

Life Extension Magazine December 2014

Report

## Magnesium The Missing Link To A Healthy Heart

By Jennifer Dawson

Cardiovascular disease remains the leading cause of death in the US.<sup>1</sup>

With nearly half the US population consuming less than the recommended amount of magnesium in their diets,<sup>2</sup> this widespread **magnesium deficiency** is a commonly overlooked risk factor for cardiovascular disease.<sup>3</sup> Studies demonstrate that the lower your intake of magnesium, the greater your risk of succumbing to cardiovascular disease.<sup>4</sup>

Research has shown that magnesium supplementation can be therapeutic for a range of cardiac factors including arrhythmias, hypertension, atherosclerosis, and endothelial dysfunction.<sup>3,5</sup>

Even a *moderate* magnesium deficiency can cause profound changes in how the heart, blood vessels, blood cells, intestinal tract, and other tissues function.<sup>6</sup> This is because magnesium is critical for tissues that have electrical or mechanical activity, such as nerves, muscles (including the heart), and blood vessels.<sup>5,7,8</sup>

Experiencing a heart attack or stroke because of a simple magnesium deficiency does not need to happen. In this article we provide important information to protect yourself from unnecessary cardiac events.

### Are You At Risk Of Magnesium Deficiency?

Nearly half of the US population consumes less than the recommended amount of magnesium in their diet.<sup>2</sup>

Inadequate dietary intake is one reason why magnesium deficit is so prevalent in the elderly. Older people have reduced magnesium absorption in their intestines, reduced stores of magnesium in their bones, and increased magnesium losses in their urine.<sup>9</sup> This correctable deficiency exposes the aging population to an **entirely preventable** cardiovascular risk factor.<sup>10</sup>

Magnesium deficit is also responsible for inflammation, endothelial dysfunction, type II diabetes, excessive platelet “clumping,” and other changes that put your heart—and your life—at risk.<sup>9</sup>

### Magnesium Deficit Increases Cardiovascular Risk

Because magnesium is essential for healthy control of blood vessel function, blood pressure regulation, and normal heart contractions, a deficiency in magnesium increases risk of conditions such as endothelial dysfunction, hypertension, and cardiac arrhythmias.<sup>3</sup>

### Arrhythmias

Low magnesium levels raise the risk of developing potentially fatal disorders of heart rhythm, known as **cardiac**



## arrhythmias.<sup>4,11-13</sup>

There are many different kinds of arrhythmias, but all have one thing in common: They involve abnormal conduction of the electrical impulses that govern heartbeat and heart rate. Such electrical disturbances in turn result in a heart rate that is irregular, or too fast or too slow.<sup>14</sup>

Mild arrhythmias may simply cause discomfort when the heartbeat can be felt in palpitations, while ones that are more serious can cause cardiac arrest or fibrillation, in which the beating chambers of the heart either stop entirely or result in an irregular heartbeat.<sup>14</sup>

The deadliest arrhythmias involve the major pumping chambers of the heart, the ventricles, while milder, more chronic arrhythmias involve the upper chambers, or atria.<sup>14</sup> Atrial arrhythmias can also degenerate into dangerous atrial fibrillation or flutter, in which slow blood flow can produce clots that travel to the brain, lungs, or other vulnerable areas.<sup>14</sup>

Many arrhythmias are managed by drug therapies aimed at restoring normal electrical activity in the heart. These drugs, however, by their very nature can be dangerous and can easily overshoot their goals, resulting in actual increases or changes to more dangerous arrhythmias.<sup>14</sup>

This cause-and-effect can be particularly dangerous in people with congestive heart failure, who may take diuretic drugs (“water pills”) that cause them to lose magnesium at a high rate,<sup>15</sup> raising their already high risk for arrhythmias.<sup>12</sup> Similarly, coronary artery bypass surgery, a procedure still used for many people with severe atherosclerosis of the heart’s blood vessels, is known to lower magnesium levels and raise the risk of arrhythmias.<sup>16</sup>

In one study, 13 women consumed an experimental diet low in magnesium.<sup>17</sup> Three of the women (**23%**) developed arrhythmias (**atrial fibrillation** and **atrial flutter**), in which the upper pumping chambers of the heart lose their normal beating pattern, and four (**31%**) had to begin magnesium repletion by supplementation earlier than scheduled.

Fortunately, magnesium supplementation readily corrects drug-induced or other low magnesium-related arrhythmias.<sup>18</sup> Supplementation is now routinely used *before* many kinds of heart surgery that are known to induce postoperative arrhythmias, and is also recommended for people with chronic arrhythmias having known low magnesium levels.<sup>19-22</sup>

Research suggests magnesium supplementation can combat that risk by restoring healthy heart cell electrical functions, fighting the development of arrhythmias at its source.<sup>23</sup>

Emergency departments have used intravenous magnesium infusions to reduce dangerously rapid heart rates in patients with a common arrhythmia called **rapid atrial fibrillation**.<sup>24</sup> In addition, giving oral magnesium supplements in the days before surgery has proven to have similar benefits to infusion of magnesium during surgery in preventing dangerous arrhythmias in patients undergoing open heart surgery.<sup>25</sup>

A recent study evaluated the use of oral magnesium supplements in preventing **premature ventricular contractions** (often called PVCs), which have been described as feeling like a “punch in the chest” and have the potential of converting into serious, life-threatening arrhythmias.<sup>26,27</sup> For the study, patients with known PVCs were randomly assigned to receive a placebo or **3 grams** of magnesium pidolate delivering **260 mg** of magnesium daily. After 30 days, **76.6%** of the supplemented group showed a significant reduction in daily arrhythmia episodes, while only **40%** of placebo recipients showed slight improvement.<sup>26</sup>

These are exciting results for a condition in which the medical establishment has struggled to find adequate treatment.

## Hypertension

Having low blood magnesium levels increases risk for *hypertension*, the dangerous persistent rise in blood pressure that leads to congestive heart failure, strokes, and other catastrophes.<sup>28,29</sup>

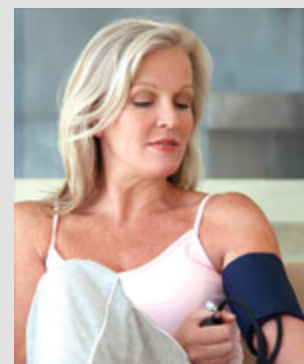
Lower magnesium levels are associated with higher blood pressure readings.<sup>30,31</sup> In fact, you are nearly twice as likely to develop “prehypertension” (blood pressures of **120-139/80-89 mmHg**) if your magnesium levels are below the safe lower limit ( **1.7mg/dL**).<sup>32</sup> Epidemiologic research shows that people in areas where drinking water is higher in magnesium tend to have lower blood pressure.<sup>33</sup> Certain common blood pressure medications, paradoxically, can also deplete your body of magnesium.<sup>34</sup>

Supplementation with magnesium has a beneficial effect on blood pressure. A large meta-analysis demonstrated an average decrease in blood pressure of **3 to 4 mmHg systolic** (top number), and **2 to 3 mmHg diastolic**, a change that increased further when intake of magnesium topped **370 mg/day**.<sup>35</sup> A subsequent meta-analysis of people with existing high blood pressure, with a mean starting systolic pressure of greater than **155 mmHg**, reported a highly significant **18.7 mmHg** mean reduction in systolic, and a similarly significant **10.9 mmHg** mean reduction in diastolic blood pressures.<sup>36</sup> In a group of patients with type II diabetes, a major cardiovascular risk factor, systolic blood pressure fell by an average of **7.4 mmHg** after supplementation with **384 mg** magnesium chloride a day.<sup>37</sup>

#### WHAT YOU NEED TO KNOW

### Magnesium Reduces Heart Disease Risk

- Your body relies on ample magnesium supplies to maintain normal, healthy function of muscle and nerve tissue, especially those found in the heart and blood vessels.
- Inadequate magnesium intake, or deficiency in total body magnesium, increases the risk of cardiovascular diseases such as heart attacks, strokes, and arrhythmias, as well as metabolic syndrome and type II diabetes.
- Restoring magnesium supplies through supplementation is proven to reduce cardiovascular disease and to potentially reverse many of the troubling signs of metabolic syndrome and diabetes.
- People with higher blood levels and intakes of magnesium appear to live longer, succumbing less often to heart disease and other causes of premature death.
- Beginning a regular magnesium supplement today may lengthen your life and lower your risk of some of the biggest killers of older adults.



## Enlarged Heart

Hypertension is also a leading risk factor for the development of dangerous enlargement of the heart, specifically the left ventricle, which is the heart’s main pumping chamber.<sup>38</sup> Preclinical and human studies reveal that a deficiency in dietary magnesium and low magnesium levels are associated with such enlargement, producing a condition known as *hypertrophic cardiomyopathy*, in which the heart muscle becomes so enlarged that it can no longer pump blood effectively.<sup>39,40</sup>

#### MAGNESIUM IMPACTS LIFE SPAN

Supplementing with magnesium is a simple, inexpensive, and effective way to reduce your unnecessary *risk of cardiovascular death*, and even death from multiple causes. Research shows that the higher the magnesium blood levels,

the lower the risk of dying from cardiovascular disease, cancer, and all causes.<sup>62</sup> This is supported by other research showing that those with the highest magnesium intake enjoy a **34%** reduction in mortality risk compared with those having the lowest intake.<sup>63</sup> Another compelling study showed that for each **0.25 mg/dL** increase in plasma magnesium, the risk of sudden cardiac death fell by **41%**.<sup>23</sup>



Preliminary research shows that magnesium is an absolute requirement for maintaining and repairing *telomeres*, the “aging timers” that are found on our DNA strands.<sup>64</sup> Without sufficient magnesium, the aging process itself might be drastically accelerated.

In fact, numerous new studies have appeared demonstrating that low magnesium levels are associated not only with specific diseases, but also with life span. As blood levels of magnesium diminish, the risk of death increases; similar risks arise with diminished magnesium intake.<sup>11,23,65,66</sup>

Lower magnesium levels have been associated with the following negative effects:

- **23%** higher risk of death from all causes,<sup>11</sup>
- **38%** higher risk of death from cardiovascular disease,<sup>11</sup>
- **18%** higher risk of hospitalization for all causes,<sup>11</sup>
- **14%** higher risk of hospitalization for cardio-vascular disease.<sup>11</sup>

Fortunately, higher magnesium levels have been associated with the following beneficial results, demonstrating the benefits of supplementing with magnesium:

- **40%** lower risk of death from all causes,<sup>62</sup>
- **50%** lower risk of death from cancer,<sup>62</sup>
- **40%** lower risk of death from cardiovascular disease,<sup>62</sup>
- **77%** lower risk of sudden cardiac death.<sup>23</sup>

Raising your blood levels of magnesium, then, appears to have the potential to save your life, especially if you are already at risk for heart disease or stroke.

## Atherosclerosis

Endothelial dysfunction leads to thickening and stiffening of the arterial walls (“hardening of the arteries,” or atherosclerosis).<sup>5</sup> While arterial stiffening drives up blood pressure, magnesium supplementation not only lowers blood pressure, but also sharply decreases the resistance against which the heart must pump; this is especially notable in the smaller arteries that provide blood flow to major organs and help improve the amount of nutrient-rich blood they receive.<sup>41</sup>

Magnesium supplementation can also improve the quality of life for those suffering from cardiovascular disease. For instance, in people with known coronary artery disease, magnesium supplementation improved exercise tolerance and reduced exercise-induced chest pain.<sup>42</sup> And in a six-month study of patients with known ischemic heart disease (poor blood circulation to heart muscle), magnesium supplementation led to an impressive *decrease* in angina attacks and a *decrease* in the use of antianginal drugs such as nitroglycerin.<sup>43</sup>

In patients on dialysis for kidney failure, thickening of arterial walls occurs much faster than in healthy patients. However, magnesium can provide important reduction of this condition.<sup>44</sup> In one study, supplementation with **440 mg** of magnesium

oxide three times weekly for six months was found to be effective at reducing that thickening among dialysis patients, while placebo recipients had increased thickening over the same period.<sup>45</sup> Another study of dialysis patients observed similar results when supplementing with **610 mg** of magnesium citrate every other day for two months.<sup>44</sup>

## CAUSES OF MAGNESIUM DEFICIENCY

Low blood levels of magnesium are considered to be one of the most underdiagnosed blood chemical deficiencies in modern medical practice.<sup>7</sup> Many experts now believe that blood magnesium should be checked whenever testing of other electrolytes (chemical ions) in the blood is done.<sup>67,68</sup>

Magnesium deficiency has two major common causes:<sup>69,70</sup>

1. Decreased intake of magnesium, which can occur with alcoholism, starvation, or poor appetite, and in patients with cancer or on chemotherapy. Another growing cause of low magnesium intake is the increased consumption of bottled and filtered water. While some natural mineral waters may contain adequate magnesium, the amounts vary, and many “pure” spring waters contain very little magnesium at all, leading to widespread lack of sufficient magnesium.<sup>71-73</sup>
2. Increased losses of magnesium, either through the digestive tract or in the urine, can occur with severe diarrhea, gastrointestinal fistulas (surgical or pathological connections between the intestinal tract and the outside world), and especially from drug therapy with diuretics and antibiotics such as *gentamicin*.

The so-called “loop” diuretics such as *furosemide* (**Lasix**<sup>®</sup>) and the thiazide diuretics (e.g., *hydrochlorothiazide*) are especially notorious for producing magnesium losses in the urine; fortunately, magnesium supplementation can prevent or correct low magnesium from these drugs.<sup>74,75</sup>

Since so many people drink bottled or filtered water, have otherwise inadequate magnesium intakes, or are taking magnesium-depleting drugs, it is important to get regular tests of your blood magnesium levels, and to supplement with a good source of this vital mineral.



## Metabolic Syndrome And Diabetes

Magnesium is vital for normal metabolic function, including glucose metabolism and insulin action. This is why magnesium supplementation in type II diabetics appears to reverse much of the damage wrought by low levels. Magnesium is an essential “co-factor” for more than 300 enzymes and is vital to the ways your body manages its energy.<sup>46,47</sup>

In one study, a daily dose of **2.5 grams** of magnesium chloride significantly reduced insulin resistance, fasting blood sugar levels, and hemoglobin A1c, a measure of chronic exposure to high sugar.<sup>48</sup> In another study, 12 weeks of supplementation with **360 mg/day** of magnesium produced a **10 mg/dL** drop in fasting glucose levels.<sup>49</sup>

Magnesium supplementation also directly counteracts metabolic syndrome. In a group of type II diabetics, treatment with **600 mg/day** of magnesium oxide produced significant drops in total and LDL (“bad”) cholesterol and triglycerides, with a rise in HDL (“good”) cholesterol.<sup>50</sup> Similar results were seen in another study when healthy volunteers supplemented with magnesium oxide, enough to deliver **520 mg/day** of elemental magnesium.<sup>51</sup> Magnesium oxide and magnesium citrate have been shown to reduce platelet aggregation, and thereby reduce the risk of a dangerous blood clot.<sup>51</sup>

In a study representative of today’s typical middle-aged person (namely, people who were overweight and insulin resistant,

but not yet diabetic), six months of magnesium supplementation significantly improved fasting blood sugar and insulin sensitivity, compared to placebo.<sup>52</sup> Intriguingly, none of the patients had detectably low blood magnesium at the study's outset, suggesting that it's possible to be total-body deficient in magnesium, while still maintaining normal blood levels. According to the authors, this study emphasized "the need for an early optimization of magnesium status to prevent insulin resistance and subsequently type II diabetes."<sup>52</sup> Subsequent preclinical research has confirmed that type II diabetes can be delayed by magnesium supplementation.<sup>53</sup>

People with lower magnesium levels or low magnesium intake may be at an increased risk for developing metabolic syndrome, the combination of central obesity with at least two of the following: hypertension, lipid disorders, impaired glucose tolerance, or diabetes.<sup>33,46,51,52</sup>

As is the case with other health problems, the lower your magnesium intake, the greater your risk of obesity, excess body fat percentage, and high triglycerides.<sup>54</sup> In fact, as magnesium levels decrease, the number of metabolic syndrome components increase, as does an important marker of inflammation C-reactive protein (CRP).<sup>46,55,56</sup>

People with existing diabetes, or with "pre-diabetes" (impaired fasting glucose or impaired glucose tolerance) have significantly lower magnesium levels than do those with normal metabolism.<sup>57</sup> In one study, **88.6%** of type II diabetics had magnesium intake less than the dietary recommendations, and **37.1%** had low blood magnesium levels.<sup>54</sup>

Magnesium deficiency is especially dangerous for diabetics. In one study of diabetic patients with heart failure, **73.3%** were found to have low serum magnesium.<sup>58</sup> Low magnesium levels in red blood cells are strongly associated with increased incidence of cardiac events and poor outcomes.<sup>43</sup>

Some of these observations may be explained by the fact that low magnesium levels appear to raise insulin resistance through a variety of biochemical mechanisms.<sup>59,60</sup> In addition, low magnesium levels make platelets "stickier," increasing the risk of a destructive or fatal blood clot forming, and thereby increasing the likelihood of a dangerous heart attack or stroke.<sup>61</sup>

**TABLE 1**

**Health Risks Associated With Magnesium Deficiency In Older Adults<sup>9</sup>**

General Physiology	Cardiovascular	Metabolic	Other
<ul style="list-style-type: none"> <li>• Increased inflammation</li> <li>• Increased oxidative stress</li> </ul>	<ul style="list-style-type: none"> <li>• Stroke</li> <li>• Atherosclerosis</li> <li>• Ischemic heart disease</li> <li>• Cardiac arrhythmias</li> <li>• Endothelial dysfunction</li> <li>• Abnormal vascular remodeling</li> <li>• Alterations in lipid metabolism</li> <li>• Increased platelet aggregation and risk of blood clots</li> <li>• Hypertension</li> </ul>	<ul style="list-style-type: none"> <li>• Glucose intolerance</li> <li>• Insulin resistance</li> <li>• Type II diabetes</li> </ul>	<ul style="list-style-type: none"> <li>• Asthma</li> <li>• Chronic fatigue</li> <li>• Depression</li> <li>• Neuropsychiatric disorders</li> </ul>

**Summary**

Magnesium is an element critical to multiple vital functions in the human body, yet even people interested in optimizing their nutritional health frequently ignore it. Low magnesium levels trigger problems in the heart muscle, blood vessel walls, and blood vessel linings that can lead to heart attacks, heart failure, atherosclerosis, and cardiac arrhythmias.

Magnesium deficiency also contributes to metabolic syndrome and type II diabetes, two epidemic conditions that themselves lead to cardiovascular disease and other chronic, age-related conditions.

But nearly half of all Americans (and more than that among the elderly) fail to get enough magnesium in their diets, and therefore have suboptimal blood levels of this vital mineral.

Magnesium supplementation is an easy, inexpensive, and effective way to restore magnesium to your whole body, and studies show that boosting your magnesium levels sooner rather than later offers the best protection. Indeed, people with the highest blood levels of magnesium, and/or the highest dietary intake of magnesium, are at lower risk for dying of both cardiac and noncardiac conditions.

If you are an older adult concerned about the possibility of a premature death from cardiovascular or metabolic diseases, you should begin a regular magnesium supplement today.

If you have any questions on the scientific content of this article, please call a **Life Extension**<sup>®</sup> Health Advisor at 1-866-864-3027.

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