g., running in hotter weather and/or a steep terrain), when digestion is more difficult, a “carb only” fuel may be more beneficial than a carb-protein fuel.

Calories Count - What and how much to consume during exercise . . .

desirable during exercise—as long as calorie intake is within the recommended 120-180 cal/hr range. (GI is a measure of the speed at which the body breaks down a carbohydrate into glucose.) But while maltodextrin elevates blood sugar levels rapidly, it does not cause fluctuation in insulin levels the way simple sugars do. Simple sugars, even in small amounts, can incite spikes in insulin. That sudden recruitment of insulin then causes a subsequent, dramatic drop in blood sugar levels, even below the fasting level! This “flash and crash” type of energy typically results in the dreaded “bonk.” Maltodextrin raises blood insulin more effectively than simple sugars, without causing the crash of simple sugars.

- **Avoid multiple carbohydrate sources during exercise** - Some sports fuels contain a blend of carbohydrates, based on research

conducted by the Dutch sports scientist Asker Jeukendrup. Jeukendrup found that consuming a carbohydrate blend increased oxidation rates, indicating higher energy production. However, most of the study subjects cycled at a low intensity pace—only 50-55% maximum output—at which you could digest almost anything without gastric issues. In our nearly three decades of working with athletes engaged in typical 75-85% efforts, and/or multi-hour endurance events, fueling with a combination of simple sugars and complex carbohydrates in amounts higher than about 4.0-4.6 calories per minute did not yield positive results. It only increased performance-inhibiting, stomach-related maladies.

Fatty acids

The typical athlete has a vast reserve of calories (up to 100,000!) available

continued on next page



Fuel lean: 120-180 cal/hr

FACT: Your body can't process calories in an amount that approaches what it expends during athletic activity. If you want to achieve your best performance, DO NOT follow the “calories out, calories in” protocol recommended by some “experts.”

Instead, replenish calories in body cooperative amounts. Your fat stores will easily make up the difference. For most athletes, 120-180 calories/hour will be the ideal range. Fewer calories per hour can be processed while running, so adjust accordingly. In very rare instances, larger athletes and people with very high metabolic rates may need more than 180 calories per hour. It's always better to err on the side of taking in too few calories, as you can always easily add them.

from fat stores. When exercise goes beyond about 2 hours, these fatty acids are the fuel of choice, providing approximately 60-65% of your caloric expenditure. However, for this process to go smoothly, you must not consume excess calories (no more than about 180 calories per hour) during exercise. If you try to match energy losses with an equal amount of calories from your fuel, you will inhibit the use of fats for fuel.

Protein

After 90-120 minutes of exercise, about 5-15% of the calories you use will come from protein. If your fuel doesn't supply this protein, your body will scavenge it from muscle tissue—causing muscle fatigue and depletion, post-exercise soreness, and a weakened immune system.

To avoid this protein cannibalization, your ingested fuel should incorporate protein in a ratio of about 8:1 (by weight) carbs to protein.

Sustained Energy, Perpetuem, and Perpetuem Solids meet this requirement, and are your best fuel choices for long-duration exercise. Although whey protein is excellent for use after exercise, soy is preferred for prolonged exercise.

Soy protein used during long-duration events:

- **does not readily produce ammonia**, a primary factor in premature fatigue
- **is easy to digest**
- **has an excellent profile of amino acids**, including the beneficial branched chain amino acids (BCAAs), which your body readily converts for energy

Fueling for 2- to 3-hour events

Digestion is more difficult in certain conditions, such as running (vs. cycling), racing at a fast pace, or competing in heat or among hills.

When fueling for a 2- to 3-hour event that includes any of these factors, it's usually better to choose a fuel without protein, like **HEED** or Hammer Gel, for faster digestion. Although some ammonia build-up (and muscle breakdown) will begin due to the lack of protein, the race will be over before it becomes too problematic.

Bottom line: For exercise that lasts less than 2 hours, a complex carbohydrate fuel that contains maltodextrin (**HEED** and **Hammer Gels**) should perfectly meet your energy needs. For exercise beyond 2 or 3 hours, we recommend a “carb + protein” fuel (**Sustained Energy** or **Perpetuem**), either as your sole fuel from beginning to end, or as your primary fuel. Remember: you can't replace calories at the same rate you use them during exercise. Instead, aim to replenish them at the rate of 120-180 calories per hour. You can always add a bit more, if necessary.

HN



Secret #3

ELECTROLYTE REPLENISHMENT

Replenish these vital minerals correctly to finish strong.

Our recommendations

To keep your body functioning smoothly through a long workout or race, replenish electrolytes gradually, consistently, and completely. During prolonged exercise:

- No more than 100-600 milligrams of sodium chloride (salt)/hour
- 2 Endurolytes*, OR 1-2 Endurolytes Extreme*, OR 1-2 Endurolytes Fizz per hour

**Extreme conditions may warrant higher levels. For usage details see the Hammer Nutrition website.*

Zandy Mangold relies on Endurolytes Extreme to get him through Badwater Salton Sea, an 81-mile team run through Death Valley. Photo : Courtesy Zandy Mangold



Think of electrolytes like the motor oil in your car—they don't make the engine run, but they're absolutely necessary to keep everything operating smoothly. Just as you shouldn't wait until you're dehydrated or bonking before you replenish fluids and calories, you shouldn't wait for muscle cramping to replenish electrolytes.

Electrolytes 101

Muscle cramping is a signal you've already allowed your electrolyte levels drop far too low, or you've replenished them improperly. To keep your body running strong, know these key concepts to master this vital aspect of fueling:

- **The goal with electrolyte replenishment is smooth, uninterrupted, and uncompromised performance.** Without the proper levels of electrolytes, your body can't carry out critical body functions, including muscle contractions and the transmission of nerve impulses, which affect performance.
- **Salt tablets are not the answer!** How you replenish those electrolytes can mean the difference between staying strong and struggling to finish. Salt tablets are an unacceptable choice for electrolyte replenishment for two important reasons: **1) They can oversupply sodium**, thereby overwhelming your body's ability to regulate this electrolyte; and **2) They provide only two of the electrolytes your body requires**—sodium and chloride.

Your body has very effective mechanisms for monitoring and conserving its stores of sodium; consuming excess sodium interferes with these mechanisms. If your body detects an increase in sodium from outside sources (e.g., salt tablets, electrolyte products too high in sodium, or food), the hormone aldosterone signals your kidneys to stop filtering and recirculating sodium. Instead, they excrete sodium, and another hormone, vasopressin, causes fluids

Fast facts:

Electrolyte replenishment is important even when it's not hot outside.

The body needs only a small amount of sodium each day (500-2,000 mg), an amount easily supplied by natural, unprocessed foods.

Those who consume high levels of dietary sodium are guaranteed to lose more sodium during exercise, and will require more sodium intake during exercise.

Adding Endurolytes Fizz or HEED to your water bottle is an easy way to replenish electrolytes consistently throughout your workout or race.



Electrolyte Replenishment - Replenish these vital minerals correctly to finish strong.

to be retained. The results include swelling and elevated blood pressure. Extreme sodium overload can be more serious, potentially causing lethargy, muscle weakness, seizures, and even death.

- **Skip the salty foods.** If you're getting more than 2,300 milligrams per day of sodium (the upper-end recommended dose) in your diet, you can be sure your sodium loss rates during exercise will be greater, too. Sodium drives thirst, and thirst drives drinking until excess results. Over-hydration is definitely not performance enhancing; in fact, it can have fatal consequences.

You can easily get an adequate amount of sodium simply by eating natural, unprocessed foods. In addition, the average athlete stores at least 8,000 mg of dietary sodium in tissues, so you already have a vast

reservoir of sodium available in your body from your diet, ready to serve you during exercise.

- **Replenish electrolytes correctly.** Proper electrolyte replenishment requires a consistent approach that incorporates all of the electrolytes in amounts that do not override your normal body mechanisms. Your electrolyte intake must avoid detection by your body's natural "radar system," yet be potent enough to support body functions and prevent cramping.

Electrolytes done right

Hammer Nutrition's *Endurolytes products* are full-spectrum electrolyte products designed to meet your body's complete electrolyte requirements. They will help you counter the effects of hyperthermia, optimize specific bodily functions, and enhance endurance performance, especially beyond the 2-hour mark.

Unlike many suppliers of electrolyte replacement products, we do not formulate Endurolytes to reflect the amount of electrolytes lost through perspiration. Sweat loss can vary greatly depending on dietary salt intake, size, fitness level, exercise pace, and heat and humidity.

In addition, your body can replace only about one-third of what it loses during exercise. If you try to replace all of the electrolytes lost, the hormones your body releases can trigger problems such as gastric distress, edema, muscle spasms, and cramping.



Endurolytes products are “electrolyte stress support formulas,” not electrolyte replacement products. They help your body perform better under the demands of exercise, especially in heat, by providing a full complement of minerals in the proper balance without interfering with normal body control systems.

HEED, Hammer Nutrition’s complex carbohydrate powdered sports drink, also contains a complete and easily assimilated electrolyte profile, not just salt and potassium, which is all that most other sports drinks contain. Some athletes find that a scoop or two of HEED in their water bottle will keep

them going strong for an hour or more. Others satisfy their complete electrolyte needs by consuming both HEED (an excellent base) and Endurolytes products.

Bottom line: Salty foods and salt tablets won’t cut it when it comes to electrolyte replenishment. Instead, adopt a low-sodium approach in your daily diet and obtain essential minerals to enhance natural hormone and enzyme actions. During exercise, rely on a product that will provide comprehensive electrolyte support without compromising internal regulation.

HN

Complete electrolyte support

Unlike salt tablets, which provide only two of the electrolytes your body requires, Endurolytes provide a full spectrum of electrolytes, along with complementary micronutrients:

Calcium – Needed for normal heart rhythm, healthy nerve transmission, and strong muscle contractions. During exercise, calcium-dependent enzymes produce energy from fatty and amino acid conversion.

Magnesium – Required for many of the enzymatic reactions involved in converting fuel to muscle energy.

Potassium – Needed for optimal concentration of sodium.

Sodium – When depleted (only after many hours of exercise), abnormal heartbeat and muscle twitching may occur. Because the average athlete already has a vast store of available sodium, and because consuming excess sodium can cause serious

problems, we recommend a moderate amount for replenishment.

Chloride – Critical for maintaining a proper balance and consistency of body fluids and electrolytes.

Manganese – Trace amounts help convert fatty acids and protein into energy.

Pyridoxine HCL – This water-soluble vitamin, B-6, is required for the metabolism of carbohydrates, fats, and protein, as well as for maintaining sodium-potassium balance.

L-Tyrosine – Protects thyroid and adrenal function, which can be lowered by endurance exercise.

Secret #4

PRE-EXERCISE FUELING

What and when to eat before your workouts and races.

Our recommendations

Adopt and consistently follow these pre-exercise/prerace fueling recommendations, and watch your performance soar! Properly timing your calorie intake before every exercise period will ensure maximum benefits and performance in training and competition, no matter the duration.

- Complete your prerace meal 3 hours before exercise.
- Consume 300-400 calories (complex carbs and a little protein).
- If you must eat before exercise, consume a small amount of supplemental fuel, such as Hammer Gel, about 5 minutes before starting.



*Will Darling comes to the starting line of the Wisconsin Off Road Series #10 with his prerace fuel dialed in for a 1st place AG finish.
Photo : Loren Darling*

It's one of the most common mistakes athletes of all kinds make: eating within an hour or two of competition or a workout. Having a bowl of cereal (no matter how healthy it is), an energy bar, or an energy drink in those critical hours before a workout or race will hurt—not help—your performance! The secret to proper pre-exercise fueling is really quite simple: You need to know what to eat, how much to eat, and most importantly, when to eat.

What: 300-400 calories of complex carbohydrates & protein

The purpose of your pre-exercise meal is to top off liver glycogen stores, which your body has expended during sleep. Muscle glycogen (about 80% of your total glycogen stores) remains intact overnight. If you had a proper recovery meal after your last workout, your muscle glycogen is already full.

With only your liver-stored glycogen to top off, you want a light meal. Sports nutrition expert Bill Misner, Ph.D., advises that a pre-workout/race meal should be “an easily digested, high complex carbohydrate meal between 300-400 calories with a minimum of fiber, simple sugar, and fat.” Dr. Misner explains that fat slows digestion and has no positive influence on fuels metabolized during an event, and a high-fiber meal (such as oatmeal) may increase the chance for an “unscheduled bathroom break.”

Some research suggests that including a small amount of protein may improve performance. (See “Good pre-exercise meals” at right.)

When: observe the 3-hour rule!

The timing of your pre-exercise meal is critical. Be sure to complete your meal no later than 3 hours before your workout or race, regardless of its duration. That means fork or spoon down at 6 a.m. if your event starts at 9 a.m.

Three hours allows enough time for your body to fully process the meal and avoid intestinal distress.

Fast facts:

Don't sacrifice critical sleep just to squeeze in a meal. Sleep is more beneficial. If you begin fueling 10-20 minutes after the start of your event, your performance will not suffer.

Being hungry before you exercise won't hurt performance. If you must eat something, about 5 minutes before the start consume 100 calories of a nutrient-dense fuel such as Hammer Gel.

The night before an event, eat light and clean: no refined sugar, saturated fats, or alcohol. Eat until you're satisfied—no more.

Good pre-exercise meals include: one banana and 1 cup active yogurt; Cream of Rice cereal sweetened with 1 serving Hammer Gel; one soy protein-enhanced pancake sweetened with 1 serving Hammer Gel; half a skinless baked potato with 1/2 cup plain active yogurt

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Pre-Exercise Fueling - What and when to eat before your workouts and races.

Dr. David Costill's landmark study [Costill D.L., Carbohydrates for exercise: dietary demand for optimal performance. *International Journal of Sports Medicine* 9:1-18 (1988)] showed that consuming complex carbohydrates 3-4 hours prior to exercise raises blood glucose and improves performance.

Observe the 3-hour no-eating window and you'll discover that you feel "lighter on your feet" during exercise, allowing you to push harder and still feel great.

On the other hand, consuming high glycemic carbohydrates (whether simple sugars or complex carbohydrates) within 3 hours of exercise can seriously hamper performance. According to Dr. Bill Misner, the consequences include:

- **Reduced fats to fuels conversion.** Our ability to utilize stored fatty acids as energy largely determines our performance.
- **Faster muscle glycogen depletion.** High insulin levels as a result of recent carbohydrate consumption lead to an increased rate of carbohydrate metabolism and carbohydrate fuel depletion. In simple terms: high insulin means faster muscle glycogen depletion.

The combination of accelerated glycogen depletion and disruption of your primary fuel availability can devastate performance. Complete your pre-workout/race fueling 3 hours prior to the start of your workout or race to allow adequate

time for your insulin and blood glucose levels to normalize.

High intensity, short duration exercise

For exercise that lasts less than 60 minutes but requires intense energy—such as cyclocross, a 40K time trial, 5K, 10K, wrestling, or tennis—the 3-hour rule is even more critical than for any multi-hour effort. Here's why.

For your body to give 100% of its effort and resources throughout the entire event, it needs to focus on that singular task. It should not have to digest food simultaneously or deal with "porpoising" (rising/falling/rising) blood sugar levels. At the start you want to be warmed up, stomach empty, and have muscles and liver glycogen stores topped up. When you start competing or working out, your blood sugar levels should be spiking for the first time, and then should stay high for the duration of your event. The key to achieving this is to strictly observe the 3-hour rule. About 10 minutes before you start, consume one serving of Hammer Gel, 2 Endurolytes or 1 Endurolytes Extreme, and 4-8 ounces of water, and you'll be set.

Bottom line: Though these recommendations may seem counterintuitive, they make perfect sense physiologically speaking. Over the course of more than 27 years we can honestly say that we've yet to have one athlete tell us that these fueling principles didn't work. Apply them consistently and watch how well your body responds. **HN**

Secret #5

POST-EXERCISE FUELING

For better performance tomorrow, recover right today!

Our recommendations

Within 60 minutes after your workout or race, consume:

- 30-60 grams of high-glycemic complex carbohydrates
- 10-20 grams of protein, preferably whey isolate
- complementary amino acids and micronutrients

Two to six scoops of Recoverite supply the recommended amounts in the ideal ratio for restoring glycogen, rebuilding muscle tissue, and reducing soreness. Recoverite also supplies a full spectrum of recovery enhancing micronutrients and electrolytes.

*Hannah Stedje recovers from her 1st place marathon finish with a bottle of Recoverite.
Photo : John Stedje*



Fast facts:

For maximum glycogen replenishment, consume 30-60 grams of high-quality, complex carbohydrates as soon as possible after exercise.

Compared to simple sugars, complex carbohydrates allow more calories to be absorbed for conversion to glycogen.

Whey protein isolate (not concentrate) is virtually free of lactose and fat, and ideal for recovery.

For endurance athletes who want lean muscle mass, a 3:1 carbohydrate to protein ratio (as provided in Recoverite) is best during recovery.

It's important to replenish vitamins and minerals depleted during exercise with a full-spectrum supplement, such as Premium Insurance Caps.

Free radicals produced during exercise can cause significant damage. Neutralize them with antioxidants.

Training alone will not yield the results you hope to achieve as an athlete. Whether your goal is a new PR or simply becoming fit and feeling strong, recovery must be a key part of your overall regimen if you want to achieve results. Taking a few extra minutes to properly refuel after you exercise—when your body is in a state of prime receptivity—will help restore your body's premium fuel (glycogen), rebuild muscle, and strengthen your immune system. To maximize your training and improve race-day performance, learn these keys to recovery success.

Rehydration

Water has no nutrient value but it's essential for performance and recovery. As a rule of thumb, you want to finish a workout with no more than about 2% body weight loss. Weight loss of more than 2% signals performance decline and dehydration. Within the first several hours after your workout, aim to drink about 1 pint of fluids for each pound (roughly 475 ml/kg) of weight lost during a workout or race. That's fairly easy, and you can get much of that through your nutritional replenishment, which we'll cover next.

Carbohydrates

Your body benefits from two key nutrients during recovery: carbohydrates and protein. Consuming carbohydrates after exercise will help your body replenish its premium fuel, glycogen. Carbohydrates also give muscles energy to absorb amino acids from the bloodstream, helping to initiate protein synthesis.

Several studies have shown that pre-exercise muscle glycogen level is the most important energy determinant for exercise performance. Athletes who have more of this readily available fuel in their bodies have a definite advantage.

The good news is that you can substantially increase your glycogen storage capacity through the process of training and replenishing. During the recovery phase, your body converts carbohydrates from food into glycogen and stores it in muscle cells. This also drives the muscle repair and rebuilding process.

To maximize glycogen synthesis and storage during recovery:

- **Consume carbohydrates within 60 minutes after exercise.** Researchers at the University of Texas at Austin demonstrated that glycogen synthesis was highest when test subjects consumed carbohydrates immediately after they exercised.
- **Choose high-glycemic complex carbohydrates.** A high-glycemic complex carbohydrate (like the maltodextrin in Recoverite) is

ideal because it spikes levels of insulin in the blood—and that's desirable after exercise. Insulin replenishes muscle glycogen, stimulates protein synthesis (needed to repair and rebuild muscles), and suppresses protein breakdown. And unlike the simple sugars used in most recovery products, maltodextrin is easily digested and rapidly assimilated. It efficiently restores muscle glycogen and promotes muscle repair without causing stomach distress.

Protein

Protein in your post-workout fuel provides raw materials to rebuild stressed muscles, enhances glycogen storage, and supports the immune system. For recovery between workouts, we recommend whey protein isolate as the best protein source. Here's why:

- **Whey works fast.** Whey has the highest Biological Value (BV) of all proteins. BV is considered an accurate indicator of how well and how quickly your body uses a protein that you consume. Whey protein isolate (the purest form of whey protein) has an outstanding BV of 154; whey protein concentrate has a rating of 104. **Hammer Whey** and **Recoverite** both use whey protein isolate, not whey concentrate. Whey protein isolate is purer: 90-97+% protein and virtually free of fat and lactose. Whey concentrate contains only 70-80% protein.



Post-Exercise Fueling - For better performance tomorrow, recover right today!

- **Whey is better for muscle repair.** Compared to soy, whey protein isolate is a much better source of branched chain amino acids (BCAAs), including three crucial to the muscle tissue repair process: leucine, isoleucine, and valine.
- **Whey supports the immune system.** Whey protein contains excellent levels of the amino acids associated with glutathione. This critically important antioxidant often becomes depleted due to aging, stress, and environmental toxins. Ward Dean, MD, a leading nutritional scientist, calls glutathione a “master antioxidant” that “has major effects on health at the molecular, cellular, and organ levels.”

Micro essentials

Research has revealed that small amounts of several other substances can give a big boost to recovery, too. Recoverite contains all three of the following recovery-boosting essentials, as well as a full-spectrum of electrolytes and antioxidants.

L-glutamine preserves and rebuilds lean tissue, supports the immune system, boosts glutathione levels, and aids gastrointestinal health.

L-carnosine offers antioxidant and antiglycation benefits. Glycation is a process that causes irreversible damage to the body’s proteins; some scientists cite it as an underlying cause of age-related problems.

Chromium polynicotinate boosts glycogen synthesis. Studies suggest that athletes who consume it (along with ample carbohydrates) within 2 hours of exercise can experience a 300% increase in glycogen synthesis.

Hammer Nutrition’s Recoverite also contains the antioxidants cysteine, methionine, glutamic acid, glutamine, and carnosine. As an athlete, you consume huge amounts of oxygen and metabolize far greater amounts of calories than a sedentary person does, so your need for antioxidants is far greater. Prolonged exercise produces many different types of free radicals, and each antioxidant targets different free radicals. That’s why it’s important to supplement with a variety of antioxidants, such as those in Recoverite.

To further boost immunity, take antioxidant supplements—including Hammer Nutrition’s **AO Booster**, **Super Antioxidant**, **Race Caps Supreme**, and **Mito Caps**—after your workouts, and eat a diet rich in antioxidant foods such as almonds, blueberries, broccoli, and carrots.

Bottom line: If you give as much attention to your recovery as you do to your training, you’ll have a distinct edge over other athletes. Replenish your body within 60 minutes of exercise with adequate complex carbohydrates, whey protein isolate, and antioxidants, and experience the difference it will make in your performance and overall health. **HN**

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The Hammer Nutrition Top 10

ENDURANCE FUELS

RECOVERITE

- Reduces soreness
- Rebuilds muscle tissue
- Restores muscle glycogen

Recoverite Flavors: Chocolate, Orange-Vanilla, Strawberry, Vanilla

HAMMER GEL

- Provides rock solid energy
- Raises blood sugar levels fast
- Smooth and easy to digest

Hammer Gel Flavors: Apple-Cinnamon, Banana, Chocolate, Espresso, Montana Huckleberry, Nocciola (Hazelnut-Chocolate) Orange, Peanut Butter, Peanut Butter-Chocolate, Raspberry, Tropical, Unflavored (26 servings only), Vanilla

HEED

- Provides steady energy
- Buffers lactic acid
- Helps prevent cramps

Recoverite Flavors: Chocolate, Orange-Vanilla, Strawberry, Vanilla

HAMMER WHEY

- Maintains & repairs lean muscle tissue
- Glutamine-fortified to enhance recovery
- Provides superb immune system support

Hammer Whey Flavors: Chai (24 servings only), Chocolate, Strawberry, Unflavored (24 servings only), Vanilla

HAMMER BARS

- Reliable, long-lasting energy
- Enhances endurance & recovery
- Easy to digest

Hammer Bar Flavors: Almond-Raisin, Cashew Coconut, Chocolate Chip, Chocolate Chip, Cranberry, Oatmeal Apple

ENDURANCE SUPPLEMENTS

RACE CAPS SUPREME

- Reduces muscle fatigue
- Enhances energy and endurance
- Increases workload capacity

PREMIUM INSURANCE CAPS

- Increases energy all day
- Supports peak performance & health
- Improves digestion

TISSUE REJUVENATOR

- Reduces pain, inflammation & swelling
- Increases joint integrity and mobility
- No NSAID side effects

MITO CAPS

- Improves energy production
- Provides superior antioxidant support
- Improves fat metabolism

PHYTOLEAN

- Blocks absorption of starchy carbs
- Enhances fat burning
- Decreases fat absorption



5 SOS

Secrets of Success for Endurance Fueling

- #1 **Proper Hydration**
- #2 **Calories Count**
- #3 **Electrolyte Replenishment**
- #4 **Pre-Exercise Fueling**
- #5 **Post-Exercise Fueling**

*World champion Stand Up Paddleboarder and Hammer Nutrition-sponsored athlete Connor Baxter fuels right and feels great with Hammer.
Photo : Courtesy Connor Baxter*

