Magnesium is now known to play a critical role in preserving our health. Studies in large populations have shown that higher intake of this mineral is associated with lower risk of high blood pressure, stroke, and ischemic heart disease. In experimental animals, low-magnesium diets worsen the impact of an atherosclerosis-producing diet, while supplemental magnesium slows the development of the disease. Low magnesium also puts a person at risk for insulin resistance (the process through which the body’s cells stop responding to the hormonal command to take up blood sugar), which leads to “Syndrome X” and non-insulin-dependent (“type-2”) diabetes but which is also, in itself, a major risk factor for heart disease.

But the importance of magnesium in cardiovascular health reaches beyond its ability to reduce the risk of a cardiovascular crisis. There’s actually a lot of evidence that magnesium also offers protection when you need it most: in the middle of a heart attack or stroke. That is, even if you do suffer a major event in your cardiovascular system, this research suggests, your chances of surviving are better when plenty of magnesium is available — as are your chances of escaping disability.

Many studies have shown that magnesium protects the brain from injury in experimental animals subjected to simulated stroke, or to excitotoxicity (the overamping of electrical signals in the brain which leads to nerve cell death, and which is so central to the carnage inflicted on your neurons during and after a “brain attack”). More impressively, many randomized, controlled trials in humans have now reported that infusion of magnesium improves your chances of survival after heart attack, while cutting down the risk of subsequent heart-rhythm disturbances and failure of the heart’s main pumping chamber. The results of a small trial suggest that similar treatment with magnesium may also improve survival and reduce disability after a stroke, and a larger trial is now underway to confirm this preliminary result.

Magnesium modulates the flow of ions across membranes at sites such as the sodium/potassium ATPase, the calcium ATPase, the mitochondrial sodium/hydrogen antiporter, and the ion channel of the N-methyl-D-aspartate (NMDA) receptor, as well as both the voltage-gated and the store-operated calcium channels now known to be the molecular targets of calcium-channel blocker drugs. As a result, magnesium has earned the title of “nature’s physiologic calcium blocker” – a moniker justified by the many clinical trials showing that magnesium supplements improve endothelial function and lower blood pressure.

But magnesium’s ion-regulating effects have health implications that extend well beyond its use for keeping your blood pressure healthy – some of which are well-recognized even by the medical mainstream. For decades, infusions of magnesium have been the standard treatment for the seizures of eclampsia (the convulsions and coma which strike some women around the twentieth week of their pregnancy), replacing the seizure drug phenytoin (Dilantin®) and the depressant drug diazepam (Valium®).
Magnesium Pidolate: The Guardian at the Gates

In choosing a magnesium supplement, there are a lot of options out there. One important factor to consider is the body's ability to absorb the mineral. At just 23% absorption, magnesium oxide and carbonate have "extremely low" bioavailability, and magnesium citrate is little better at 29.64% absorption. Much better absorption is available from other forms of magnesium, such as magnesium monoaspartate, with a bioavailability of 41.7%.

But there are other things to consider beyond bioavailability. Studies have shown that different forms of magnesium vary in their ability to regulate the ionic floodgates — and thus, in the amount of protection they provide against the havoc when ion channels aren't kept under strict control. And among available magnesium supplements, research shows that magnesium pyrrolidone-carboxylate (more handily known by its nickname, Magnesium Pidolate) provides the greatest membrane-stabilizing protection.

A Surge Bar for the Brain

Magnesium Pidolate has been proven to provide a powerful shield against seizures caused by massive injections of excitotoxic amino acids such as NMDA and kainic acid in experimental animals. In fact, part of the reason for kainic acid's excitotoxicity is that it drains the brain of membrane-regulating magnesium — and Magnesium Pidolate was subsequently found to be superior to other magnesium forms in protecting animals against this depletion. When magnesium levels are low, certain frequencies of sound will throw some laboratory animals into seizures; Magnesium Pidolate has proven itself to be better than a conventional magnesium salt at preventing these convulsions.

Again, insane killing frenzies overtake some experimental animals when they don't have enough magnesium. Among several forms of the mineral, Magnesium Pidolate returns these animals to sanity more effectively than other forms, increasing the amount of provocation required to trigger attacks and cutting down on killing activity.

Migraine headaches are also caused in part by hyperexcitability of the central nervous system, and a study that measured the electrical response of the brain to a visual stimulus reported that Magnesium Pidolate reduces brain hyperexcitability in migraine-prone children. So as you might expect, an open study in children with migraines or recurrent periodic disorders linked to neuronal hyperexcitability found that 77.5% of cases treated with Magnesium Pidolate had either a complete halt to their crises, or suffered less than a third as many crises as they had before taking up the supplement. Similarly, a randomized, controlled trial showed that Magnesium Pidolate supplements effectively reduce the frequency and severity of menstrual migraines. The same study found that Magnesium Pidolate also improves other PMS symptoms — a finding confirmed in a separate, open study.

There are many other situations in which Magnesium Pidolate's superior protection against hyperexcitation of the brain would provide relief. For instance, studies show that there is a close association between excessive activation of the NMDA receptors of the brain and poor slow-wave sleep (also known as delta-wave sleep: the deepest, most restorative stage of the sleep cycle). Clinical trials have shown that magnesium supplements give users longer, deeper slow-wave sleep and reverses neuroendocrine disturbances associated with impaired delta-wave function, and prevents the slump in athletic performance after chronic sleep deprivation. With its greater protection against NMDA overactivation, Magnesium Pidolate is the supplement of choice for such health-enhancing benefits.

A Smoother Pump

The direct effects of an infusion of Magnesium Pidolate on the heart were measured in a pilot study in ten patients. As the heart contracted, Magnesium Pidolate reduced peak systolic
pressure by 10 millimeters of mercury (mmHg) in the heart's main pumping muscle (the left ventricle). Likewise, the rate at which the contracted heart muscle released the squeeze of its contraction (pressure decay) was improved by Magnesium Pidolate. In turn, this allowed the heart to begin refilling with blood more quickly with the help of Magnesium Pidolate, which increased the heart's uptake of blood as the heart muscle relaxed. As a result, Magnesium Pidolate increased the delivery of that blood through the heart to the systemic circulation. Overall, the active relaxation of the heart muscle was improved, while the heart's passive relaxation was unaffected.27

What's Out There ... and Why
With all of the decades of research backing the benefits of Magnesium Pidolate, why is it not more widely available? The simple reason is that there are several features of this form of the mineral that can make people reluctant to look beyond the label of a Magnesium Pidolate supplement if they haven't yet learned about the benefits of different forms of the mineral. For one thing, Magnesium Pidolate is more expensive than other magnesium supplements on a milligram-for-milligram basis, so that health-conscious people may be put off by the price, and turn instead to a cheaper alternative even though Magnesium Pidolate would benefit them more. For another thing, the pyrrolidone-carboxylate ligand in Magnesium Pidolate is a big molecule. As a result, when you bind magnesium to this ligand, the final complex yields only about 8% elemental magnesium by weight. As a result, while companies using cheaper magnesium forms can cram a full day's magnesium into one tablet or two capsules, it takes several caps or tabs a day to get an RDA of magnesium from this superior form.

Supplement companies know that people don't like taking a lot of pills. But instead of educating people about the importance of choosing the right kind of magnesium if they want to reap the full benefits of the mineral, most companies just pick a form of magnesium that let them cater to the reluctance to take more than a few pills a day.

On the other hand, while Magnesium Pidolate is hard to find in supplements on health food store shelves, there are plenty of supplements labeled "magnesium aspartate." Unfortunately, most of the "magnesium aspartate" on the market is not true, fully-reacted, pure magnesium aspartate, but a "blend" or "complex," mostly made up of magnesium oxide or magnesium carbonate. Few of these products are even labeled as "complexes" or "blends" — and even when they are, few health-conscious people are familiar with the terminology that the labeling ends up being almost equally deceptive to most consumers. Many people, when asked, even think that this term indicates that they're getting a superior, more "natural" form of magnesium aspartate, with unspecified "cofactors" in the product!

The motivation for this deceptive practice lies in the fact that, like the pidolate, magnesium aspartate is expensive and relatively bulky (though not quite as bulky as the pidolate) — but unlike the pidolate, magnesium aspartate already has an established reputation with many health-conscious individuals. The same as with the pidolate form. And it may be fine to take one of these "blended," magnesium aspartate "complex" products if all you need is a little extra insurance against frank magnesium deficiency. But if you need the full benefits of high-bioavailability, true magnesium aspartate — or the membrane-regulating powers of Magnesium Pidolate — you'll want to be sure you're getting the real thing. The small added cost, and the need to fit an extra capsule or two into your pill box, will be sound investments in your health.

Another form of magnesium which has been used as a cardiovascular supplement is magnesium taurate. A theoretical case was once made for this form of magnesium as the best supplement for the heart,* based on the fact that taurine itself has powerful membrane-stabilizing properties; but no subsequent studies have confirmed this hypothesis. In hindsight, you might be able to predict a no-show by this form of magnesium.

For one thing, there's no particular reason to believe that magnesium taurate will be especially well-absorbed or well-utilized. In addition, it's not clear how well a true magnesium aspartate or the membrane-regulating powers of Magnesium Pidolate — you'll want to be sure you're getting the real thing. The small added cost, and the need to fit an extra capsule or two into your pill box, will be sound investments in your health.

For one thing, there's no particular reason to believe that magnesium taurate will be especially well-absorbed or well-utilized. In addition, it's not clear how well a true magnesium taurate allows either the amino acid or the magnesium to do their respective functions. And finally, the amount of taurine delivered by most magnesium taurate supplements is far less than is needed to get real heart benefits: clinical trials using taurine for blood pressure30,31 and congestive heart failure32-34 consistently use 6 000 milligrams of taurine per day, not the few hundred milligrams provided in these supplements. (The point is often moot in any case, since many commercially-available "magnesium taurate" supplements contain only a tiny amount of this form of magnesium, mixed in with magnesium oxide).
On the other hand, excellent results have been reported in animal models using magnesium acetyltaurinate, a form of magnesium related to, but different from, the simple taurate. Remarkably, magnesium acetyltaurinate provides significantly more powerful membrane-stabilizing, ion-regulating benefits than even the pidolate form; furthermore, the effects are clearly not attributable to taurine, since some of its effects are not even dimly reflected in the actions of taurine itself. Unfortunately, because of the difficulties in manufacturing this form of the mineral on a scale large enough to fill the needs of supplement users, a true magnesium acetyltaurinate is not yet available for use in dietary supplements, despite what some companies may claim.

So while magnesium taurate was the theory-based cardiovascular magnesium of yesterday, Magnesium Pidolate and true magnesium aspartate are the evidence-backed cardiovascular magnesium supplements for today ... and an authentic magnesium acetyltaurinate may one day emerge, as the magnesium of tomorrow.

References

22 Sanjuliani AF, de Abreu Fagundes VG, Francischetti EA. Effects of magnesium on blood pressure and intracellular ion levels of Brazilian hypertensive patients. Int J Cardiol. 1996 Oct 15;56(1-2):177-83.