

**REPORT**

**Magnesium in Hypertension Prevention and Control**

By Jay S. Cohen, MD

*High blood pressure is an even stronger predictor of cardiovascular risk than high cholesterol. Scientific studies directly correlate high blood pressure with decreased longevity. Yet most mainstream physicians and their patients ignore this risk until life-threatening hypertension has already developed.*

*A well-established body of research indicates that nutrients such as magnesium are highly effective in treating and—even more importantly—preventing high blood pressure. Because this metallic element is not plentiful in foods, magnesium supplementation may be effective in both preventing and controlling high blood pressure. Learn why you should be concerned about high blood pressure—whether you have it yet or not.*



Fifty million Americans have high blood pressure. If you are not one of them, you likely will be eventually. As New York Times health columnist Jane Brody wrote:

“Americans now 55 or over face a 90% chance of developing high blood pressure, or hypertension, a major risk factor for heart attacks, strokes, congestive heart failure, circulatory failure, kidney disease, and loss of vision.”<sup>1</sup>

Hypertension expert Norman Kaplan, MD, agrees, writing that “Most people will develop hypertension during their lifetime.”<sup>2</sup> In fact, 800 million people—or about 20% of the Earth’s adult population—already have high blood pressure. This is bad news because hypertension leads directly to heart disease, kidney disease, strokes, and other major health disorders. Conn’s Current Therapy, a highly respected medical reference, defines how hypertension greatly reduces longevity:

“A 35-year-old man with an arterial pressure of 130/90 will die 4 years earlier than another 35-year-old man with the same medical background but with normal pressure. If his pressure is 140/90, he will die 9 years earlier, and if it’s 150/100, he will die 17 years earlier.”<sup>3</sup>

To put it in perspective, Mark Houston, MD, a nationally recognized expert on hypertension, once asked an audience of health care practitioners, “If you have elevated cholesterol, diabetes, and hypertension, which should you treat first?” Most picked diabetes, and others chose elevated cholesterol, but the correct answer is hypertension. Why? Because high blood pressure is a much stronger indicator of cardiovascular risk than high cholesterol. The damage to blood vessels caused by high blood pressure leads to hundreds of thousands of heart attacks and strokes each year. Moreover, people with high blood pressure have a much greater risk of developing adult-onset diabetes, and most people with diabetes sustain their greatest harm from the hypertension that frequently accompanies it.

This is why preventing hypertension is so important to maintaining health and prolonging longevity.

**The Importance of Prevention**

All experts agree on the importance of preventing high blood pressure. The Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, a widely recognized expert panel of hypertension specialists, advises: “Before considering the active treatment of hypertension, the even greater need for prevention of disease should be recognized.”<sup>4</sup> Yet mainstream medical doctors are usually content to wait for high blood pressure to develop in their patients and then treat it. Few doctors actively advise patients about how to prevent the disorder from occurring in the first place.

This treatment approach is not very effective. Of the 50 million Americans with hypertension, only about one-half are being treated, and only one-half of those are being treated adequately.

<b>TABLE 1: BLOOD PRESSURE CLASSIFICATIONS</b>
This table lists the levels of hypertension associated with different blood pressure

readings. Except for Stage 2 hypertension, experts suggest that hypertension should be diagnosed only after at least two elevated blood pressure readings have been taken during different office visits. If your systolic and diastolic readings fall into different categories, the higher category defines your blood pressure classification. These classifications do not apply if you are taking antihypertensive drugs or are acutely ill.

	<b>Systolic Blood Pressure (mm Hg)</b>	<b>Diastolic Blood Pressure (mm Hg)</b>
Normal	less than 120	less than 80
Prehypertension	120-139	80-89
Stage 1 hypertension	140-159	90-99
Stage 2 hypertension	160 or higher	100 or higher

Adapted from the Seventh Report of the Joint National Committee on the Prevention, Detection, Evaluation, and Treatment of High Blood Pressure, 2003.<sup>5</sup>

Prevention is even more important today because a blood pressure of 120/80 mm Hg (systolic/diastolic) is not good enough anymore (see Table 1). The most recent report of the Joint National Committee, published in the Journal of the American Medical Association in 2003, warned:

“The risk of cardiovascular disease, beginning at 115/75 mm Hg, doubles with each increment of 20/10 mm Hg.”<sup>5</sup>

Thus it is vitally important to do what you can to keep your blood pressure low instead of waiting for it to creep up over the years. It is especially important to be proactive because many people have a genetic tendency toward hypertension. Even if you have such a tendency, it does not mean you are powerless. As with predispositions toward developing diabetes or elevated cholesterol, much can be done to prevent hypertension from occurring or to modify its severity if it does occur.



### **How Lifestyle Affects Blood Pressure**

Many factors contribute to the development of hypertension, and lifestyle choices play a central role. Maintaining a healthy weight is very important. Extra pounds mean extra work for the heart, which must exert additional pressure to push the blood through the extra mile of blood vessels that come with each pound of excess fat.

A healthy diet can have a major impact on your blood pressure. Studies have shown that the DASH (Dietary Approaches to Stop Hypertension) diet, which emphasizes poultry, fish, fruits, vegetables, whole grains, lowfat dairy products, and nuts, can reduce blood pressure as much as some prescription drugs.<sup>6</sup>

Regular exercise and stress reduction also help keep blood pressure normal. Tobacco and stimulant drugs should be avoided, as these substances boost blood pressure and can injure the sensitive endothelium that lines the blood vessels.

Caffeinated beverages are a controversial topic among hypertension specialists. Caffeine appears to raise the blood pressure of some people but not others. Caffeine certainly does not appear to help control blood pressure and thus probably should be avoided.

Similarly, some people's hypertension is sensitive to salt, meaning that a high or even moderate salt intake will raise their blood pressure. Other people are not sensitive to salt. Nevertheless, experts generally recommend moderation in the use of salt.

## Natural Supplements vs. Prescription Drugs

The list of supplements that can help lower blood pressure is lengthy, and includes coenzyme Q10, essential fatty acids, fiber, garlic, lipoic acid, hawthorn, magnesium, N-acetylcysteine, taurine, and vitamins B6 and C, among others. Some of these substances are more useful than others; some are backed by considerable scientific study, while others are not.

Patients are not likely to hear about any of these natural therapies from a mainstream physician, though practitioners of alternative or integrative medicine regularly recommend these supplements to their patients. Unfortunately, the drug industry dominates the information that most mainstream doctors receive, so that pharmaceuticals become the primary and often only option prescribed for high blood pressure. The top-selling antihypertensive drugs are costly, however, and all come with potential side effects that may include fatigue, sedation, dry mouth, cough, dizziness, headache, nausea, diarrhea, constipation, rash, itching, flushing, swollen legs or ankles, depression, sexual dysfunctions, and metabolic imbalances. Because of these side effects, half of those who take antihypertensive medications eventually quit taking them, usually within three months of starting treatment.<sup>5,7</sup>



Moreover, even when they lower blood pressure, prescription drugs do not eliminate one's risk entirely. People with controlled hypertension still have a higher risk of heart attack and stroke than those who have the same blood pressure but never developed hypertension in the first place. Why is this? Mainstream medicine does not have the answer. One explanation is that while drugs can be effective in blocking some of the factors that cause elevated blood pressure, these medications do nothing to address the intracellular imbalances that lead to the development of hypertension.

In other words, mainstream medicine treats the symptoms of hypertension but does not address the underlying causes. Because nutritional imbalances and other deficits remain, some of the risk remains as well.

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### Magnesium in Hypertension Prevention and Control

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#### The Magnesium Solution

Natural substances that lower blood pressure can differ significantly. First, there is a big difference between a nutrient and a supplement. Health care practitioners of all stripes often overlook this distinction. Taking an herb with pharmacological effects is not much different than taking a drug. If your blood pressure is rising because of nutritional deficiencies, it makes more sense to start with the very nutrients that are missing.



Which nutrients are the most important for maintaining a healthy blood pressure? Two that stand out are the metallic elements potassium and magnesium.

Most people and doctors know that adequate amounts of potassium are essential for maintaining healthy blood pressure. One of the main reasons that the DASH diet reduces blood pressure is that it provides a large daily supply of potassium. When doctors prescribe diuretics, they also recommend taking potassium, derived either from food sources (such as bananas or vegetables) or a prescription product.

Yet few doctors know that diuretics help flush magnesium as well as potassium from the body. The resulting magnesium deficiency hinders potassium use by the cells.<sup>8,9</sup> "Magnesium deficiency keeps people from replenishing potassium," says hypertension expert Chris Mende, MD. "So when patients are hospitalized and potassium levels are low, efforts to increase potassium often are hampered unless the magnesium deficiency is also treated."

Nevertheless, magnesium's importance in maintaining normal blood pressure and treating high blood pressure is not widely recognized. This is surprising because magnesium is one of the most intensively studied nutrients in the scientific literature. Thousands of studies of magnesium can be found in MEDLINE ([www.pubmed.org](http://www.pubmed.org)), the National Institutes of Health's vast collection of medical journal articles. Indeed, according to the National Institutes of Health:

"Evidence suggests that magnesium may play an important role in regulating blood pressure. Magnesium deficiency can cause metabolic changes that may contribute to heart attacks and strokes. There is also evidence that low body stores of magnesium increase the risk of abnormal heart rhythms, which may increase the risk of complications associated with a heart attack. Population surveys have associated higher blood levels of magnesium with lower risk of coronary heart disease."<sup>10</sup>



Magnesium is one of the body's most important minerals. It is required as a cofactor in hundreds of enzymatic processes within cells.<sup>11</sup> Magnesium is a major factor in relaxing the smooth muscles within the blood vessels, thereby reducing peripheral vascular resistance and blood pressure.<sup>11-13</sup> In addition, magnesium reduces nerve and muscle excitability, stabilizes cardiac conductivity, and influences neurochemical transmission.<sup>11,13,14</sup> Magnesium also affects circulating levels of norepinephrine and the synthesis of serotonin and nitric oxide.<sup>11,14,15</sup>

Indeed, because of magnesium's primary role in blood pressure regulation, for decades scientists have called magnesium "nature's calcium channel blocker" because

magnesium directly offsets the constriction of blood vessels caused by calcium.<sup>11,14</sup> Because drug companies cannot make money from a natural substance like magnesium, they have developed a whole group of drugs called calcium antagonists or calcium channel blockers to do what magnesium does. In 2000, doctors wrote more than 95 million prescriptions for calcium antagonists, including top sellers amlo-dipine (Norvasc®), nifedipine (Procardia®), diltiazem (Cardizem®, Tiazac®), and others at a total cost of more than \$4.5 billion.<sup>16</sup> These drugs are not only costly, but they can also cause side effects such as dizziness, palpitations, fatigue, tiredness, and swollen legs. Yet many doctors do not hesitate to prescribe these drugs because they were never taught about magnesium. While legions of pharmaceutical sales representatives bring stacks of studies and free samples of these drugs, no one pushes magnesium.<sup>17</sup>

Fortunately, a growing number of doctors are now learning about magnesium. Sherry Rogers, MD, a highly respected integrative medicine physician, has written extensively about magnesium's benefits for disorders caused by abnormal muscle constriction: "In order for a muscle to contract, it needs calcium. In order to relax, it needs magnesium."<sup>18</sup> Hypertension is one of the conditions for which Dr. Rogers recommends supplementing with magnesium.

## Magnesium in Treating High Blood Pressure

Numerous studies demonstrate magnesium's importance in maintaining healthy blood pressure. Epidemiological studies, which survey the causes, prevalence, and distribution of disease in population groups, have found a clear relationship between magnesium in the diet and blood pressure: the more magnesium in the diet of a given population, the lower its blood pressure tends to be; conversely, the lower the amount of magnesium in the diet, the higher the blood pressure.<sup>19</sup>

For example, in studies of the natives of Greenland, the Bedouin peoples of the Middle East, the Bantu of southern Africa, and Australian aborigines, the incidence of high blood pressure and cardiac disease was low when the water they consumed or diets they ate were rich in magnesium. When these people moved to urban areas and adopted modern, magnesium-deficient diets, they developed hypertension and cardiac disease as often as their urban counterparts.<sup>19</sup>

In the US and other Western countries, the incidence of cardiovascular disease is significantly lower in people who live in areas with hard water containing a high concentration of magnesium.<sup>20</sup> Vegetarians, who usually get a lot of magnesium in their diets, have a correspondingly lower incidence of hypertension, heart disease, and sudden cardiac death. Assessing the scientific data, Drs. Burton and Bella Altura, who have pioneered the study of magnesium and cardiovascular diseases, concluded in *Scientific American*: "At least 10 independent clinical studies show that patients with hypertension of diverse etiologies exhibit hypomagnesemia [low magnesium] in serum or tissues, or both."<sup>19</sup>



Evidence-based studies have shown the same thing. A 1989 study published in the journal *Hypertension* found that taking 625 mg of magnesium daily produced significant reductions in blood pressure in 21 subjects.<sup>21</sup> A study published in 1993 in the *American Journal of Hypertension* found that taking supplemental magnesium reduced average systolic blood pressure from 154 to 146 mm Hg and cut average diastolic blood pressure from 100 to 92 mm Hg. The authors commented: "For the first time in a double-blind, placebo-controlled study, we have demonstrated that oral magnesium results in a significant dose-dependent reduction of systolic and diastolic blood pressure."<sup>22</sup>

A study published in the *International Journal of Cardiology* in 1996 found that taking 600 mg of magnesium daily reduced systolic blood pressure by an average of 7.6 mm Hg and diastolic pressure by an average of 3.8 mm Hg.<sup>23</sup> In another double-blind, placebo-controlled study published in the *British Journal of Nutrition* in 1997, subjects who took 411-548 mg of magnesium daily experienced significant reductions in systolic and diastolic blood pressure.<sup>24</sup>



These and other studies<sup>25-27</sup> create a compelling body of evidence for the use of magnesium in preventing and treating hypertension. In some studies, magnesium failed to reduce blood pressure significantly, though these studies typically were too brief in duration for the magnesium to reach maximum effect, or they used inadequate amounts or poorly absorbed types of magnesium. While some people obtained benefit from magnesium in these studies, not enough people did to achieve statistical significance.

Summarizing the studies, Mildred Seelig, MD, who has been studying magnesium for 60 years and has written numerous articles and books about this vital element, concluded: "The studies that employed the larger supplements of magnesium did in fact show that it has ability to lower high blood pressure."<sup>28</sup>

## Recognizing and Treating Magnesium Deficiencies

In 1900, the average American diet provided about 450 mg of magnesium a day. By 2000, the average diet provided only 200-225 mg of magnesium daily, well below the US RDA (recommended dietary allowance) of 320 mg for adult women and 420 mg for adult men (see Table 2). Thus, while most Americans in 1900 obtained adequate magnesium from their diets, today as many as 80% do not get enough.<sup>28,29</sup> Similar deficiencies exist in all Western countries. A survey conducted in France in the mid-1990s found that 72% of men and 77% of women obtained less than the RDA of magnesium from their diet.<sup>30</sup>

**TABLE 2: US RDA FOR MAGNESIUM**

The recommended dietary allowance (RDA) for magnesium is affected by age, gender, and other circumstances. Stress, for example, may increase the amount required. Some experts believe these allowances are too low. Amounts listed below are in mg per day.

Age	Men	Women	Pregnant	Lactating
14-18	410	360	400	360

19-30	400	310	350	310
31+	420	320	360	320

Modern food production contributes to the problem by using inadequate amounts of magnesium in plant fertilizers, as well as by employing accelerated growing techniques and refining methods that reduce magnesium content. Today's dietary habits also exacerbate the problem. Soft drinks and other popular beverages contain large amounts of phosphates that interfere with magnesium absorption. Diets containing large amounts of fat, salt, coffee, or alcohol also interfere with magnesium absorption or cause magnesium loss. Calcium supplementation can reduce the absorption and increase the kidney excretion of magnesium and other vital minerals.

Despite all this, magnesium deficiencies are rarely recognized because there is no simple, widely available test for magnesium deficiency. Mainstream medical laboratories measure the total serum (blood) magnesium. This measurement is not very helpful; even if one is severely magnesium deficient, the body will maintain a normal blood level of magnesium by drawing magnesium from cells and bone. Thus, a normal serum magnesium level can mask even a major magnesium deficiency. Incidentally, the same is true for calcium, which is why osteoporosis is not diagnosed using a blood test but rather by measuring bone density.



Developing a reliable test that can accurately reflect magnesium levels in the tissues has been a challenge because less than 1% of the body's total magnesium is contained in the blood, whereas about 55% resides in bone, 26% in muscle, and 18% in other tissues. Yet such measurement is possible today. Specialty laboratories can perform magnesium analyses on ionized blood, red blood cells, hair, and cells swabbed from the inner side of the cheek. These tests can be quite accurate and are frequently used by alternative doctors, though not by most mainstream major doctors. If one of these tests became as standard as the others that doctors order, magnesium deficiencies would be widely recognized and properly treated.

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#### Should You Take Magnesium?

Unlike potassium, magnesium is not plentiful in a large number of foods. Green vegetables, whole grains, and nuts contain substantial amounts of magnesium. Unless you eat a lot of these foods, however, it is difficult to obtain the RDA on a consistent basis, let alone the higher amounts often needed for treating magnesium deficiencies or high blood pressure and other vascular disorders.

Many people think they get enough magnesium from their multivitamins, but the amount of magnesium in many supplements is inadequate. It is recommended that you start with a low dose of magnesium such as 100 mg taken twice daily with meals, then gradually increase the dose to the RDA. For older people, whose kidney excretion of magnesium is reduced, 100-200 mg per day of magnesium is often sufficient.

People with magnesium deficiencies or hypertension may need even higher daily doses of magnesium. Some integrative practitioners use 600-800 mg per day of magnesium. Magnesium is usually well tolerated in people with normal kidney function, but you should always consult with a health care professional if you are taking more than the RDA. Symptoms of magnesium toxicity are rare and include weakness, slowed heart rate, reduced tendon reflexes, and somnolence.



#### Summary

Magnesium should be considered by anyone seeking to prevent or treat high blood pressure. The foundation for a healthy blood pressure consists of a healthy diet, adequate exercise, stress reduction, and sufficient amounts of potassium and magnesium. If you eat plentiful amounts of vegetables, you are likely getting plenty of potassium. Sufficient magnesium, on the other hand, is difficult to obtain through diet alone.

If you require medications for high blood pressure, take them as your doctor suggests. For those with borderline or Stage 1 hypertension, however, natural methods can be tried first. If you have done this and your blood pressure is still elevated, see your doctor and inquire about medications that can help. The best way to avoid medication side effects is to use the very lowest dose required to bring your blood pressure down.<sup>31,32</sup>



Jay Cohen, MD

Magnesium can be used in concert with drugs for hypertension. A friend of mine, an advanced yoga instructor, developed muscle tightness as a side effect of her antihypertensive medication. Supplementing with magnesium allowed her to reduce her medication dose, and her muscle tightness went away.

Of course, the best way to avoid medication side effects is to prevent hypertension from developing in the first place. If you do not have high blood pressure yet, now is the time to initiate preventive measures. Start with lifestyle strategies, including a healthy diet, regular exercise, stress reduction, and avoiding smoking, caffeinated beverages, and chemicals that raise blood pressure. Then make sure that you are getting enough potassium and magnesium, as well as other nutrients known to help control blood pressure.

If your blood pressure is already on the rise, do not hesitate to take action. By the time hypertension is apparent, your arteries have sustained years of injury; damage has already occurred and will continue to accelerate. High blood pressure is a killer, and often more destructive than high cholesterol. Do not wait for your doctor's instruction—you can start taking steps to prevent hypertension today.

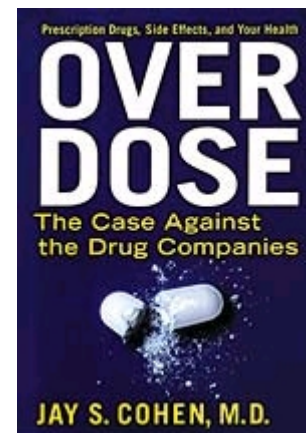
*Jay S. Cohen, MD, is the author of *OverDose*, published by Tarcher/Putnam.*

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