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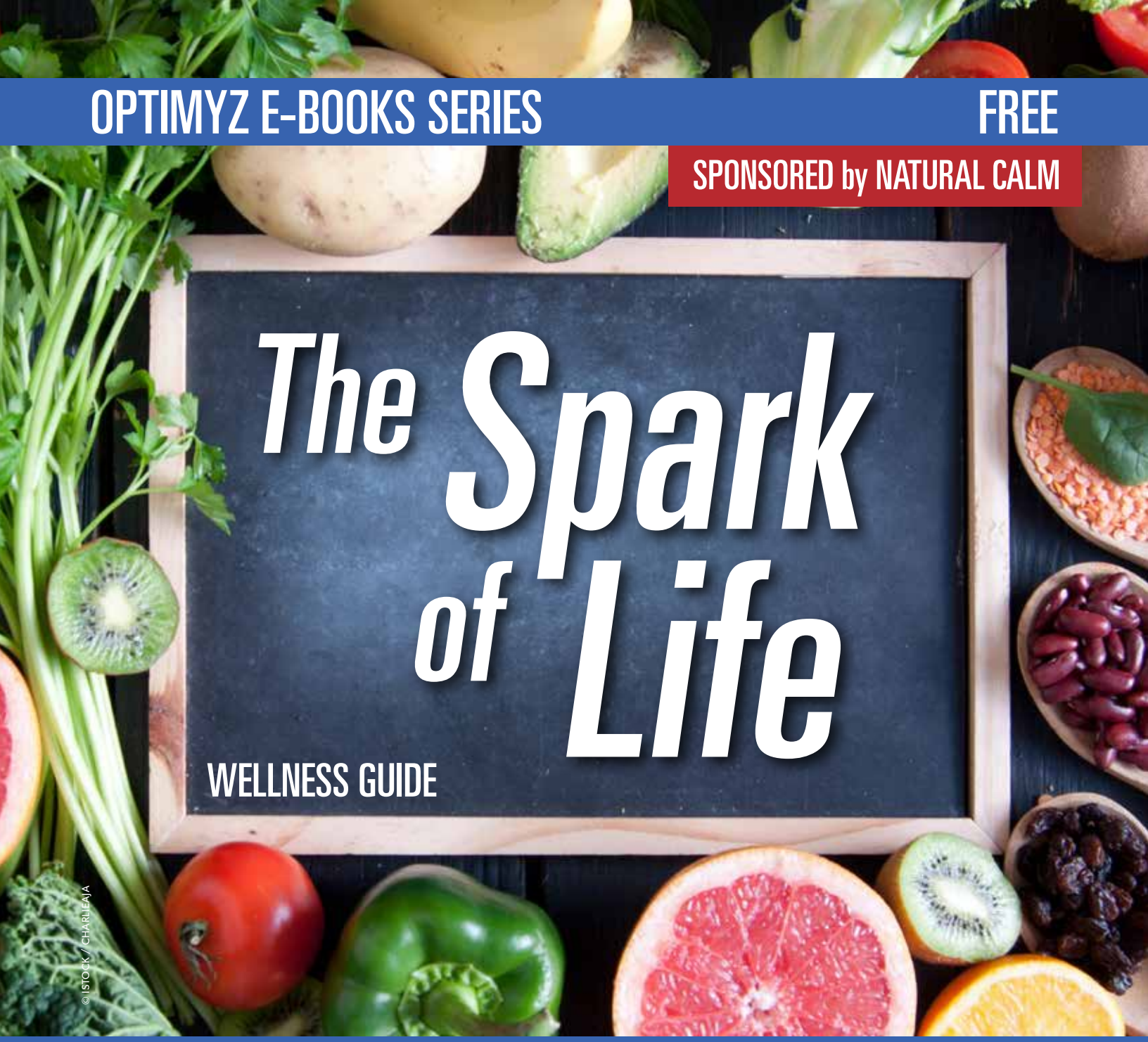

The Spark of Life

WELLNESS GUIDE

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Make sure you get enough

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The spark of life

Magnesium is key to many of the body's essential processes. Many people don't get enough.

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Few people give thought to what happens inside the body, deep down at the cellular level. We have trillions of cells performing many jobs and we take most for granted. Like breathing, they simply happen.

Most of our cells are so small that we can't see them with the naked eye, but despite their size, each performs many complex biochemical reactions every millisecond—reactions that are made possible only with the right nutrients, cofactors, and plenty of oxygen.

When you consider magnesium is the fourth most common mineral in the human body -- after calcium, sodium, and potassium—it seems ensuring healthy magnesium levels would be a dietary priority. However, if you don't realize the importance of something, it tends to disappear from view.

Approximately 24-35 grams of magnesium are stored in the human body: 60% is located in the bones, 39% in the muscles and soft tissues, and 1% in the extracellular fluid.

Most people are surprised to hear that magnesium plays a pivotal role as a cofactor in over 300 bodily functions. In fact, name a physiological process and most likely magnesium is intricately involved. It's often referred to as "the spark of life." Yet it's estimated that almost half of Canadians are not getting enough with diet alone.

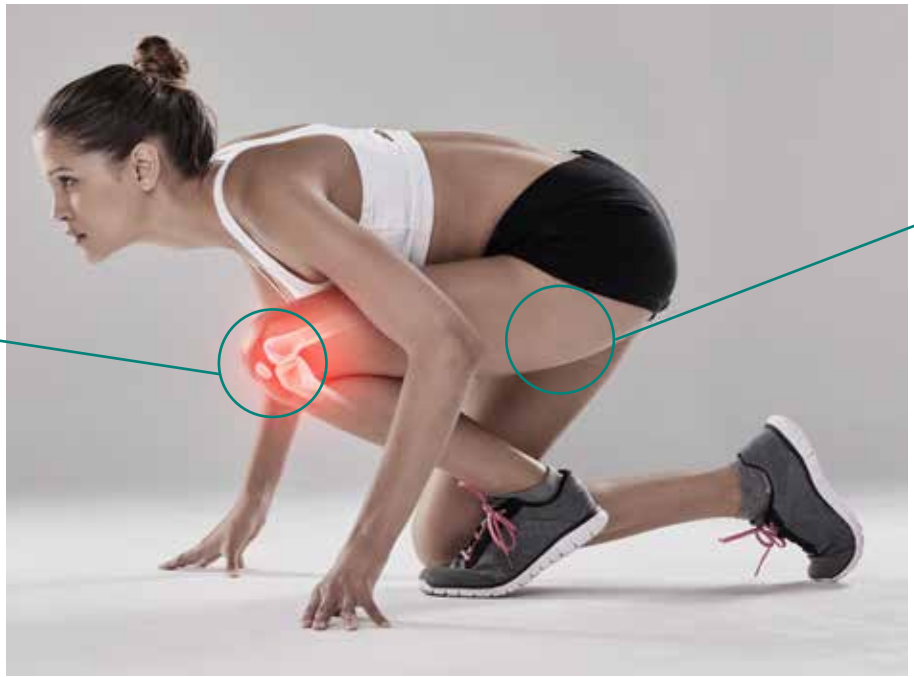
You likely weren't aware that magnesium is essential for regulating cellular and organ function. It is absorbed through the small intestine, mainly the jejunum, through passive diffusion and the active transport process. It is needed to create cellular energy, which enables you to accomplish everything on your daily to-do list.

Magnesium is a co-factor in activating enzymes that affect our metabolic rate. Metabolism is unique to each individual—some people have a fast metabolism while others are slow. These enzymes help to regulate this process as it varies from person to person.

Other enzymes are found in DNA and contribute to making and protecting proteins, which are instrumental in repairing DNA. Magnesium helps to regulate the delicate balance between sodium and potassium ions within the cells, thereby regulating our internal electrical signals, and it also helps to maintain proper calcium levels.

And this is only scratching the surface. Yes, magnesium is a mighty important mineral and consuming it daily contributes to a happier, healthier and more balanced body.

APPROXIMATELY 24-35 GRAMS OF MAGNESIUM IS STORED IN THE HUMAN BODY



60% of which is located in the bones

39% in the muscles and soft tissues

1% in the extracellular fluid.

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JUST ANOTHER MIGRAINE—OR IS IT A DEFICIENCY?

Your body is good at maintaining the right levels of this key mineral—but sometimes it needs help.

Magnesium deficiency is more common than you might think. Nationwide, 43% of adult Canadians and 68% of adult Americans are not consuming the daily minimum amount. Translation: 10.7 million adult Canadians and 170 million adult Americans are at risk for magnesium deficiency and its associated health disorders.

Depending on a person's height, weight, sex, age, and health status, the recommended daily allowance (RDA) of magnesium for adult males ranges between 400-420 mg. For adult females, the daily range is between 310-360 mg. However, most adults are missing a third of the daily RDA.

The average American male consumes only about 323 mg/day and females are getting about 228 mg/day—indicating our daily diets are missing roughly 100 mg/day, according to the RDA requirements.

The severity of a magnesium-deficient diet is variable across all Canadian provinces, but some provinces fare worse than others. For example, up to 38% of adults living in Quebec and British Columbia fail to reach their daily magnesium requirement, while upwards of 70% of adults in Newfoundland and Labrador are missing this key mineral.

It begs the question, "Why are we so deficient?" The short answer: it's 100 years of food evolution. The way we grow, breed and process food has changed significantly in the last century. The rise of industrialization has been a springboard for factory farms—moving away from traditional farming practices that helped to maintain soil integrity by fostering mineral-dense soil.

In 1992, at the United Nations Conference on Environment and Development held in Rio de Janeiro, it was reported that U.S. and Canadian agricultural soil was missing 85% of its original mineral content, meaning fresh vegetables are no longer nutrient-dense with minerals.

COMMON SIGNS OF MAGNESIUM DEFICIENCY

- Headaches and migraines
- Stress, nervousness, panic attacks, and anxiety
- Insomnia and poor quality sleep
- Restless legs, muscle spasms, cramps, and twitching
- Depression and irritability
- Fatigue, low energy
- Chronic neck and back pain, or stiff, sore muscles
- Sugar cravings and weight gain
- Abnormal heart rhythm and palpitations
- PMS and hormonal imbalances
- Constipation, indigestion, and acid reflux
- Teeth grinding

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CONDITIONS ASSOCIATED WITH LOW MAGNESIUM

- Anxiety
- Depression
- Migraines
- High cholesterol
- High blood pressure
- Metabolic syndrome
- Diabetes
- Chronic fatigue syndrome
- Fibromyalgia
- Asthma
- Insomnia and sleep disturbances
- Decreased physical activity and performance ability
- Stress
- Spasms and cramps
- Memory issues
- Cancer
- Osteoporosis
- Atherosclerosis (blocked heart arteries)
- Stroke
- Chronic inflammation

Likewise, the use of herbicides, pesticides, lack of crop rotation and the introduction of genetically engineered seeds has all contributed to the decline in mineral-dense soil. We also process foods differently today, and this process tends to diminish the magnesium content through milling, grinding and heating.

Highly processed foods—not freshly picked spinach—have become a staple in our diet, rather than just an occasional meal for convenience.

Even if you're eating magnesium-rich foods, you need a healthy "gut" (microbiome) to absorb the minerals.

If you currently have digestive problems, you're likely not going to absorb as much, potentially contributing to a deficient state. Once the microbiome in the gut (the "good" bacteria that assist with digestion) has been restored, you begin to absorb the minerals and nutrients.

Other factors that can lead to a deficiency are regular use of antacids, acid blockers, antibiotics, and certain diuretics.

Magnesium concentration in the body is tightly maintained and depends on balancing magnesium intake with magnesium excretion through the urine. Since magnesium concentration is highly regulated, magnesium overdose is rare, but its likelihood increases if you have kidney dysfunction because the kidneys are required to excrete magnesium through the urine.

Unfortunately, once a magnesium deficiency develops, simply eating magnesium-rich foods can't solve it. As an alternative to topping up the RDA, magnesium supplementation has been getting greater attention.

A magnesium deficiency can show up in ways that would surprise you, like a migraine headache or sugar cravings. Going forward, consider a balanced approach: try consuming more magnesium-dense foods coupled with a magnesium supplement and pay close attention to how your body feels—today and a month after adjusting your diet.

THE BEST FOOD SOURCES OF MAGNESIUM

- **Nuts:** brazil, almond, pine, cashew
- **Seeds:** pumpkin (shelled), sunflower (shelled), flax (ground),
- **Fish:** salmon, mackerel, pollock
- **Whole grains:** wheat germ (toasted), bran, quinoa
- **Legumes:** black-eyed peas, tempeh/fermented soy, soybeans, soy nuts, beans

SOURCE: dietiansofcanada.ca

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MAGNESIUM
THE INNER WORKINGS

From heart health to mental health, magnesium is at the forefront of helping our bodies stay balanced and healthy.

Since the mineral magnesium is involved in over 300 physiological processes, to say it's "integral" is somewhat understated. Dozens of common health disorders have been scientifically linked to a magnesium deficiency. However, these same conditions can also be improved, perhaps reversed, and in some cases even prevented when dietary changes are implemented.

ANXIETY & DEPRESSION

In Canada, over 5 million adults suffer from a mood disorder, namely anxiety and depression. In the U.S. it's six times that: over 30 million adults, yet only 39% seek help.

Since 1921, magnesium has been used to treat anxiety and depression as science has shown there is an inverse relationship between magnesium consumption and mood disorders. As the body becomes depleted of magnesium stores, the appearance of depression and anxiety increases.

Brain areas associated with anxiety include the amygdala, the hippocampus, and the prefrontal cortex. Studies show magnesium keeps anxiety at bay by inhibiting specific receptors in these brain regions. A deficiency results in hyper-excitability in these receptors, leading researchers to suspect a magnesium deficiency may be one of the physiological origins.

Magnesium also promotes GABA-A receptor function. This is an inhibitory neurotransmitter that promotes calm and relaxation. It modulates hormonal activity associated with stress and decreases the fight-or-flight response.

ASTHMA, COPD, & THE LUNGS

Asthma attack may be caused by allergic reactions to external substances like mold, dust, and feathers, or by exercise, emotional upset, or infection. The severity of the attack can be related to the amount of magnesium that's stored in the body. A deficiency can contribute to an increase in wheezing, airway obstruction, and decreased lung function.

Magnesium helps to alleviate asthma, along with other respiratory disorders such as COPD, by acting as a natural bronchodilator that increases airflow by relaxing the airways and surrounding muscles.

Studies show that 300 mg/day of magnesium supplementation significantly reduces broncho-spasm and the number of asthmatic episodes in children. Adults treated with a simple magnesium supplementation showed significant improvement.

ATHEROSCLEROSIS/BLOCKED ARTERIES

Research demonstrates a direct link between atherosclerosis (blocked arteries) and low magnesium levels. Turns out that low magnesium levels cause a dysfunction in the blood vessel tissues. This dysfunction causes inflammation and the production of plaque, which results in atherosclerosis.

There is an interplay between calcium, fatty acids, cholesterol, and magnesium. Excess calcium, along with fatty acids and cholesterol, work in conjunction to produce plaque in the arteries. Magnesium helps to prevent this plaque formation, and it plays an important role in diverting calcium to the bones, thus reducing the potential for plaque formation.

CHOLESTEROL

When we talk about cholesterol, we have to differentiate between "good" and "bad" types. Low-density

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lipoprotein, LDL, is harmful because it carries cholesterol into the bloodstream, promoting the build-up of plaque on the arterial walls.

High-density lipoprotein (HDL), on the other hand, is considered beneficial to the body. It helps remove cholesterol from arterial walls and also helps to cleanse the blood, transporting it to the liver for processing and excretion.

According to a recent Canada-wide health survey, 57% of Canadians between the ages of 40 and 59 have unhealthy LDL levels. Studies indicate that a higher intake of magnesium can lead to a substantial decrease in unhealthy levels of blood triglycerides and an increase of HDL levels.

Magnesium acts like a natural statin drug. It helps to block a specific enzyme in the liver that produces LDL. When this enzyme is blocked, LDL levels decrease, but when magnesium levels are low, LDL levels continue to rise, which could mean an increased risk of coronary heart disease.

CHRONIC PAIN & CHRONIC FATIGUE SYNDROME

Almost 20% of adult Canadians (about 5.5 million people) experience chronic pain, with the most common ailments being back pain and arthritis. The origin of chronic pain remains a mystery, but researchers have discovered two things: first, NMDA receptors in the brain play a crucial role; and second, pain-sensing nerve cells in the peripheral nervous system become over stimulated, sending chronic pain signals to the brain.

NMDA receptors are stimulated by a neurotransmitter called glutamate—a neurotransmitter that excites nerve cells to fire. The activation of NMDA receptors depends upon an influx of calcium into the nerve cell through a channel usually blocked by magnesium.

It is thought that a constant over stimulation of NMDA receptors causes a change within the brain that heightens or perpetuates the perception of pain. Magnesium works to inhibit NMDA receptor activity without the toxicity of over-the-counter pain medications. It has

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the potential to lessen postoperative pain, neuropathic pain, complex regional pain syndrome, chronic fatigue syndrome and fibromyalgia.

DIABETES

Magnesium intake is directly related to the development of insulin resistant type II diabetes: as magnesium concentration in the blood increases, the incidence of type II diabetes decreases. This mineral plays an important role in the prevention and regulation of type II diabetes, yet 87% of diabetic patients fail to consume the minimum RDA requirement, and 37% end up with a deficiency and subsequent diabetic complications.

Further studies indicate type II diabetes can cause an increase in magnesium excretion through the urine, preventing magnesium from entering into the cells. Magnesium supplementation helps to:

- Restore intracellular magnesium levels
- Improve insulin sensitivity
- Reduce insulin resistance
- Decrease platelet reactivity, thus reducing risk for cardiovascular disease
- Control blood glucose levels
- Reduce body fat percentage, body mass index (BMI), triglycerides, and waist circumference
- Protect kidney function
- Slow the progression of peripheral neuropathy in type I diabetes

FIBROMYALGIA

Even though fibromyalgia (FM) has been considered a clinical disorder for the last 20 years, it's taken a long time for researchers to begin uncovering the cause of FM and its associative pain disregulation in the central nervous system.

In 2013, a study published in *Rheumatology International* demonstrated that magnesium supplementation provided significant improvements in several FM markers. Patients who received 300 mg/day of magnesium citrate over eight weeks saw a reduction in the number of tender points, tender point index, Beck Depression Inventory scores and Fibromyalgia Impact Questionnaire scores.

Many of the positive outcomes reported in the study were related to pain reduction, leading researchers to hypothesize that low magnesium levels may contribute to FM symptoms.

HYPERTENSION

Studies have demonstrated how magnesium participates in regulating the vascular tone and inflammation of blood vessels, specifically the inner lining. The supplement Magnesium taurate has been reported to act as a natural calcium blocker in the cells, helping to improve the health of blood vessels in hypertensive diabetic patients.

Magnesium may also act as a natural diuretic, ridding the body of excess water and sodium that can cause high blood pressure. The therapeutic value of magnesium to help control hypertension remains unclear: some studies indicate its efficacy while others fail to demonstrate its effectiveness.

Despite the lack of scientific consensus, U.S., Canadian, European, and international medical treatment guidelines recognize the importance of magnesium and recommend it for hypertension prevention and management. Many experts believe that magnesium supplementation, coupled with a low sodium diet, should be the first line of defense against hypertension.

INFLAMMATION

Inflammation is the activation of the immune system as a result of infection, irritation, injury or an autoimmune condition. Researchers have found that when magnesium levels are too low, there is a profound increase in inflammatory cytokines, along with increased levels of histamine.

The body's inflammatory response is triggered to eradicate the irritant, but at the same time the surrounding healthy tissues become damaged by the inflammatory process itself; this is why inflammation is so worrying.

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The presence of inflammation will deplete magnesium levels, so supplementation is critical when the body is battling inflammation. Likewise, when a deficiency is present, excess calcium will collect around the inflamed area, causing blood vessels to constrict and decrease blood flow.

Increasing magnesium intake may decrease the inflammatory response and increase the ability to block excessive calcium build-up.

KIDNEY STONES

Along with the liver, the kidneys are the master cleansers of the body. They remove waste from the body, regulate and purge excess minerals such as magnesium, sodium, and potassium and, control the body's water levels and blood pressure.

Kidney stones are hard, crystallized mineral deposits that slowly grow in the kidney. Men are four times more likely to develop kidney stones than women.

The prostate gland in men enlarges as they age, leading to a condition called Benign Prostate Hypertrophy (BPH).

BPH can make it difficult to empty the bladder. Restricting urine flow which allows chemicals and toxins to accumulate, ultimately forming crystals and stones in the kidneys.

People who develop calcium stones in their kidneys not only have excess calcium in their urine and kidneys, but also low levels of urinary citrate—a form of citric acid that inhibits calcium stone formation.

You can increase citrate levels by adding lemon juice to water. Ironically, magnesium—just like urinary citrate—helps with the prevention of kidney stones.

MIGRAINES & HEADACHES

Magnesium is an excellent addition to your daily routine if you're prone to migraines and headaches. This mineral

allows the muscles to relax—promoting the release of any physical tension, thereby avoiding muscle cramping in the neck and shoulders. It also increases serotonin and releases it as needed to prevent migraines from starting. With daily supplementation, magnesium has been shown to reduce the frequency, duration, severity and intensity of migraines.

OSTEOPOROSIS

You can take all the vitamin D in the world to treat osteoporosis, but if you don't have magnesium, vitamin D can't do its job. Supplementation is associated with greater bone mineral density in elderly men and women and it plays a role in reversing osteoporosis.

Magnesium also helps to reduce a process called bone turnover: if you have a higher bone turnover, you have greater bone loss. However, excessively high or low levels of magnesium are both detrimental to bone health, so take your supplement as per the RDA.

PREGNANCY

Magnesium deficiency during pregnancy is common and the demand for magnesium increases during fetal development. As most women are already deficient before getting pregnant, it's important to understand the associated risks.

Preeclampsia, a complication that's associated with dangerously high blood pressure in the late stages of pregnancy or seizures (eclampsia), affects about 10% of pregnant women. It is a potentially serious condition. Intravenous magnesium is the treatment of choice as it relaxes the blood vessels, thus reducing blood pressure and complications.

SLEEP, INSOMNIA, & RESTLESS LEG SYNDROME

Fifty percent of older adults suffer from insomnia. Research indicates that there is a direct relationship between magnesium intake and sleep disturbances, insomnia, and restless leg syndrome (RLS).

Essentially, magnesium inhibits the excitability receptor in the brain, and promotes GABA-A receptor activity—a process that stimulates relaxation, which in turn allows you to fall asleep.

A double-blind clinical trial of older adults with insomnia found that 500 mg/

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day of magnesium significantly increased sleep time and sleep efficiency, while decreasing insomnia and sleep onset latency—the length of time needed to fall asleep.

In terms of restless leg syndrome, it's not fully understood how magnesium improves this condition, but research has shown that supplementation with 300 mg/day significantly decreased periodic limb movements.

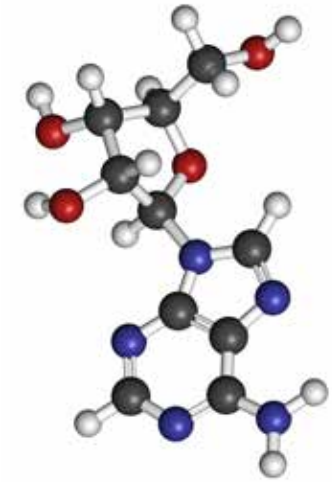
SPORT PERFORMANCE & PHYSICAL ACTIVITY

Whether you're a dedicated athlete or just trying to stay active, magnesium can make a surprising difference in your performance and endurance. In older adults, muscle strength is directly related to magnesium concentration in the blood—the more magnesium present, the stronger the muscles.

Likewise, the more you exercise, the more magnesium your body requires. It begins with the release of energy from adenosine tri-phosphate (ATP), which is your body's energy source.

In muscle tissue, magnesium also plays a role in oxygen uptake, energy production, and electrolyte balance. It's important to continue supplementing with magnesium before hitting the gym.

ATP PROCESS



STRESS

Physical and emotional stress increases our need for magnesium, which is known as "the anti-stress mineral." The relationship between magnesium and stress is interwoven: stress depletes magnesium, yet magnesium intake counteracts stress.

The physiological response to stress include increased blood pressure, hyperventilation, increased heart rate, an adrenaline and cortisol surge, and the fight-or-flight response.

Magnesium supplementation helps to reduce the cortisol response as well as to cleanse cortisol from the cells. It keeps excess calcium outside the cells, which helps to prevent rigidity, tension or hyper-excitability of muscle and nerve cells. It also calms the nervous system and relaxes muscles, thereby improving mood.

STROKE

Stroke is the third leading cause of death in Canada. Every year, over 25,000 Canadians experience a stroke, caused mostly by health conditions that are preventable: hypertension, high cholesterol, diabetes, drug use, obesity, physical inactivity, smoking, poor diet, sleep apnea, stress, and depression.

Generations ago, doctors prescribed magnesium chloride or magnesium sulphate, intravenously, when heart attack or stroke patients arrived at emergency rooms. When administered within three hours (post-stroke or heart attack), this mineral reduced the incidence of death by 50%.

Magnesium supports the entire cardiovascular system. It lowers blood pressure and prevents the build-up of cholesterol and calcium on the walls of arteries, which otherwise may lead to blockages or thromboses (blood clots) that can cause a stroke or heart attack. Magnesium also acts as a healthy, natural blood thinner that helps to keep blood flowing smoothly.

MAGNESIUM RICH FOODS

Looking to increase your magnesium intake? Here are a few delicious sources:

AVOCADOS are growing in popularity. They are nutritious and a tasty source of magnesium, producing 58 mg per medium-sized avocado. Enjoy on toast, in smoothies, and on salads. They are high in potassium, vitamins B and K, and fibre. Yum!

NUTS, especially almonds, cashews, and Brazil nuts, are a great source of magnesium. For example, about 18 cashews (28 g) contain 82 mg of the mineral. Many nuts are also great sources of protein and fibre. Makes a great snack!

TOFU, a key food for the growing population of vegetarians, contains high levels of protein and magnesium. A 100-g serving has 8 g of protein and 53 mg of magnesium, making it a great meat alternative. Try it in a stir-fry or a deep-fryer!

WHOLE GRAINS contain many important nutrients, including magnesium. Wheat, oats, barley, buckwheat, and quinoa are a few good sources. Whole wheat flour, for example, contains 137 mg of magnesium per 100 g. Hand me the bread!

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WHAT'S IN A SUPPLEMENT?

There are many options: Here's what you need to know.

When it comes to choosing a magnesium supplement, the selection can be overwhelming: powders, liquids, tablets, capsules and topical creams. Adding to the confusion, this mineral—in supplement form—contains a variety of magnesium salts. Unlike most mineral supplements, there isn't a one-pill-fits-all when we're talking about magnesium. So, let's start with the salts:

Magnesium salts are classified into two major types: organic and inorganic. Inorganic magnesium salts are taken from earth and rock sources. Magnesium oxide is a common inorganic form that's found in supplements. Unfortunately, research has discovered how poorly absorbed inorganic magnesium salts are when taken orally. However, chemists are able to manufacture organic magnesium salts to increase solubility, absorbability, and bioavailability.

Organic magnesium salts are created in a laboratory by combining an inorganic magnesium salt with either an acid or an amino acid (a protein). For example, magnesium citrate is created by combining inorganic magnesium with citric acid, and magnesium glycinate is created by combining an inorganic magnesium with the amino acid glycine.

Research indicates that organic magnesium salts taken orally are more soluble, absorbable, and bioavailable than inorganic magnesium salts—meaning magnesium salts like citrate are more effective than inorganic magnesium salts like oxide. You will often find two different salts blended together, like citrate and oxide, because each one supports a different function in the body.

WHAT'S THE DIFFERENCE?

Magnesium Oxide: this form is the least bioavailable, yet likely the most common type found on store shelves. It is an excellent stool softener to help with constipation, but your body actually absorbs very little. Oxide is often blended with either citrate or malate.

Magnesium Citrate: this is a blend of magnesium and citric acid. Citric acid in commonly found in fruit and when combined with inorganic magnesium, it provides a blend that is well-absorbed, assists with digestion and prevents constipation. This is a great starting point if you're looking to add this mineral to daily routine.

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Magnesium Malate: a blend of magnesium and malic acid, this combination offers another highly absorbable option. It supports tired, achy muscles and the production of cellular energy; and it offers a mild detoxification of some heavy metals.

Magnesium Glycinate or Bis-Glycinate: an excellent choice if you are prone to being deficient as it's highly absorbable, yet without the laxative effect, although it's fairly common to see Oxide blended with Glycinate. This is a good choice if you are in your 50s or older, and although there's no research data to support the "sensitive stomach" claim, many people will say the Glycinate or Bis-Glycinate form is easier on their digestive tract.

Magnesium Chloride Oil: this is applied topically, instead of being ingested. It is absorbed rapidly through the hair follicles, making it an excellent choice for those with digestive issues or disorders that prevent them from absorbing vitamins and minerals. A transdermal magnesium oil with a 31% magnesium concentration applied to the skin and via a foot bath was found to increase cellular magnesium concentration by almost 60% in the majority of study participants. It is also a good choice if you have difficulty swallowing pills. And as it's applied to the skin, it's effective at diminishing muscular aches and pains.

Magnesium Threonate: considered to be highly absorbable as it penetrates the cell membrane, it is not widely available and therefore tough to locate.

Magnesium Orotate: this form offers a blend of magnesium and orotic acid, which is considered to be beneficial for the heart. Again, this blend is not widely available as a standard option in stores.

Magnesium Chelate: naturally found in foods that are rich in magnesium, and provided you don't have a digestive disorder, your body will top up magnesium stores with this highly absorbable form.

From the same people that brought Natural Calm to Canada, comes Bolton's Naturals topical magnesium chloride products. Sourced from pure and natural ocean mineral salts, topical magnesium spray, gel and balm help to deliver magnesium where you need it most. Also available with lavender essential oil – for an even more calming, relaxing experience. Plus, Heavenly Sleep Liquid Melatonin, for help getting to sleep and staying there.

boltonsnaturals.com

Linda Bolton
CEO, Bolton's Naturals

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WHEN YOU'VE TAKEN TOO MUCH

The recommended daily intake provides a guideline for adult men and women, although some people may require less while others may need more. If you feel your body requires more and opt to increase your daily consumption, take note of your daily bowel movement. If your stool becomes very loose, you are consuming too much—try cutting the amount in half.

THE RECOMMENDED DAILY INTAKE

Men: 400–420 mg

Women: 310–360 mg

Quantities may vary depending on age, height, weight, lifestyle and related factors.

THE BEST TIME: AM OR PM

Although magnesium is not a sedative, it does support a natural sleep cycle. Many people who started taking magnesium in the morning, and then switched to the evening, found they experienced a deeper, more restful sleep.

MAGNESIUM & MEDICATIONS

If you currently take prescription medication, always check with your pharmacist to ensure there's no interactions.

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KNOWLEDGE IS POWER

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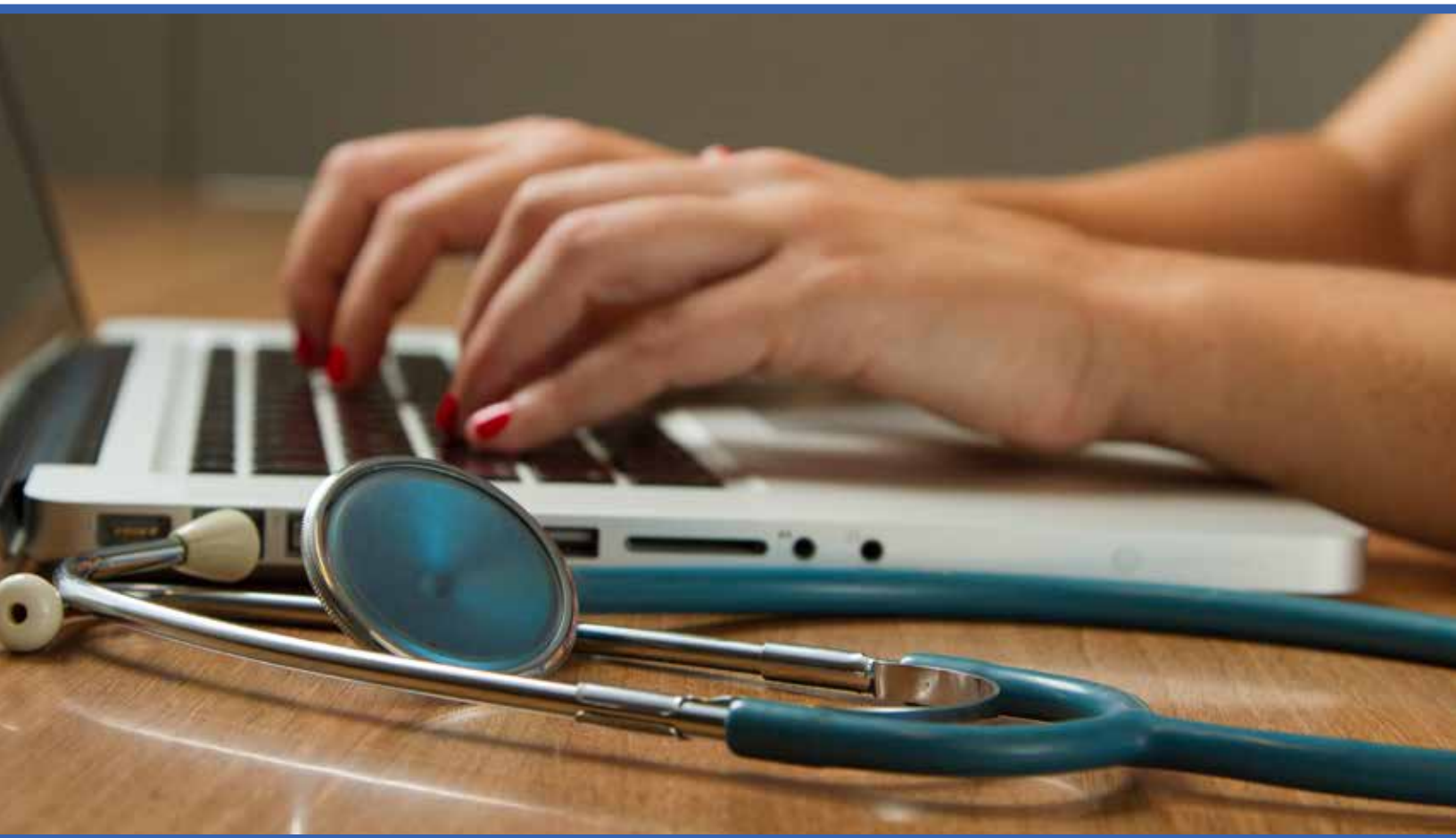

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