

A Complete Guide to Electrolytes

*Everything you wanted to know about how salts
impact your performance, and keep you at the top
of your athletic game.*

Brought to you by:



Thank you for reading our Complete Guide to Electrolytes!

Before jumping into all of the science-y stuff that will keep you safe, hydrated, and performing at your best, we wanted to say “thank you” and give you a little background on SaltStick.

What is in this eBook?

This eBook is our attempt to provide an overview of the science behind electrolytes and how a proper hydration plan can help you perform your best in training or on race day. In the following pages, you’ll get a scientifically-backed overview of four key electrolytes lost in sweat: sodium, potassium, magnesium, and calcium, as well as their impacts on your physical health and performance. Because we know it’s hard to incorporate changes to your diet, we’ve included more than 20 recipes at the end that will inspire you to increase your natural consumption of these important minerals, so that you can keep performing at your best.

Who is this eBook for?

While the eBook is geared toward endurance athletes (including runners, triathletes, cyclists, rowers, cross-country skiers, and swimmers), anyone can take advantage of increased knowledge of hydration. Those interested in a wide range of activities can also benefit, including CrossFit, yoga, zumba, and aerobics. Finally, emergency personnel such as firefighters, who are required to perform in hot environments, can also benefit from knowing more about how to stay properly hydrated.

What is SaltStick?

SaltStick products help Reduce Muscle Cramping, Reduce Heat Stress, Maintain Electrolyte Levels, and Boost Stamina. They are the ONLY electrolyte products formulated to closely resemble the electrolyte profile lost in sweat, and the FIRST electrolyte products that include Vitamin D to help the body absorb and utilize calcium.



Learn about SaltStick Caps [here!](#)



Learn about SaltStick Caps PLUS [here!](#)



Learn about SaltStick FASTCHEWS [here!](#)

Why is SaltStick the ideal electrolyte supplement?

Five electrolytes in particular play a pivotal role in maintaining normal human muscle function: sodium, potassium, magnesium, calcium, and chloride. A shortage of any of these electrolytes will affect athletic performance through a range a subtle to serious side effects. Sweat typically has about 1000 mg sodium/liter, a typical sports drink has 440 mg sodium/liter. If, during the course of training, you ingest nothing but sports drinks (or worse, water), you will become hyponatremic (low sodium) at some point. Many sports drinks also do not address any form of supplementation of the other key electrolytes, potentially causing yet further cramping and muscle issues. Thus, it's in your best interest to ensure that replacement of the full spectrum of electrolytes is replaced, and in a form and quantity the body can absorb, such as that provided conveniently in a SaltStick Capsule. For more information: [Salt Science](#).

SaltStick is different from most electrolyte supplements because:

It replaces what you lose through sweat: SaltStick is the ONLY electrolyte product that was formulated to closely resemble the electrolyte profile lost during activity: sodium, potassium, calcium and magnesium. The products were engineered by [a Ph.D. chemist](#) who is also a pro triathlete, so you know they are geared toward helping YOU perform at your best.

Product	Sodium (mg)	Potassium (mg)	Magnesium (mg)	Calcium (mg)
Sweat (per 315mL)	220	63	8	16
SaltStick Caps	215	63	11	22
SaltStick Caps PLUS caffeine	190	53	7	14
SaltStick FASTCHEWS	50	15	3	5

Learn more about SaltStick products [here](#).

It contains electrolytes and nothing else: SaltStick's buffered salt composition helps digestion and absorption. The vegetable-based non-GMO capsule composition includes bio-available active ingredients, and that's it! No herbal, trace, or questionable components added. No high-fructose corn syrup and no sweeteners of any kind. SaltStick is also vegetarian and gluten-free.

What are my options?

Purchase SaltStick: Find your nearest SaltStick retailer by heading to saltstick.com/storelocator/locator.htm

Learn more about SaltStick: Check out all our products and company history at saltstick.com

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Important note about this eBook: All content in this eBook should not be construed as medical advice. Contact your physician before starting any exercise program or if you are taking any medication. Individuals with high blood pressure should also consult their physician prior to taking an electrolyte supplement. Overdose of electrolytes is possible, with symptoms such as vomiting and feeling ill, and care should be taken not to overdose on any electrolyte supplement.

Part 1: Sodium

Part 1: How does the body use sodium?

Like all of the electrolytes we'll discuss this e-book, sodium is critically involved in many different processes in the body.

Blood pressure

Sodium is known as an “extracellular” compound, meaning it mainly exists outside the cell walls, in the plasma. By shifting water from the blood to inside cells, and vice versa, the body alters the balance between water and sodium levels to regulate blood pressure. The process goes awry when you consume too much (or too little) sodium, which is why your hands swell when you eat too much salt at once. The body sucks water from the cells into the extracellular fluid to maintain appropriate sodium-to-water ratios (osmolality). By consuming more water, the body is able to release excess sodium through urine and balance levels to normal.

Sweat

Sodium is the main electrolyte lost through sweat. This is why your face tastes salty after a long run in the heat, especially if you are a heavy sweater. It's also likely why you crave salt after a long run -- a study (1999, [Appetite](#)) of 21 college-age students found that salt cravings increased for as much as 12 hours after a one-hour bout of exercise.

Fluid regulation

Every cell in the body utilizes what's commonly known as the sodium-potassium pump to regulate fluid levels inside cells. The body naturally stores sodium outside the cell walls (remember “extracellular?”) and potassium exists in higher concentration inside cells. However, nature tries to balance things out (the same process that occurs in heat dissipation, or a drop of food coloring dispersing through water, i.e. things naturally move from an area of higher concentration to lower concentration), and the concentrations of sodium and potassium seek to equalize overtime. The constant transfer of potassium and sodium in and out of the cells contributes to how the body manages fluid levels.

Nerve impulses

Because sodium is an ion, meaning it has an electrical charge, concentrations of sodium allow electric charges to build within an area of the body or in an area of a cell. Nerves utilize these electric charges to send messages to the brain and to direct the muscles to contract or relax. The role in muscle contraction is one of the key reasons electrolytes are so important during exercise.

Part 2: Should endurance athletes care about sodium?

The body is very adept at managing sodium/water ratios, and it can easily manage up to 90 minutes of exercise without supplementation. In fact, several studies have found that salt intake has negligible impact on performance when exercise tests last less than two hours.

The science

Only after extended exercise duration does sodium contribute to increased stamina. As we have previously highlighted [on our blog](#), another 2015 study (this one published in the [Scandinavian Journal of Medicine & Science in Sports](#)) found that in distances such as the half Ironman race (70.3 miles in total), sodium supplementation does matter.



PHOTO: Pro triathlete Mirinda Carfrae runs toward her 2014 victory at Ironman Kona in Hawaii. From: SaltStick archives.

In order to test the theory that increased salt supplementation caused a boost in endurance performance, researchers at UCJC divided medium-distance triathletes into two groups. Twenty-six experienced triathletes were matched for age, anthropometric data, and training status, and randomly placed into the salt group (113 mmol Na⁺ and 112 mmol Cl⁻) or the control group (cellulose capsule). The first group completed a half-Ironman race (1.2 mile/1.9k swim, 56 mile/90k bike, and 13.1 mile/21.1k run) consuming sports drink as they usually would, but also consuming [SaltStick Caps](#) in order to replace sodium lost through sweat. The second group completed the same distance while consuming sports drink as they usually would, but they received a placebo capsule with no extra sodium.

When the triathletes completed the race, researchers tallied up finishing times and found that the triathletes who consumed the sodium tablets finished in an average of 26 minutes (8%) faster!

When the triathletes completed the race, researchers tallied up finishing times and found that the triathletes who consumed the sodium tablets finished in an average of 26 minutes (8%) faster! The increase in speed usually came from improved cycling and running times, which come later in the race after electrolyte levels begin to decline.

Part 3: What does a sodium deficiency look like?

As we wrote above, the body is very good at managing sodium concentration. However, sodium is not produced by the body, and it must be consumed throughout the day. If you chronically under-consume sodium (which can sometimes happen for extremely disciplined endurance athletes over-restricting sodium for health concerns), you will hamper your body's ability to manage blood pressure, fluid levels, muscle contraction, etc. A sodium deficiency can commonly manifest itself in [headaches, insomnia and extreme fatigue](#) (partly due to very low blood pressure).

In races, low sodium levels can contribute to a range of symptoms, the most severe of which is hyponatremia.

In races, low sodium levels can contribute to a range of symptoms, the most severe of which is hyponatremia. This dangerous medical condition can lead to nausea, fatigue, cramping, vomiting, weakness, sleepiness, and in rare severe cases, even death. Low sodium concentration can be obtained by either excessive fresh water consumption or too little electrolyte replacement with normal water intake.

On the lesser extreme, low sodium levels can result in what's known as "bonking," "hitting the wall," or simply running out of energy. After experiencing dizzy spells in early races, SaltStick-sponsored professional triathlete [Lauren Goss](#) realized she was drinking too much water in lieu of electrolytes. This left her in a state of fatigue, muscle cramping and the feeling of "bonking." (You can read more about it in the "[Salt Science](#)" section of our website.)

"I was drinking so much water and flushing my system of all electrolytes and this was causing me to have a bonking sensation," Lauren said. "Since I have started using SaltStick, I have maintained a healthy balance of electrolytes and water and finish my races strong now."

Make sure you don't bonk!

We provide [a guide to using SaltStick](#) on our website, and we encourage you to check it out so you can tailor a nutritional plan to your specific needs. For an overview of the electrolytes SaltStick provides, check out our blog post "[Why You Need Salt and Where to Get It.](#)"

Part 4: How should endurance athletes incorporate sodium into their daily diets?

Outside of lengthy workout sessions, endurance athletes have wide flexibility in how they approach sodium. Health officials generally agree that the average Western diet is already too high in sodium and would benefit from a reduction in sodium intake. The [USDA](#) advocates for less than 2,300 mg of sodium per day, and the [American Heart Association \(AHA\)](#) is stricter at less than 1,500 mg a day. However, 90 percent of U.S. adults consume too much sodium, and on average, we consume about 3,400 mg a day.

Outside of lengthy workout sessions, endurance athletes have wide flexibility in how they approach sodium.

As sodium consumption increases, output in sweat also increases to maintain a healthy level in our body. Your body become acclimatized to this intake, and “needs” more sodium to maintain this level of function. However, athletic performance drives up the loss of sodium through sweat. If your diet already contains a lot of sodium, you’ll need to maintain a higher level of sodium in your body to keep homeostasis (balance) and your ability to function under athletic stress. This can be accomplished by higher doses of electrolyte supplementation. If your diet is lower in sodium, you will still lose electrolytes through sweat, but you can maintain your appropriate blood electrolyte level with less supplementation.

In many respects, the ideal situation is to live a low-sodium diet and supplement during heavy training and racing as needed. Using [SaltStick Caps](#) electrolyte capsules will allow you to do this easily, and to customize your dose based on individual need.

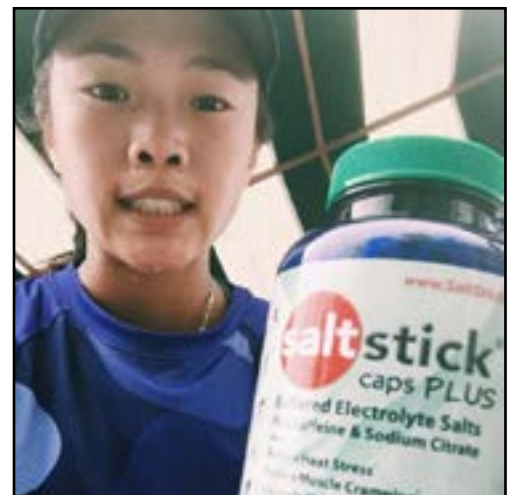


PHOTO: SaltStick-sponsored tennis player Danielle Lao shows off her SaltStick Caps PLUS after a sweaty practice.

Stay tuned to the end of the eBook, where we share some recipes to help you get optimal amounts of sodium!

Part 2: Potassium

Part 1: How does the body use potassium?

Potassium is the primary electrolyte located inside the body's cells (intracellular) and stored in muscle fibers along with glycogen. Like all electrolytes in our e-book, potassium has a variety of roles in the body.

Blood pressure

For the past 20 years, [scientists have found](#) that people with high blood pressure who don't want to lower their salt intake can simply consume more potassium-containing foods (such as bananas, potatoes or berries). Why? Because the balance of the two minerals is what matters. In fact, Dutch researchers determined that a low potassium intake has the same impact on your blood pressure as high sodium consumption. Additionally, [a 1997 study](#) by the National Heart, Lung and Blood Institute found that volunteers who consumed 4,700 mg of potassium per day through a well-balanced diet that included lots of fruits and vegetables reduced their blood pressure in just two weeks. This study ultimately became the foundation for today's [DASH diet](#).

Muscle contraction

As we discussed in last week's blog post, sodium and potassium ions operate through what's called the "sodium-potassium pump." Potassium passes through cell walls much more easily than sodium and naturally builds up inside cells. Sodium, on the other hand, is primarily stored outside the cell wall in the extracellular fluid (plasma). Recall from your undergrad biology class that nerves relay information through electric signals. Thus, the different concentrations of sodium and potassium inside and outside of the cells build up slight electric charges, which help your nerves send information and manage muscle contractions. This is one reason low electrolytes are sometimes thought to cause muscle cramps.

Fluid/nutrient regulation

This same sodium-potassium pump also contributes to fluid regulation. In nature, things naturally move from an area of high concentration to low concentration, and the imbalance of sodium and potassium causes these two ions to move in and out of cells, based on water content. As potassium ions transverse the cell walls, sugars, waste products, and nutrients pass with them, meaning potassium is also essential for transporting energy throughout the body.

Enzyme production

Potassium is also necessary for certain enzyme production, including adenosine triphosphate (or ATP, the prime source of energy for cells) and pyruvate kinase, an important enzyme involved in carbohydrate metabolism.

Part 2: Should endurance athletes care about potassium?

Absolutely! It is nearly impossible to find a local race without trays of oranges and bananas. In addition to being great sources of simple sugars, these fruits are full of potassium.

The science

Some exercise physiologists theorize that the sodium-potassium pump may contribute to exercise-induced fatigue. Recall from above that the body naturally stores potassium inside cells and sodium outside in the extracellular fluid

(plasma). However, studies of marathon runners ([1970, Journal of Applied Physiology](#)) have found that long exercise results in greater amounts of potassium outside the cells, which can contribute to cramping, bloating and general fatigue. The balance of sodium and potassium usually returns to normal about an hour after exercise in healthy adults.



PHOTO: After his 2015 Ironman Kona third-place finish, pro triathlete Tim O'Donnell likely experienced some fatigue! Some researchers believe a potassium deficiency is the cause of post-marathon fatigue.

A lack of potassium will slow down or halt nerve and muscle action.

For the technically-minded reader, here is a more in-depth explanation, via "[Salt Science](#)," a helpful guide on our website regarding electrolyte supplementation: The electrochemical gradient of potassium between intracellular and extracellular space is essential for nerve function; in particular, potassium is needed to repolarize the cell membrane to a resting state after an action potential has passed. This means that the presence of potassium is critical to "reset" the nerve for the next activity. Decreased potassium levels in the extracellular space will cause hyperpolarization of the resting membrane potential. As a result, a greater than normal stimulus is required for depolarization of the membrane in order to initiate an action potential. Simply, this means that lack of potassium will slow down or halt nerve and muscle action.

Part 3: What does a potassium deficiency look like?

Potassium deficiency symptoms include nausea, slow reflexes, vomiting, muscle weakness, muscle spasms, cramping, and rapid heart rate.

Plain water intake or hyper-hydration will exacerbate losses of potassium.

Note that, similar to sodium intake, high blood pressure patients have to pay extra close attention to potassium. According to a [University of Connecticut USATF](#) advisory, potassium levels lost in sweat can be a concern for people in general and especially for people taking diuretics for high blood pressure. Diuretics cause excessive excretion of potassium, and running could result in hypokalemia (low potassium). Also, plain water intake or hyper-hydration will exacerbate losses of potassium by sending the excess fluid to the kidneys for excretion at the expense of potassium.

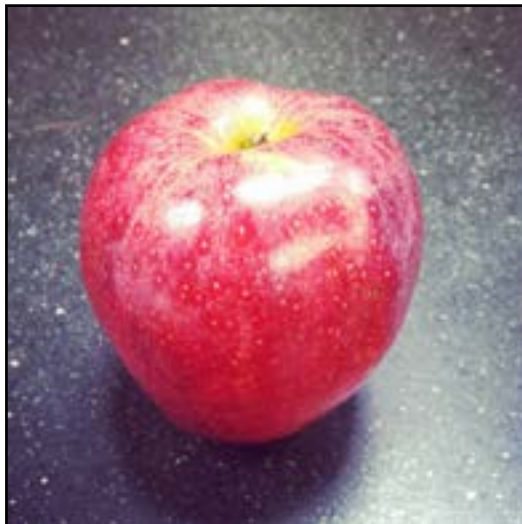


PHOTO: Fruit, including apples, are some of the best sources of potassium available to athletes.

Part 4: How should endurance athletes incorporate potassium into their daily diets?

The easiest way to get enough potassium is to eat lots of fruits and vegetables, which are full of potassium and many other vital nutrients and phytochemicals. There's nothing special about the effectiveness of the DASH diet (mentioned above), which is commonly used to help patients reduce blood pressure. It's composed of whole foods balanced across fruits, vegetables, whole grains and lean meats. Because of potassium's abundance in natural foods, you'll easily consume your 4,700 recommended mg per day.

The easiest way to get enough potassium is to eat lots of fruits and vegetables, which are full of potassium and many other vital nutrients and phytochemicals.

Fruit, including bananas, watermelon, cantaloupe, peaches, and grapefruit, is especially full of potassium, so enjoy that slice of watermelon after your next run! Another great source is sweet potatoes, which make an excellent post- or pre-workout source of carbohydrates.

Outside of exercise, supplementation is probably not necessary, due to the abundance of potassium in natural foods. Replenishing lost potassium during and after exercise is important, but athletes should be aware that hyperkalemia (high serum potassium levels) can cause electrical impulse disturbance, irregular heartbeat, and possibly death. Individuals should never take potassium supplements in large doses (beyond normal supplementation) without the advice of a physician. Just be sure to eat a balanced diet and reduce your intake of processed foods. You'll likely get more than enough potassium naturally.

Stay tuned to the end of the eBook, where we share some recipes to help you get optimal amounts of potassium!

Part 3: Magnesium

Part 1: How does the body use magnesium?

Overall, magnesium is a bit of a wonder-mineral. It's required for more than 300 different biological processes, and we've listed the major processes below. Unfortunately, despite magnesium's importance in everything from regulating blood pressure to bone health, more than 57 percent of U.S. adults do not consume adequate amounts, according to the USDA. If you're not meeting your daily needs (which are higher for athletes than sedentary adults), then you're hampering your body's ability to perform the following processes:

Energy production: Magnesium is crucial for the production of ATP, which is how your body "packages" energy. The body breaks down glucose from the bloodstream into ATP molecules, and these molecules are used to fuel cell functions that contribute to muscle contraction and metabolism. A magnesium deficiency can often result in lethargy, which is the result of a hampered energy-production process. A [2003 study](#) found that magnesium supplementation resulted in increased exercise stamina, relative to a placebo. Same goes for a later [2006 study](#), which found magnesium supplementation helped decrease the fatigue-inducing effects of lactate buildup.

Sweat

Though not in great amounts -- unlike sodium and potassium -- trace amounts of magnesium are lost through sweat, and they will need to be replaced. Luckily, each [SaltStick Capsule](#) contains magnesium in an amount proportional to the other electrolytes in sweat.

Muscle contraction

Mustard is currently a popular method used to prevent cramping in tennis players, and some researchers believe this is due to mustard's high magnesium content. There's [no consensus](#) or definitive study; however, many tennis player swear by its effects. Additionally, some [endurance athletes](#) report that magnesium supplementation has helped reduced chronic muscular tension.

Bone formation

Although calcium is a little more famous for building strong bones, magnesium is no less important. The body uses these two minerals together for bone health, and several studies of rats have found that magnesium deficiencies are linked to higher-than-normal risk for osteoporosis ([Journal of the American College of Nutrition](#), 2009; [Osteoporosis International](#), 2006).

Antioxidant

A growing body of evidence suggests that magnesium also acts as an antioxidant, protecting the body against free-radical damage. This is especially important to athletes, because free radicals can disrupt the body's ability to recover, causing inflammation and reduced performance. A [2003 study](#) of diabetic rats found that **magnesium supplementation reduced oxidative damage** caused by artificially-induced diabetes. A later [2007 scientific review](#) argued that **magnesium deficiency "induces a systemic stress response,"** and "contributes to an exaggerated response to immune stress and oxidative stress." The review also argued that inflammation caused by magnesium deficiencies contributed to risk for metabolic syndrome.

Part 2: Should endurance athletes care about magnesium?

“Magnesium supplementation or increased dietary intake of magnesium will have beneficial effects on exercise performance in magnesium-deficient individuals,” concludes a [2006 scientific review](#). Additionally, magnesium deficiencies have been [shown](#) to harm athletic performance, due to impaired carbohydrate metabolism and increased oxidative stress.

Magnesium supplementation or increased dietary intake of magnesium will have beneficial effects on exercise performance in magnesium-deficient individuals.

The science

A 2002 [study](#) of 10 women found markers of physical fitness (reduced oxygen uptake and heart rate at certain intensities) fell in direct proportion to levels of magnesium deficiencies. The study took place over three months, during which women were given the recommended daily amount (RDA) of magnesium for the first month, reduced levels of magnesium for the second month, and RDA levels for the third month. At the end of each month, oxygen uptake levels and heart rate were measured while the women exercised by cycling indoors. Oxygen intake and heart rate levels were significantly higher during the second month, but resumed to normal after the third month, thus indicating adequate magnesium levels are necessary for maximum exercise performance.

Notably, researchers have concluded that while magnesium deficiencies harm athletic performance, the benefits of magnesium supplementation stop once RDA levels are achieved. Consuming additional magnesium has not been shown to improve performance. Still, it is very important for athletes to be aware of magnesium levels, as ***strenuous exercise is associated with increased needs for magnesium***, due to mineral loss through sweat and urination. This is especially cause for concern given that more than [60 percent](#) of men and women consume less than the RDA for sedentary people.

In conclusion, the answer is obvious: Yes, magnesium is crucial for endurance success.

Part 3: What does a magnesium deficiency look like?

Because magnesium is essential for more than 300 different bodily functions, a deficiency can manifest itself in just as many ways. As *Triathlete Magazine* correctly points out: “Athletes in particular might find it easy to explain away fatigue or muscle cramps, lowered immunity, and even altered heart rates, and indeed these symptoms are common and multi-faceted in cause. However, a simple magnesium deficiency could also be the underlying factor.”

High levels of sugars or sugary drinks in a diet sometimes correlates with low levels of magnesium.

The biggest symptoms include chronic fatigue and muscle cramps, but these are not exclusively caused by a magnesium deficiency. Nor are other common symptoms, such as migraines, anemia, depression, irregular heart rates, or insulin resistance. How, then, would one know if a magnesium deficiency is the cause?

We suggest checking your diet. The body does not produce magnesium, and the mineral must be absorbed from food or supplements. The following dietary traits could indicate you aren't meeting your magnesium needs:

- High levels of alcohol consumption
- Low levels of dark leafy greens, legumes, nuts, seeds and whole grains (all excellent sources of magnesium)
- A calorie-restricted diet (in effort to lose or control weight) of less than 1,800 calories per day
- High levels of sugars or sugary drinks



PHOTO: Remember, fruit is one of the best natural sources of electrolytes!

Part 4: How should endurance athletes incorporate magnesium into their daily diets?

Race nutrition: How SaltStick can help: Like all nutrients needed by the body, an athlete's ideal magnesium levels can only be determined in relation to every other mineral in the body, particularly calcium. (We cover this concept more extensively in [this blog post about ratio-based nutrition](#).) When it comes to electrolytes lost through sweat, sodium, potassium, calcium and magnesium are lost in a 220-63-16-8 ratio for the average athlete. To ensure the full spectrum of electrolytes is replaced, **a *SaltStick Capsule conveniently provides the same ratio***, and in a form and quantity the body can absorb. While the exact ratio also varies from person-to-person, supplying your body with building blocks in about the right amount is key. For the athlete interested in how SaltStick Caps can help maintain electrolyte levels during training, we provide a complete suggested usage guide here: [Training with SaltStick Capsules](#).

Outside of training and racing, magnesium can be obtained naturally.

Outside of training and racing, magnesium can be obtained naturally. Athletes can meet their daily magnesium needs by including foods rich in magnesium content. These include:

- Pumpkin seeds (532 mg per serving)
- Almonds (300 mg per serving)
- Sesame seeds (200 mg per serving)
- Walnuts (158 mg per serving)
- Whole grain bread (85 mg per serving)
- Spinach (80 mg per serving)
- Broccoli (30 mg per serving)

Other great options include Brazil nuts, bananas, peanuts and other legumes. If you're an endurance athlete in the midst of heavy training, you're likely consuming far more than 1,800 calories per day. As long as you include mid-sized portions of the foods listed above, you're likely meeting your magnesium needs. For inspiration, check out our recent post about how to include five magnesium-filled foods into your diet. Later this week, we'll share some delicious recipes to help you get optimal amounts of magnesium!

Stay tuned to the end of the eBook, where we share some recipes to help you get optimal amounts of magnesium!

Part 4: Calcium

Part 1: How does the body use calcium?

Calcium is used by the body in five main ways.

Bone formation

This one is a little obvious, but we'd be remiss if we didn't mention that calcium is necessary for strong bones -- especially in high-impact sports such as running or tennis. The skeletal system is partially made of calcium, and the constant breakdown and build-up of bones through impact requires adequate calcium levels in your diet. Nutritionists often recommend higher levels of calcium for endurance athletes, yet many athletes do not get the [recommended daily amount](#) of 1,000 mg per day for men and 1,000 - 1,300 mg per day for women. Additionally, the National Institutes of Health has published [data](#) that link inadequate calcium intake with higher levels of risk for osteoporosis.

Muscle contraction

As far back as the [1960s](#), scientists have known that muscle contraction is partly caused by calcium. Nerve impulses stimulate muscles to contract by pumping calcium in and out of the cells -- a process known as the "calcium pump." The difference concentrations of intra- and extracellular calcium ions during muscle contraction has been documented by several studies, including this 1975 [Biophysical Journal](#) study. Because of its importance in the muscle contraction process, low calcium levels are often thought to contribute to cramps.

Improved fat-burning

Fat-burning is especially important to endurance athletes. While glycogen stores are limited, fat is a nearly unlimited energy source, provided the body is efficient at burning fat during exercise. The greater an athlete's ability to burn fat, the higher his or her endurance will be. A [2012 study](#) out of the University of Central Lancashire concluded that "calcium plays a multifactorial role in performance enhancement of endurance events ... via a combination of influence on substrate metabolism and body composition." Participants exercised 60 minutes on a stationary bicycle after four weeks of calcium supplementation, and researchers observed increased fat oxidation during exercise. Researchers also noted increased power output -- without increased oxygen consumption -- which indicated improved cycling efficiency.

Improved weight loss

Calcium is needed to activate lipase, the enzyme that breaks down fat stores to produce energy, and a calcium deficiency impairs this process and hampers weight loss. Researchers in the [2012 UCL study \(mentioned above\)](#) noted that "calcium supplementation significantly improved body composition of the participants with a greater fat loss and increased lean mass." Also, a [2006 study](#) by researchers at the University of Washington examined data from more than 5,000 women aged 53 to 57 over a ten-year period. They found that while most of the women gained some weight, those who consumed at least 1,100 mg of calcium per day (the recommended daily amount is 1,200 mg per day) gained two pounds less than their counterparts. The study also indicated calcium supplementation could aid in weight loss.

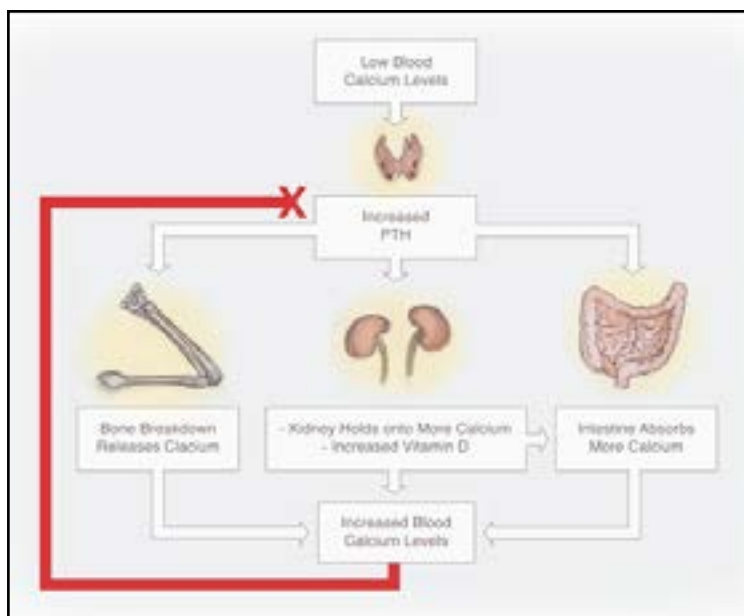
Sweat

Like all electrolytes in this e-book, calcium is lost through sweat. That's why each [SaltStick Capsule](#) contains calcium in an amount proportional to the other electrolytes in sweat.

Part 2: Should endurance athletes care about calcium?

Absolutely! Strong bones, optimal muscle contraction, sweat and fat oxidation are all necessary for optimal endurance performance.

Moreover, low calcium levels can greatly inhibit your ability to perform in training and on race day. The American Association of Endocrine Surgeons provides a great [graphic](#) (see below) illustrating the effects of low calcium levels in the blood. Blood-calcium levels are controlled by the parathyroid gland, and if levels drop too low, the gland will release hormones that (1) cause the intestine to absorb more calcium, (2) cause the kidneys to retain more calcium, or (3) cause the body to break down bone. The last effect (breaking down bone) is particularly concerning to endurance athletes because the body already undergoes high



levels of stress on the skeletal system from impact (largely through running). A [2012 study](#) found that adolescents and adults who participate in endurance sports, such as running, and non-weight-bearing sports, such as biking and swimming, often have lower bone mineral density (BMD) than athletes participating in ball and power sports, and sometimes their BMD is lower than their inactive peers. It's important to note the link between endurance sports and bone loss is contested, though. A [2009 study](#) found the exact opposite result: In men, aged 19 - 45, runners had greater spine BMD than cyclists, indicating high-impact sports increase BMD.

Perhaps the best evidence comes from a 2005 [Sports Medicine](#) study, which linked endurance exercise with increased bone density, **with the caveat that**

adequate calories and calcium is consumed. Researchers found that “physical activity increases growth in width and mineral content of bones in girls and adolescent females, particularly when it is initiated before puberty, carried out in volumes and at intensities seen in athletes, and **accompanied by adequate caloric and calcium intakes.**” This study also found that “after menopause, effectiveness of exercise to increase bone mineral depends heavily on **adequate availability of dietary calcium.**”

Only by consuming adequate levels of calcium in the diet can this unnecessary bone breakdown be avoided.

What about Vitamin D? The body absorbs dietary calcium from the intestines with the help of Vitamin D, which is why you often see calcium and Vitamin D paired together as a solution to bone loss. If a person's Vitamin D levels are too low, the body will leach calcium from the bones, which decreases bone strength and contributes to osteoporosis. Low Vitamin D levels have also been [linked](#) to many common cancers, multiple sclerosis, rheumatoid arthritis, hypertension, cardiovascular heart disease, and type I diabetes. This is why each [SaltStick Capsule](#) contains 100 IU Vitamin D, to help with calcium ingestion.

Part 3: What does a calcium deficiency look like?

Because the body responds to calcium deficiencies by leaching calcium from the bone, symptoms include higher risk for stress fractures and brittle nails and teeth. Low calcium levels have also been linked with increased risk for cancers, particularly colon cancer (2000, [Cancer Causes and Control](#)).

Women are more at risk for low calcium levels, especially older women or women who are pregnant.

Who is at risk? Women are more at risk for low calcium levels, especially older women or women who are pregnant. Hormones released during menopause increase calcium loss in the bones and decrease calcium absorption, which is why calcium RDA increases from 1,000 mg per day to 1,300 mg per day for women at or above menopause age. Also, a 2004 study found U.S. women are less likely than men to consume adequate calcium from their diets.

Also at risk are people who avoid dairy, out of dietary choices or lactose intolerance. This is not to say adequate calcium levels cannot be maintained through other means -- just that you'll need to take extra steps to eat a balanced diet to obtain your calcium.



PHOTO: A special SaltStick brew from Zombie Runner. Find them at www.zombierunner.com.

Part 4: How should endurance athletes incorporate calcium into their daily diets?

Race nutrition: How SaltStick can help: Like all nutrients needed by the body, an athlete's ideal calcium levels can only be determined in relation to every other mineral in the body, particularly magnesium. (We cover this concept more extensively in [this blog post about ratio-based nutrition](#).) When it comes to electrolytes lost through sweat, sodium, potassium, calcium and magnesium are lost in a 220-63-16-8 ratio for the average athlete. To ensure the full spectrum of electrolytes is replaced, **a [SaltStick Capsule](#) conveniently provides the same ratio**, and in a form and quantity the body can absorb. While the exact ratio also varies from person-to-person, supplying your body with building blocks in about the right amount is key. For the athlete interested in how SaltStick Caps can help maintain electrolyte levels during training, we provide a complete suggested usage guide here: [Training with SaltStick Capsules](#).

Outside of training and racing, calcium can be obtained naturally.

Outside of training and racing, calcium can be obtained naturally. Athletes can meet their daily calcium needs by including foods rich in calcium content. These include low-fat dairy products, such as skim milk and low-fat cheeses or yogurt, which all contain between 300 and 400 mg per serving. For the vegan or paleo athlete, or for people with lactose intolerance, calcium can also be obtained from these sources:

- Canned fish, with bones, such as salmon or sardines (250 to 350 mg per serving)
- Dried figs (300 mg per serving)
- Fortified cereals, juices, or tofu (250 - 400 mg per serving)
- Sesame seeds (280 mg per serving)
- Spinach (240 mg per serving)
- Broccoli (180 mg per serving)



PHOTO: Figs are an excellent plant-based source of calcium, with 300 mg per serving. Photo source: [Pixabay.com](#).

Stay tuned to the end of the eBook, where we share some recipes to help you get optimal amounts of calcium!

Part 5: Recipes

Let's start with sodium!

Now that you are a sodium expert, the next step is figuring out how to incorporate your knowledge into everyday nutrition plans. We thought we would make that process a little easier by providing you with five delicious recipes containing sodium naturally.

It's probably not surprising that all of these recipes are savory. Sodium naturally occurs in savory foods like beets, carrots and meats, and you don't even need to add salt to bring out the warming flavors. Nevertheless, if you feel these foods' saltiness is lacking, it's probably okay to add a dash or two of salt. In order to maintain adequate sodium levels, we advise you to salt your food to taste. Your body will tell you when it's running low.

In order to maintain adequate sodium levels, we advise you to salt your food to taste. Your body will tell you when it's running low.

1. Oven-Roasted Celery and/or Carrots:

Celery and carrots are nearly ubiquitous in savory stews for a reason. With nearly 50 mg of sodium in each stalk, these two vegetables make great additions to meat dishes and warm winter soups. For a super-easy side dish, try [these roasted carrots](#). They practically melt in your mouth, and they pair great with a beef-based entree.

Recipe by [PureWow.com](#).

Ingredients

2 bunches carrots, peeled and tops trimmed
1 red onion, peeled and cut into 8 wedges
3 tablespoons olive oil
2 tablespoons red-wine vinegar
1 tablespoon ground cumin
1 teaspoon kosher salt
1 teaspoon freshly ground black pepper
3 tablespoons chopped fresh mint
Zest of 1 lemon

Directions

Preheat the oven to 400°F. In a medium baking dish, toss the carrots with the onions.

In a small bowl, whisk the olive oil with the red-wine vinegar, cumin, salt and pepper to combine. Pour the mixture over the carrots and onions; toss gently to coat. Roast until the carrots and onions are tender and browning at the edges, 30 to 35 minutes. Garnish with mint and lemon zest. Serve warm.

2. Herb-Roasted Beets:

There is a reason beets are currently popular in endurance circles: they are packed with inflammation-reducing phytonutrients. Beets are also packed with naturally-occurring nitrates, which have been shown to lower blood pressure and boost exercise stamina by as much as 16 percent (1985, [Journal of Applied Physiology](#)). Each beet contains about 65 mg of sodium, and beets' versatility contributes well to a variety of dishes, including salads, smoothies, and pasta. If you are looking to enjoy the beet by itself, consider the following recipe. The process of oven-roasting brings out the earthy flavor of the beet, which pairs well with the more tart flavors of the vinegar and orange juice.



Photo source: [Pixabay.com](#).

Recipe from [Barefoot in Paris](#).

Ingredients

- 12 beets
- 3 tablespoons good olive oil
- 1 1/2 teaspoons fresh thyme leaves, minced
- 2 teaspoons kosher salt
- 1 teaspoon freshly ground black pepper
- 2 tablespoons raspberry vinegar
- Juice of 1 large orange

Directions

Preheat the oven to 400 degrees.

Remove the tops and the roots of the beets and peel each one with a vegetable peeler. Cut the beets in 1 1/2-inch chunks. (Small beets can be halved, medium ones cut in quarters, and large beets cut in eighths.)

Place the cut beets on a baking sheet and toss with the olive oil, thyme leaves, salt, and pepper. Roast for 35 to 40 minutes, turning once or twice with a spatula, until the beets are tender. Remove from the oven and immediately toss with the vinegar and orange juice. Sprinkle with salt and pepper and serve warm.

3. Grilled Artichokes with Dill Yogurt Sauce:

Artichokes have long been celebrated for their many benefits. Ancient Greeks used them as an aphrodisiac, a diuretic, a breath freshener, and even a deodorant. Today, we can appreciate the vegetable a little more scientifically, knowing it's a good source of folate, dietary fiber, and vitamins C and K. Artichokes are also packed with antioxidants; they are listed at No. 7 on the [US-DA's top 20 antioxidant-rich foods list](#). Also high in sodium (one large artichoke contains about 150 mg of sodium), artichokes also act as a good way to replenish electrolytes.

Not sure how to brave the artichoke's tough exterior? Try the recipe below. Recipe by [The Bon Appétit Test Kitchen](#).

Ingredients

1 lemon, halved
4 large artichokes
2 tablespoons olive oil
1/2 cup low-fat Greek yogurt
1 teaspoon chopped fresh dill

Directions

Bring a large pot of salted water to a boil. Fill a large bowl with water; squeeze in juice from one half of a lemon; add the lemon half. Working with 1 artichoke at a time, trim off the outer leaves, then cut them in half lengthwise through the stem. Scoop out the choke, and add it to the lemon water to prevent browning while trimming remaining artichokes.

Drain the artichokes. Cook the artichokes in same large pot of boiling salted water until they are almost tender but not falling apart, 10–15 minutes. Drain.

Heat a grill pan or large heavy skillet over medium-high heat. Brush the artichokes with oil and season with salt and pepper. Grill with the cut side down until the artichokes are charred in spots and the hearts are tender, about 5 minutes.

Meanwhile, squeeze enough juice from the remaining lemon half to measure 2 Tbsp.; place in a small bowl. Whisk in yogurt and dill; season with salt and pepper. Serve the grilled artichokes with the yogurt sauce.

4. Pickled Shrimp:

(Or shellfish in general, including crab, lobster, scallops and oysters.): Unlike other fish, shellfish are naturally high in sodium, averaging a few hundred milligrams of sodium in a 3 oz. serving. Because shellfish are so small, they are less likely to accumulate toxins (like mercury) in their bodies, unlike larger fish such as tuna or swordfish. Shellfish are very high in protein, and they can be added to salads, pasta, or as a meal of their own. This quick-pickled shrimp recipe makes a delicious treat for summer, as an appetizer, snack or small entree.

Recipe by [The Bon Appétit Test Kitchen](#).

Ingredients

1 pound shell-on medium shrimp
Kosher salt
1/2 medium fennel bulb, thinly sliced
1/2 medium onion, thinly sliced
2 garlic cloves, thinly sliced
1/2 Fresno chile or red jalapeño, thinly sliced, seeded
1/2 cup fresh lemon juice
1/4 cup apple cider vinegar
1/4 cup extra-virgin olive oil
2 tablespoons fennel fronds
Freshly ground black pepper
1/2 loaf ciabatta or country-style bread, sliced 1/2-inch thick, toasted
Mayonnaise (for serving; optional)

Directions

Cook shrimp in a large pot of boiling salted water until just opaque in the center, about 2 minutes. Drain; rinse under cold running water to cool. Peel and devein, leaving tails intact, if desired.

Combine shrimp, fennel bulb, onion, garlic, chile, lemon juice, vinegar, oil, and fennel fronds in a medium bowl. Season with salt and pepper and toss to combine. Let sit, tossing occasionally, at least 20 minutes. Serve shrimp with toast and mayonnaise, if using.



Photo source: [Pixabay.com](#).

5. Sauteed Garlicky Swiss Chard:

Have you ever been browsing through the greens section in the grocery store and seen those massive leafy greens with colorful stalks of red, yellow and purple? That outlandish-looking green is Swiss chard, and it's a great source of natural sodium (one cup of cooked Swiss chard contains 300 mg). Additionally, it provides approximately 700 percent of vitamin K needs, 200 percent of vitamin A, 38 percent of magnesium, and 17 percent of vitamin E. Like any dark, leafy green it also packs in the phytochemicals, which help reduce inflammation and counter exercise-induced free radical damage.



Photo source: [Pixabay.com](https://www.pixabay.com).

Even though one cup of unsalted chard contains so many nutrients, it's not the most flavorful. Consider the recipe below instead. Recipe from [Simply Recipes](https://www.simplyrecipes.com).

Ingredients

1 large bunch of fresh Swiss chard
1 small clove garlic, sliced
2 Tbsp olive oil
2 Tbsp water
Pinch of dried crushed red pepper
1 teaspoon butter
Salt to taste (which could mean no salt at all)

Directions

Rinse out the Swiss chard leaves thoroughly. Remove the toughest third of the stalk. Roughly chop the leaves into inch-wide strips.

Heat a saucepan on a medium heat setting, add olive oil, a few small slices of garlic and the crushed red pepper. Sauté for about a minute. Add the chopped Swiss chard leaves. Cover. Check after about 5 minutes. If it looks dry, add a couple tablespoons of water. Flip the leaves over in the pan, so that what was on the bottom, is now on the top. Cover again. Check for doneness after another 5 minutes (remove a piece and taste it). Add salt to taste, and a small amount of butter. Remove the swiss chard to a serving dish.

Now try adding in some potassium.

Now that you are a K+ expert, the next step is figuring out how to incorporate your knowledge into everyday nutrition plans. We thought we would make that process a little easier by providing you with five delicious recipes containing potassium naturally.

Potassium occurs naturally in almost all fruits and vegetables, as well as legumes (which are also great sources of magnesium!). A balanced diet which includes a large variety of plants will easily provide the recommended 4,700 mg per day of potassium. Still, if you are looking for an extra boost, try one of these recipes below.

A balanced diet which includes a large variety of plants will easily provide the recommended 4,700 mg per day of potassium.

1. Three-Bean Chilli:

Legumes, including beans, lentils and peas, are all packed with potassium, containing about 450 mg per cup. White beans are the most potent -- with 595 mg per cup. Plus, with the magnesium, iron, fiber and protein content, legumes do a great job at providing your body healthy recovery fuel! This warming three-bean chilli makes use of a surprising ingredient (chocolate syrup) to bring the cajun spices together. Serves 4. 1,098 mg of Potassium per serving, or 23 percent of your daily needs.

Recipe by [Midwest Living](#).

Ingredients

1 15 - ounce can no-salt-added red kidney beans, rinsed and drained
1 15 - ounce can small white beans, rinsed and drained
1 15 - ounce can low-sodium black beans, rinsed and drained
1 14 1/2 - ounce can diced tomatoes and green chile peppers, undrained
1 cup beer or chicken broth
3 tablespoons chocolate-flavored syrup
1 tablespoon chili powder
2 teaspoons Cajun seasoning
Dairy sour cream (optional)
Shredded cheddar cheese (optional)

Directions

In a 3-1/2- or 4-quart slow cooker, combine kidney beans, white beans, black beans, undrained tomatoes and green chile peppers, beer or broth, chocolate syrup, chili powder, and Cajun seasoning.

Cover and cook on low-heat setting for 6 to 8 hours or on high-heat setting for 3 to 4 hours. If desired, garnish individual servings with sour cream and cheese.

2. Sweet Potato Fries:

As most of the nutrients in sweet potatoes are concentrated in the skin, it is important to avoid peeling these potatoes when you cook them. This recipe is savory, but these fries are equally delicious as a sweeter treat! Just ditch the paprika and thyme, and sprinkle the fries with cinnamon. Serves 4-8. 438 mg Potassium per serving, or 12 percent of your daily needs.

Recipe by [Family Fresh Cooking](#).

Ingredients

2-4 large Garnet Yams “Sweet Potatoes”, scrubbed clean, skin on, cut into 1/2 inch fries
A few splashes of Olive Oil
Season to taste: Paprika, Garlic Salt or Sea Salt, Pepper, Thyme and/or Rosemary



Photo source: [Pixabay.com](#).

Directions

Preheat oven to 400°F. Line a baking sheet with parchment paper. Toss cleaned and sliced sweet potatoes with olive oil and chosen seasonings. Bake in oven for 30-40 minutes. Toss every 10 minutes to assure that all sides cook evenly, adjusting your baking time according to how crispy you want your fries.

Recipes: Potassium

3. Grilled Peaches:

Peaches are excellent sources of potassium, Vitamin A, Vitamin C, and iron. Get these benefits and more with this this grilled peaches recipe, which takes an interesting twist by adding a balsamic vinegar and pepper glaze. This dish makes a delicious dessert or side to a savory dish like rosemary chicken. Serves 4. 333 mg of Potassium per serving, or 9 percent of your daily needs.

Recipe by [A Family Feast](#).

Ingredients

1 cup balsamic vinegar
1/4 cup molasses
1 tablespoon freshly ground black pepper (you can add more or less based on your tastes but the pepper is really great against the other sweet flavors in this dish)
4 ripe peaches
2 tablespoons vegetable oil

Directions

In a small sauce pan, bring vinegar to a boil and reduce to a simmer. Simmer until reduced by half (15-20 minutes). Remove from heat and add molasses and black pepper. Cut the peaches following the natural line that circles the fruit. Cut all the way down to the pit and just run the knife right around keeping the blade against the pit. Gently grab each half and twist in opposite directions. Then pop the stone out with a paring knife or a spoon.

Heat the grill to medium. Keep glaze warm so it does not harden up. Brush each cut side with oil and place cut down on the grill. Grill for about 2 minutes and flip. Brush the cooked tops with the glaze and cook for about two more minutes. Remove to a platter and brush on more of the glaze. Serve with extra glaze on the side.

4. Trail Mix:

Trail Mix is perhaps one of the best mixes of electrolytes around. Nearly all dried fruit, from apricots to raisins to cranberries to dates, is high in potassium. Nuts and seeds, especially sunflower seeds, are high in magnesium. Trail mix is the perfect marriage of both worlds. If you need a little guidance, try this list of 21 different trail mix options from [Greatist](#). We're partial to anything containing dark chocolate, so No.'s 1, 6-8, 13-17, and 19 caught our eye. Serving sizes vary, as well as potassium content. However, one 1/2 cup of dried fruit can get you about 15 percent of the recommended daily potassium level, or about 750 mg.

Ingredients

1 Cup Almonds
1 Cup Dried Cherries
1/2 cup Dark Chocolate Chips
Pinch of Sea Salt
1/2 Teaspoon Cinnamon

Directions

Mix and enjoy!

5. Cantaloupe Pepper Salsa:

Cantaloupe packs a potassium punch: one cup of this delicious orange fruit contains 431 mg of potassium -- more than one banana. It also provides a variety of antioxidants including choline, zeaxanthin, and beta-carotene, all of which provide protection against diseases ranging from the common cold to cancer. The red bell pepper in this delicious salsa adds a hefty dose of Vitamin C, and the mint provides a coolness that balances the spicy jalapenos. This salsa makes a great addition to pork! Serves 3. 230 mg of Potassium per serving, or 5 percent of your daily needs.

Recipe by [Cooking Light](#).

Ingredients

1 cup finely chopped fresh cantaloupe
1/2 cup finely chopped red bell pepper
1/4 cup finely chopped red onion
3 tablespoons chopped fresh mint
1 tablespoon finely chopped seeded jalapeno pepper
1 tablespoon fresh lime juice
1/4 teaspoon kosher salt

Directions

Combine all ingredients in a medium bowl, stirring well. Cover and chill at least 1 hour.



Photo source: [Pixabay.com](#).

Next up is magnesium.

Magnesium is abundant in a few key food groups, including whole grains, nuts and seeds, legumes, and dark leafy greens. Like we said on Monday in our magnesium overview, athletes are at risk of a magnesium deficiency if they underconsume these types of foods. Never fear, though. By using these recipes, and others like them, you can fill your plate with nutritious foods full of magnesium, which is essential for more than 300 bodily processes.

Want more? In case you missed our blog post about how to fit magnesium-packed foods into your diet, head [here](#) to check it out.

Magnesium is abundant in a few key food groups, including whole grains, nuts and seeds, legumes, and dark leafy greens.

1. Scrambled Eggs with Sunflower Seeds:

With sunflower seeds providing so much magnesium, why stop at one recipe? This protein-packed breakfast makes a great way to start your day. We encourage you to add whatever vegetables you like, including spinach, bell pepper, mushroom and onion for some extra nutrients. The flax seeds add a healthy dose of fiber. Serves 2. 44 mg of magnesium per serving, or 11 percent of your daily needs.

Recipe from [Home Cooking Adventure](#).

Ingredients

3 tbsp sunflower seeds
Salt
1 tbsp sesame seeds
1 tbsp flax seeds
1 tbsp butter
4 oz (100g) Mozzarella Cheese, thinly sliced
Freshly ground black pepper
4 eggs
Optional sides:
4 bacon slices
Toast bread
Fresh chives

Directions

Place sunflower seeds and salt into a hot dry skillet, on medium heat and let them toast stirring from time to time so they don't burn. Add sesame seeds and flax seeds and give them a stir. Immediately add butter and let it melt. Add Mozzarella slices and stir to combine. Add whole eggs and gently stir and cook until slightly underdone. Remove from heat. The eggs will continue to cook in the hot skillet. Add freshly ground black pepper. Serve with toast bread, bacon slices, greens, whatever works better for you. Bread and bacon can be made before preparing the eggs.

2. Sunflower Seed Pesto

As we pointed out in Monday's post, sunflower seeds are extremely high in magnesium, with about 11 percent of your daily needs in a ¼ cup serving. They're also packed with other essential minerals, such as phosphorous, copper and manganese, as well as several B-vitamins. Like most nuts and seeds, they're pretty dense on the calories (that same ¼ cup serving contains more than 200), so eat them sparingly. Luckily, you don't need much for some great benefits. Try mixing sunflower seeds with basil to create delicious sunflower seed pesto. Serves 8. Contains 42 mg of magnesium, about 11 percent of your daily needs.

Recipe from [Bon Appetit](#).



Photo source: [Pixabay.com](#).

Ingredients

- 1/2 cup raw shelled sunflower seeds
- 1 small garlic clove
- 2 cups (packed) arugula leaves
- 1 cup (packed) fresh basil leaves
- 1/4 cup extra-virgin olive oil
- 2 teaspoons honey
- 1 teaspoon finely grated lemon zest
- 1 tablespoon fresh lemon juice
- Kosher salt

Directions

Rinse sunflower seeds, put in a small bowl or jar, and add cold water to cover seeds by 1 inch. Cover; soak overnight at room temperature. Drain and rinse seeds.

Purée sunflower seeds, garlic, arugula, basil, oil, honey, and lemon zest and juice until smooth. Season with salt. Thin pesto with water if too thick.

3. Cuban Black Beans and Rice:

This recipe is a smorgasbord of delicious and nutritious ingredients. Black beans, of all legumes, contain the highest amounts of magnesium per serving (60 mg in ½ cup), and paired with rice provide a full spectrum of proteins and complex carbohydrates. Add in some bell pepper for Vitamin C content, oregano for immune-boosting antioxidants and radishes which aid digestion and help ward against infections. Serves 8. 75 mg of magnesium per serving, or 18 percent of your daily needs.

Recipe from [Real Simple](#).

Ingredients

1 cup long-grain white rice
1 tablespoon olive oil
1 onion, chopped
1 bell pepper, cut into 1/4-inch pieces
2 cloves garlic, chopped
Kosher salt and black pepper
1 teaspoon ground cumin
2 15.5-ounce cans black beans, rinsed
1 teaspoon dried oregano
1 tablespoon red wine vinegar
4 radishes, cut into 1/2-inch pieces
¼ cup fresh cilantro

Directions

Cook the rice according to the package directions.

Meanwhile, heat the oil in a saucepan over medium-high heat. Add the onion, bell pepper, garlic, 1 teaspoon salt, and ¼ teaspoon pepper and cook, stirring occasionally, until softened, 5 to 7 minutes. Stir in the cumin and cook for 1 minute. Add the beans, oregano, and 1 cup water. Simmer, covered, for 10 minutes.

Add the vinegar. Smash some of the beans with the back of a fork to thicken. Serve over the rice. Top with the radishes and cilantro.

4. Kale and Almond Salad:

What's better than one magnesium-packed ingredient? Two magnesium-packed ingredients! Both almonds and kale (as well as all dark leafy greens) are excellent additions to an athlete's diet because of their high magnesium content. This dish combines the two, as well as a slightly-Asian-style vinaigrette. Eat immediately, or store overnight for slaw that makes a great addition to any sandwich. Serves 4. 51 mg of magnesium per serving, or 13 percent of your daily needs.

Recipe from [Home Cooking Adventure](#).

Ingredients

1/2 pound kale
1/2 cup Marcona almonds crushed
(about 2.5 ounces)
2 tablespoons olive oil
2 tablespoons sherry vinegar
1 tablespoon minced shallot
2 teaspoons vincotto (or honey)
1 teaspoon Worcestershire sauce
3/4 teaspoon salt
1/2 teaspoon sesame oil
Black pepper
1 ounce Pecorino Romano
Shredded cheddar cheese (optional)



Photo source: [Pixabay.com](#).

Directions

Thoroughly wash the kale in a large bowl until there's no sediment settling at the bottom. Remove the tough parts of the stems by grabbing the bottom of the stem with one hand and pulling and stripping the left parts from the stem with the other hand. Place the kale in a salad spinner and dry thoroughly.

Use a sharp knife to cut the kale into a chiffonade (thin ribbons) and then add it to a bowl along with the crushed almonds.

In a small glass bowl, whisk together the olive oil, sherry vinegar, shallots, vincotto, Worcestershire sauce, salt, sesame oil and black pepper. Pour the dressing over the kale and. Toss to coat.

You can serve the salad right away, but letting the salad rest in the fridge for a few hours lets the flavors meld and mellows the bitterness and harsh green edge that kale can have. When you're ready to serve the salad, just use a vegetable peeler to shave some Pecorino Romano onto the salad and toss together.

5. Chocolate Almond Hearts:

We couldn't make it through the entire e-book and not mention dessert! Not only is this recipe delicious, it's super easy to make. Prep and cooking time take less than 20 minutes, and it's definitely worth it in the end! Serves 4. 34 mg of magnesium per serving, or 8 percent of your daily needs.

Recipe from MyRecipes.com.

Ingredients

1/2 cup whole blanched almonds, toasted

1 (2-ounce) chocolate bark coating square, melted (The darker the chocolate, the better)

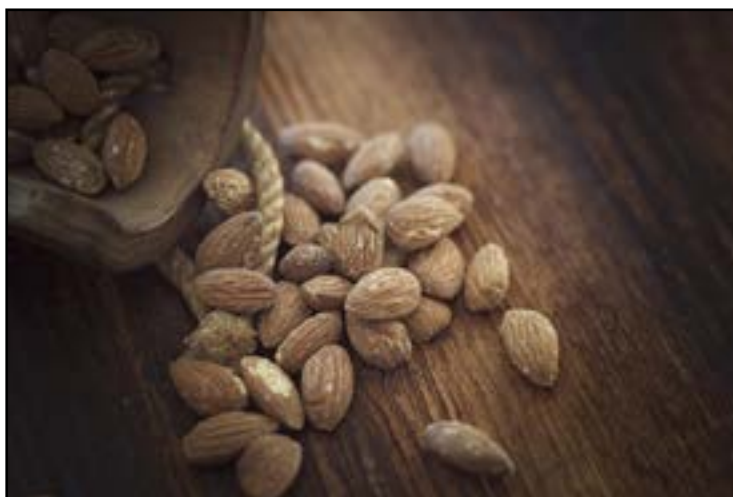


Photo source: Pixabay.com.

Directions

Dip almonds halfway in melted chocolate, pointed ends down. Lay 2 almonds side by side, pointed ends down and touching, on wax paper, forming a heart shape. Let stand until firm.

Finally, be sure to get your calcium!

In the section above, we pointed out that calcium is contained in a wide variety of foods. Eating a balanced diet will ensure you obtain your required dietary levels – about 1,000 mg per day for men and 1,000 - 1,300 mg per day for women. Check out these five recipes for savory meals and sweet post-workout treats – all containing a healthy dose of calcium to help maintain strong bones, aid muscle contractions, assist fat oxidation, and recover from hard workouts.

Eating a balanced diet will ensure you obtain your required dietary levels.

1. Phyllo Shells + Fig Jam:

Figs are an all-around electrolyte source, packed with potassium, as well as calcium and magnesium. In fact, before the age gels and sports drinks, figs were widely used as race fuel among professional endurance athletes. In addition to electrolytes, figs contain simple sugars that are easily digested during (or after) exercise. That's how we suggest you treat these fig jam treats, which are so tasty you won't be able to have just one. Prepare them before a long workout (such as your Saturday ride or run), and enjoy them as a post-exercise recovery meal. Serves 15, although you may eat more than one! 25 mg of calcium per serving, about 2.5 percent of your daily needs.

Recipe from Health.com.

Ingredients

30 mini phyllo shells
1/2 cup plus 2 tablespoons black pepper goat cheese
1/4 cup plus 1 tablespoon fig jam
Freshly ground black pepper

Directions

Preheat oven to 300°. Fill each of mini phyllo shells with 1 teaspoon black pepper goat cheese and 1/2 teaspoon fig jam; arrange on a baking sheet. Bake, in middle of oven, until cheese is melted (about 3 minutes). Sprinkle with freshly ground black pepper.

2. Roasted Edamame:

One of the few non-animal sources that contain the full spectrum of amino acids, edamame is valued for its many nutritional benefits. In addition to protein, edamame contains fiber, as well as calcium – about 10 percent of your daily needs per cup. This recipe makes a great snack, filling you up quickly to power through your day. The next time you have a craving for some salty goodness, try these roasted edamame. Serves 4. 75 mg of calcium per serving, about 7.5 percent of your daily needs.

Recipe from Health.com.



Photo source: Pixabay.com.

Ingredients

1 pound frozen shelled edamame, thawed
1/2 teaspoon salt
1/2 teaspoon ground pepper
1 1/2 teaspoons olive oil
Cooking spray

Directions

Preheat oven to 400°. Toss edamame with salt, pepper, and olive oil. Roast on a lightly sprayed baking sheet for 50–60 minutes or until golden brown. Each 1/4-cup serving has 130 calories of guilt-free yumminess.

3. Sesame Tofu and Broccoli Salad:

Widely acclaimed for acting as a vegetarian source of protein, fortified tofu can also serve as a significant source of calcium. Dark, leafy greens also provide moderate servings of calcium, and the broccoli and mixed greens help make this salad a phenomenal source for Ca²⁺, with one serving providing nearly half your daily needs! Serves 4. 400 mg of Calcium per serving, or about 40 percent of your daily needs.

Recipe from [One Green Planet](#).

Ingredients

(Dressing) 1/4 cup tahini
2 cloves garlic, minced
1 tbsp ginger, minced
2 tbsp agave nectar
Juice of 1 lime
1 tbsp sesame oil
1 tsp sambal oelek
1/4 cup tamari
2 tbsp rice wine vinegar
(Salad) 1 head broccoli, cut into florets
1 19 fl oz can chickpeas, drained, and rinsed
1 block extra-firm tofu, drained, and pressed, and cut into long blocks
1 Tbsp olive oil
2 Tbsp vegetable broth or water
Mixed greens, washed, and dried



Photo source: [Pixabay.com](#).

Directions

(Dressing) Blend all ingredients in a blender until smooth. Set aside.

(Salad) Prepare tofu. In a pan over medium heat, heat olive oil. Add tofu, and fry for 1-2 minutes on all four sides, until a crust has formed.

Steam broccoli until tender.

Warm chickpeas in a frying pan with vegetable broth over medium heat, a few minutes, until warm. Heat dressing by submerging in hot water until fluid. Place mixed greens in large serving bowl and top with broccoli, chickpeas, tofu, and dressing. Enjoy!

4. Portuguese Sardine and Potato Salad with Arugula:

Sardines may not be the most appetizing of foods, but they can really add nutritional value to a dish. Filled with protein, omega-3 fats and Vitamin B-12, these tiny fish will provide you with long-lasting energy and recovery-enhancing nutrients. They're also a great source of calcium, containing about 350 mg per 3.75-ounce can. Still not convinced? Sardines are one of the few natural foods to contain Vitamin D, which – as we pointed out in our Calcium blog post – is necessary for calcium absorption. Serves 4. 200 mg calcium per serving, about 20 percent of your daily needs.

Recipe from MyRecipes.com.

Ingredients

1 1/2 pounds fingerling potatoes, halved lengthwise
5 tablespoons extra-virgin olive oil, divided
1 teaspoon kosher salt, divided
Cooking spray
3 tablespoons fresh lemon juice
2 tablespoons minced shallots
1/4 teaspoon smoked paprika
1 large garlic clove, minced
8 fresh whole sardines (about 1 pound) OR 2 (4.25-ounce) cans of oil-packed sardine fillets
5 ounces baby arugula
8 lemon wedges
Freshly ground black pepper

Directions

Preheat oven to 400°. Combine potatoes, 1 tablespoon oil, and 3/8 teaspoon salt on a baking sheet coated with cooking spray; toss well to coat. Bake at 400° for 15 minutes. Stir potatoes; bake an additional 10 minutes or until golden brown and tender. Combine 2 tablespoons oil, juice, shallots, paprika, garlic, and 1/4 teaspoon salt in a large bowl, stirring with a whisk. Add hot potatoes to bowl; toss to coat.

Heat a large nonstick skillet over medium-high heat. Pat sardines dry with paper towels; sprinkle with remaining 3/8 teaspoon salt. Add remaining 2 tablespoons oil to pan; swirl to coat. Add sardines to pan; cook 3 minutes on each side or until crisp and done.

Arrange about 1 1/2 cups arugula on each of 4 plates. Remove potatoes from dressing with a slotted spoon; arrange about 3/4 cup potatoes on each serving. Drizzle remaining dressing over salads; top each with 2 sardines. Serve with lemon wedges; sprinkle with pepper.

5. Collard Salad with Roasted Tomatoes, Bacon, and Mushrooms:

Like all dark, leafy greens, collard greens contain a wide spectrum of nutrients, including Vitamin A, Vitamin K, manganese, Vitamin C, and several cancer-fighting antioxidants. Combined with the tomatoes and mushrooms, collards make this recipe a delicious and savory meal – perhaps for dinner after a long day of training. Serves 4. 150 mg of calcium, about 15 percent of your daily needs.

Recipe from Health.com.

Ingredients

1 pint cherry tomatoes
Cooking spray
8 teaspoons extra-virgin olive oil, divided
Kosher salt
Freshly ground black pepper
1 pint sliced cremini (baby bella) mushrooms (about 2 cups)
2 large garlic cloves, minced
3 turkey-bacon slices, cut into slivers
10 cup de-ribbed and chopped collard greens, rinsed and drained
1 tablespoon balsamic vinegar

Directions

Preheat oven to 400°. Place tomatoes in a medium glass baking dish lightly coated with cooking spray. Drizzle with 2 teaspoons oil and a pinch each salt and pepper. Bake at 400° for 15 minutes, until tomatoes are hot and skins are wrinkled. Cover with foil; set aside.

Place 2 teaspoons oil in a large non-stick skillet over medium-high heat. Add mushrooms, and sprinkle with a pinch each salt and pepper. Sauté just until mushrooms are tender and golden brown, about 5 to 8 minutes. Transfer to a plate, and keep warm.



Photo source: Pixabay.com.

Add 2 teaspoons oil to the same skillet over medium-high heat, along with half of garlic and half of bacon; sauté 30 seconds. Add half of collard greens, and stir-fry just until greens are wilted; transfer to a large metal bowl. Repeat with remaining 2 teaspoons oil, garlic, and bacon, and sauté briefly before adding remaining greens. Stir-fry just until greens are wilted; add to bowl.

Add tomatoes and mushrooms to the bowl with greens. Pour vinegar into skillet (be careful of fumes); simmer 30 seconds. Drizzle over salad, and lightly toss along with salt and pepper to taste. Serve warm.

Conclusion

Thank you for reading our Complete Guide to Electrolytes!

We hope you were able to enjoy learning more about the science behind hydration. We certainly enjoyed sharing it with you!

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Happy Training!

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