

Magnesium Malate: Supports Natural Energy Production & Promotes Joint Health

Isotrope



[Magnesium malate](#) is a type of magnesium that is made by combining [elemental magnesium](#) with malic acid. This is considered a magnesium salt of malic acid, and offers some distinct benefits over other forms of magnesium. Magnesium helps control hundreds of processes in our body ranging from digestion to brain health. Magnesium is a cofactor involved in the absorption of many nutrients, and different types of magnesium

offer different types of benefits. This specific [type of magnesium](#) has been shown to be easily absorbed and well-suited for supporting natural energy levels.

Malic Acid + Magnesium

Magnesium malate is a combination of malic acid and magnesium known to increase absorbability. Malic acid is found in many fruits such as oranges, and has many notable health benefits. Forms of magnesium such as magnesium oxide offer elemental magnesium by weight — but they are poorly absorbed by the human body. Compounds like Magnesium Malate and Dimagnesium Malate are comprised of elemental magnesium bonded with a malic acid compound to produce an *organic* form of magnesium (sometimes referred to as a magnesium salt). This type of compound allows more magnesium to be absorbed before side effects like diarrhea occur. Magnesium Malate is a preferred choice over other forms of magnesium for several reasons. It is cheaper than many amino acid chelate forms like magnesium glycinate, lysinate, or glucarate — but still offers a higher level of bioavailability than oxides and sulfates. Magnesium malate also offers the benefits of malic acid, such as the support of cellular energy production (Krebs Cycle) and the chelation of heavy metals such as aluminum.

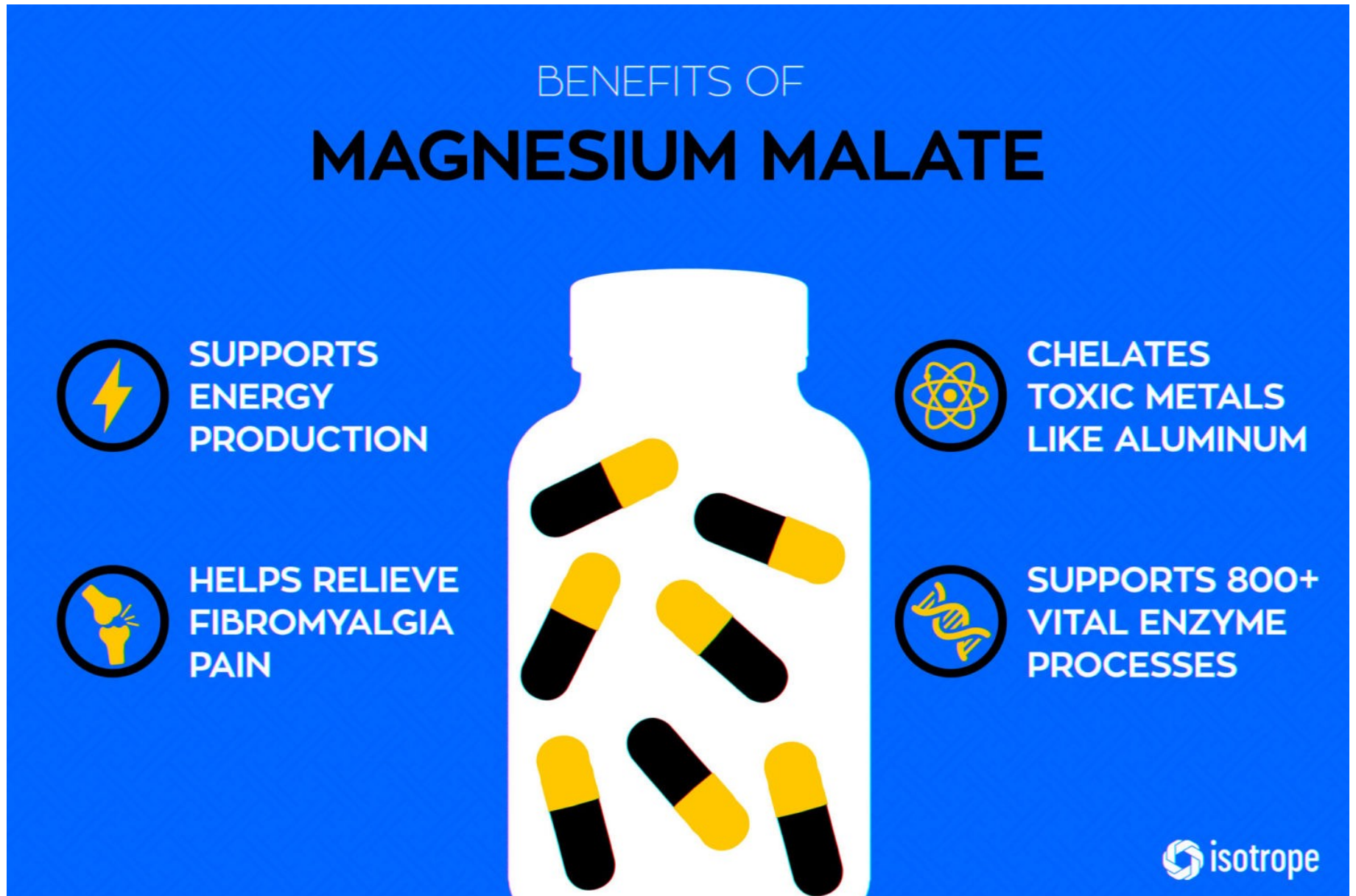
Importance of Magnesium





In 2012, a review of medical data found that nearly 50% of Americans weren't getting the recommended daily intake (RDI) of magnesium from diet alone. **1** Assuming that the 320–420 mg/day RDI of magnesium is an effective amount of magnesium, that means 1 out of 2 people in America are likely magnesium deficient. It's very likely that number is higher, considering some prior research found as many 68% of Americans consumed less than the RDI of magnesium **2** Many factors come into play when considering how much magnesium we may be, or may *not* be, getting from our food. Topsoil mineral depletion, overally processed foods, and genetic modification may all play a role in providing less magnesium to we've evolved to expect from certain foods. In addition, many health conditions such as Candida overgrowth and parasitic infections can cause intense magnesium competition in the body, often limiting the effective amounts.


1 out of 2 people in America are likely magnesium deficient

Plants and animals alike rely on elemental magnesium to facilitate hundreds of vital processes. In humans, magnesium is involved in all processes that utilize *Adenosine Triphosphate* (ATP) which is commonly considered our primary source of energy. ATP is like a universal energy molecule, which can be transferred between different types of cells, and is produced through such processes as glycolysis **3**. Think of it like crude oil that gets turned into kerosene, gasoline, or even jetfuel depending on which type of vehicle it's being used in. Magnesium has the unique ability to form compounds known as chelates, which are certain types of organic molecules made of centralized metal compounds. Magnesium is able to form ATP chelates which allow it to effectively transfer intracellular energy in our body. **4** In considering which magnesium supplements may offer you the most benefit, oftentimes it's best to consider which type of molecule magnesium has been combined with. In this case, malic acid has been shown to offer several notable health benefits — particularly to pain reduction and energy production.

BENEFITS OF MAGNESIUM MALATE



-  **SUPPORTS ENERGY PRODUCTION**
-  **CHELATES TOXIC METALS LIKE ALUMINUM**
-  **SUPPORTS 800+ VITAL ENZYME PROCESSES**
-  **HELPS RELIEVE FIBROMYALGIA PAIN**



Benefits of Magnesium Malate + Malic Acid

The benefits of magnesium malate are best discussed in the context of the benefits of malic acid. Different types of magnesium supplements may be absorbed better than others, and provide different amounts of magnesium. Regardless of the unique composition — they are all effectively supplying your body with the same magnesium compound. The benefits of different types of magnesium can be seen in the compounds they've

been bonded with, such as malic acid in the case of magnesium malate. While these compounds still provide elemental magnesium, they are also supplying additional compounds that provide distinct benefits aside from magnesium. With that in mind, it's best to consider the benefits of magnesium malate as being largely attributable to malic acid.

Reduces Fibromyalgia Related Pain

Fibromyalgia is a complex disease which causes sometimes debilitating pains. It's symptoms often come and go with little predictability. The causes of fibromyalgia aren't currently well-understood, and there isn't currently an FDA-approved treatment for it. Several studies of natural fibromyalgia treatments have found a remarkable connection between usage of compounds such as malic acid in reducing fibromyalgia pain. One such study done in 1995 found that among 24 patients suffering from fibromyalgia all given the malic acid compound saw a significant reduction in fibromyalgia-related pain.⁵ This study utilized a 200mg malic acid + 50mg magnesium compound that was administered initially over a period of two-months. A second phase of this study involved the participants increasing dosage every 3–5 days until they achieved desired pain-reducing effects. During the first, fixed dose trial, there were little effects seen from the malic acid + magnesium treatment. However, when patients increased their dosage and received treatment over a longer period of time there were significant reduction in all pain-related symptoms. Another study conducted in 1992 found that fibromyalgia pain, as measured by the tender point index (TPI), was reduced by 300% after a period of 4–8 weeks of treatment with magnesium + malic acid. This study used a range of malic acid of 1200–2400mg and magnesium in range of 300–600mg.⁶ Noteworthy is that non-placebo receiving participants in this study noticed subjective decreases in pain as little as 48 hours after beginning treatment with magnesium + malic acid. In addition to the benefits of malic acid, elemental magnesium has been shown to be an indicator of lowered levels of C-reactive protein — a type of universal biomarker for inflammation.⁷ Fibromyalgia is thought to be integrally influenced by inflammation, and magnesium's correlation to C-Reactive protein could offer further insight into the benefit of magnesium compounds towards reducing fibromyalgia symptoms.

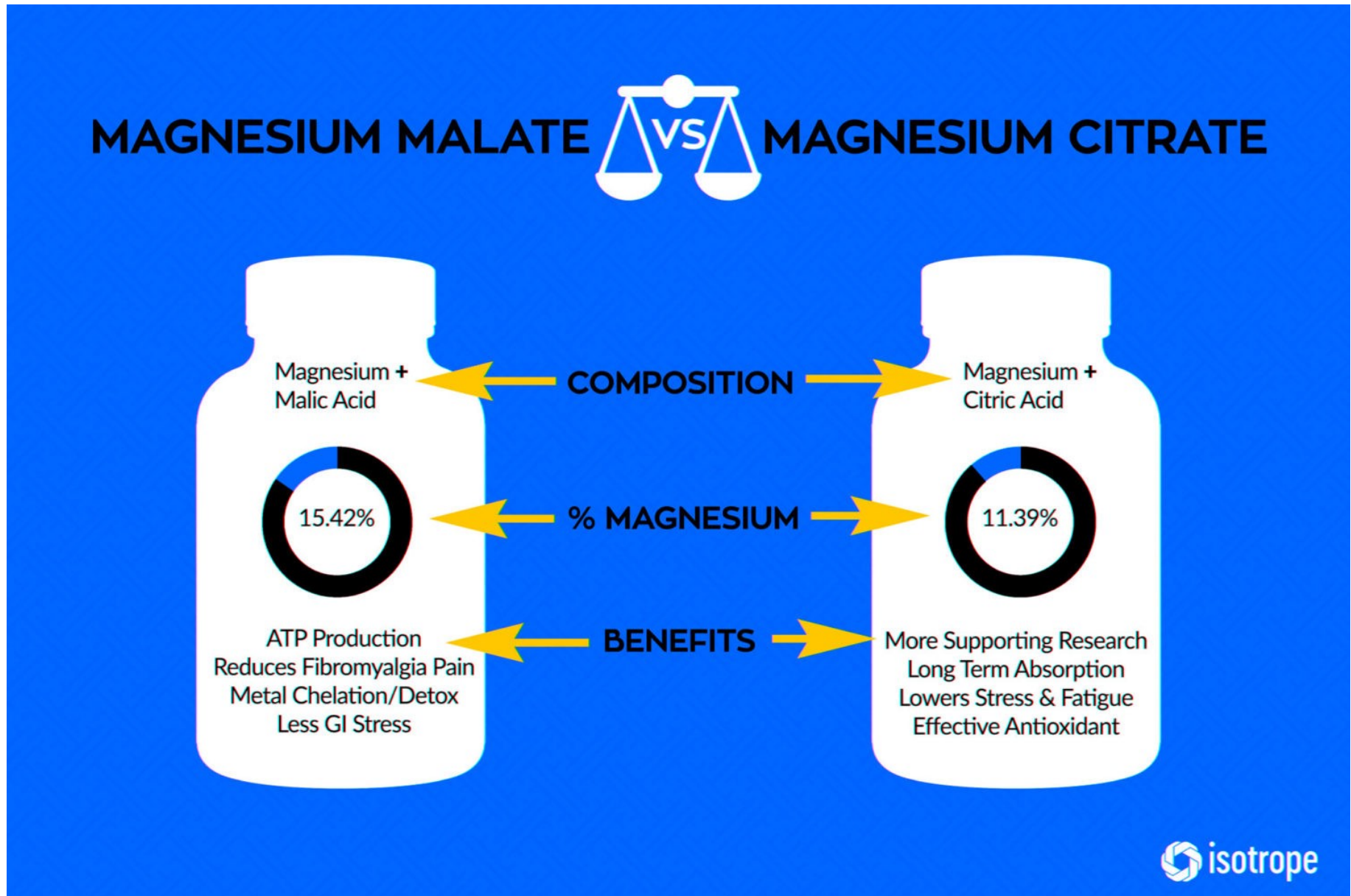
Vital to Cellular Energy Production

In 1953 a man named Hans Krebs received a Nobel Prize for his description of a biological process within the body responsible for cellular energy production. This process is known as the Citric Acid Cycle (sometimes called Krebs Cycle) and helps generate and process energy within our body. This process involves many different enzymes and intermediary metabolites, but ultimately functions to utilize ATP. This process is regarded as one of the most fundamental cellular processes in aerobic lifeforms such as humans, and many believe it likely integral to the origin of life. ⁸In the later stages of the Krebs Cycle, an enzyme named Fumarase acts on a Fumarate molecule to transform it into ionized malic acid (malate). This step directly precedes the formation of *Nicotinamide Adenine Dinucleotide* (NAD+) which leads directly to energy utilization by the mitochondria.⁹ Malic acid is present in many natural foods such as apples and oranges. This compound exists as the non-ionized form, and must undergo transformation within the Krebs Cycle before being able to be useful in the production and utilization of ATP. Ionized malic acid, such as that found in Magnesium Malate supplements, conceivably offers the human body a more efficient intermediary to utilize within the final stages of the Krebs Cycle. This has been noted in anecdotal accounts as an effective way to treat symptoms of chronic fatigue and boost overall baseline energy levels.

Aluminum Detoxing/Chelation

Aluminum is a potentially hazardous compound that is being increasingly linked to many neurological disorders such as Alzheimer's Disease. The specific action of aluminum in neural tissues isn't completely known, but there is enough evidence to suggest a causative correlation.¹⁰ Several studies have shown the ability of carboxylic acids such as malic acid, citric acid, and tauric acid to offer aluminum chelating action, potentially

viable solutions for reducing overall aluminum toxicity. To understand how this process works, it helps to realize that aluminum and magnesium are both metals. Aluminum is capable of bonding with compounds like citric and malic acid the same way that magnesium is. When you consume foods high in these types of natural acids, research has shown some evidence of lower aluminum presence. **11 12 13** This type of effect has largely been investigated in animal studies only, though there are some reports of similar effects being noted in uncontrolled human trials **14** This effect has been noted in varying degrees of efficiency among several acids, with several forms of aluminum compounds as well. Aluminum toxicity stemming from vaccination is a very debated topic in recent years. While much focus is given to the efficacy of vaccines in general, many argue that preservative agents used in vaccines are capable of harmful toxic effects as well. Adjuvants such as aluminum draw criticism for adding unrelated toxic load to the administered host. In a New Zealand animal study, researchers found that compounds such as malic acid were able to reduce the amount of these types of aluminum compounds present in the blood stream after injection. While promising, this study was conducted with levels of Aluminum that are likely far beyond those found in practical applications.



Magnesium Malate vs. Citrate

In the world of Chemistry, when an acidic and alkaline (basic) compound are combined they often form a neutral compound referred to as a *salt*. Malic Acid and Citric acid are both hydrogen ion-containing molecules, which effectively classifies them as acids. Elemental magnesium is considered an Alkaline Earth Metal, and is naturally found in a silvery metallic form. This is considered an inorganic form of magnesium, and isn't

readily available to the body. Creating magnesium salts such as citrates or malates transforms elemental magnesium into an organic magnesium which can be effectively utilized by our bodies for purposes of nutrition.

Comparing magnesium citrate vs. magnesium malate is effectively comparing the differences in malic acid vs citric acid with regards to their effect on the absorption and utilization of magnesium in our body. These types of magnesium provide the action of their respective acids (malic and citric) when consumed, and are effectively compared in that regard. For example, malate is an integral component to the production of ATP (cellular energy), and malic acid is regarded as providing that benefit. There is very little research on the differences in efficacy for different types of magnesium. Limited research suggests that chelates such as magnesium glycinate are most effective for acute short-term dosing, while magnesium citrate provides better absorption over the long term. ¹⁵ Magnesium Citrate and Malate have both demonstrated the ability to be better utilized by the body compared to forms such as oxide and chloride.

Another important consideration to make when comparing magnesium malate vs. citrate is in their respective amounts of elemental magnesium. Each of these types of magnesium contain compounds in addition to magnesium, and the listed amount on the label accounts for the acid + magnesium total, not always the magnesium. To understand this type of difference, you have to calculate the elemental weight of magnesium for each type. This is done by subtracting the molecular weight of magnesium from the molecular weight of the specific magnesium type, then calculating the overall percentage using that figure. The formula for such a calculation is as follows:

$$\frac{\text{Molecular Weight of Magnesium}}{\text{Molecular Weight of Magnesium Type}} * 100$$

Using this formula, the following elemental magnesium percentages can be calculated as 15.54% elemental magnesium for Magnesium Malate, and 11.39% elemental Magnesium for Magnesium Citrate. This reveals roughly 4% greater amount of elemental magnesium found within magnesium malate than in magnesium citrate. There isn't enough research currently to state conclusively any differences in bioavailability between the two types. To summarize, magnesium Malate offers approximately 4% more elemental magnesium than magnesium citrate, and it's benefits are commonly regarded with context to it's malic acid component.

Potential Side Effects

Magnesium supplements in general are noted as having very few side effects. Some topically-applied sprays and oils have been reported as causing rashes or itching, though these aren't relevant to orally-administered forms such as magnesium malate. One side effect typical to *all* magnesium supplements is gastrointestinal distress. The human body has a certain level of magnesium homeostasis it tries to maintain, and when too much magnesium is present it signals the release of excess amounts. This typically results in loose or watery stools, and diarrhea in cases of massive over-consumption. Magnesium malate offers a more highly-absorbed form of magnesium — meaning your tissues, organs, and cells can receive more magnesium than when taking other types such as magnesium oxide or carbonate. Many lower-absorbed magnesium supplements can cause gastrointestinal distress such as diarrhea, long before your body is able to absorb a therapeutic amount. These side effects aren't regarded as serious in most cases, and are often seen as an easy way to test to see if you need more magnesium.

Final Considerations

Magnesium is an essential compound that controls hundreds of processes in our body. It aids in nervous system function, digestive actions, and in

the generation of cellular energy. Magnesium malate is a specific type of magnesium compound that has been combined with malic acid — known also for many health benefits. Malic acid has been shown to be effective as a heavy metals chelating agent, vital in the production of energy, and potentially a treatment for fibromyalgia related pain. Magnesium compounds in general, but specifically magnesium malate, are poorly researched currently. The majority of research is either conducted in animals or only within small isolated human trials. While confirmation for the health benefits of magnesium malate may take years to confirm in clinical settings, many anecdotal reports describe very positive experiences. Magnesium malate has very rare and very mild side effects associated with it, and is generally regarded as safe to experiment with. Always check with your doctor before beginning a new supplement or changing your current medication.

References

1. <https://www.ncbi.nlm.nih.gov/pubmed/22364157>
2. <https://www.ncbi.nlm.nih.gov/pubmed/15930481>
3. https://en.wikipedia.org/wiki/Adenosine_triphosphate#Glycolysis
4. <http://journals.sagepub.com/doi/pdf/10.1177/000456329102800103>
5. <https://www.ncbi.nlm.nih.gov/pubmed/8587088>
6. <http://agris.fao.org/agris-search/search.do?recordID=US201301762139>
7. <https://www.ncbi.nlm.nih.gov/pubmed/15930481>
8. https://en.wikipedia.org/wiki/Citric_acid_cycle
9. https://simple.wikipedia.org/wiki/Krebs_cycle#/media/File:Citric_acid_cycle_with_aconitate_2.svg
10. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3056430/>
11. <https://www.ncbi.nlm.nih.gov/pubmed/2051716>
12. <https://www.ncbi.nlm.nih.gov/pubmed/3588526>
13. <https://www.ncbi.nlm.nih.gov/pubmed/3391623>
14. <http://hsionline.com/2003/06/25/aluminum-chelation/>
15. <https://www.ncbi.nlm.nih.gov/pubmed/14596323>