



## Nutritional Influences on Illness

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### The Influence of Minerals: Magnesium Supplementation in Bronchial Asthma

Magnesium is well known for its ability to relieve muscle spasm, and its effect on the smooth muscle of the bronchial wall is no exception. When supplied by inhalation to the respiratory trees of asthmatics in remission, magnesium reduces the ability of both histamine<sup>1</sup> and methacholine<sup>2</sup> to produce bronchospasm, suggesting that it protects against various agents that may provoke spasm of the bronchial musculature. Moreover, prostanoids, which stimulate mucus secretion and bronchial smooth muscle contraction, are magnesium-dependent, and rats made magnesium-deficient have been found to have increased tissue prostanoid levels.<sup>3</sup>

How often magnesium deficiency plays a role in provoking asthmatic symptoms is uncertain, although some clinicians believe it to be a common finding.<sup>4</sup> We do know that inadequate magnesium intake is common: people frequently fail to ingest the recommended daily intake,<sup>5</sup> and, among patients presenting to an emergency department, evidence of deficiency is often found.<sup>6</sup>

Furthermore, there is evidence that magnesium nutrition may affect the susceptibility to asthmatic episodes. Magnesium intake is inversely related to the risk of airway hyper-reactivity and wheezing.<sup>7</sup> Moreover, abnormally high intracellular calcium levels may exist during an asthmatic attack.<sup>8</sup> Since magnesium blocks calcium's entry into smooth muscle cells, it may inhibit the action of calcium in releasing chemical mediators from basophils and mast cells.<sup>3</sup>

Studies relating asthmatic attacks to blood magnesium levels have produced a confusing picture. In one study, reduced serum magnesium levels were found in one-quarter of a group of asthmatics. That number increased to half of the group during acute attacks,<sup>9</sup> although other

studies of asthmatics during acute attacks have found serum magnesium to be normal.<sup>10</sup>

Serum levels may not be the only relevant measure of blood magnesium in asthmatics. Yet another study looked further and found that in asthmatics studied between attacks, levels of serum and erythrocyte magnesium were normal, but magnesium levels in polymorphonuclear leukocytes were reduced.<sup>3</sup> Durlach suggests that these latter findings reflect dysregulation of the control mechanisms of magnesium metabolism (what he calls magnesium *depletion*) rather than a true magnesium deficiency.<sup>11</sup>

#### Supplementation

Several double-blind studies have demonstrated the value of magnesium therapy in the treatment of an acute asthmatic episode when administered either by intravenous

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injection<sup>12</sup> or by intranasal inhalation.<sup>13</sup> Although not all studies have found intravenous magnesium to be effective,<sup>14,15</sup> a meta-analysis of five randomized, placebo-controlled trials concluded that in children treated with conventional bronchodilators and steroids, intravenous magnesium sulfate probably provides additional benefit.<sup>16</sup> Moreover, a systematic review of six randomized controlled trials found that an aerosol of magnesium sulfate during an asthmatic attack was beneficial.<sup>17</sup>

Since it would take some time to be utilized, oral magnesium supplementation would not be expected to reduce asthmatic symptoms during an acute episode. However, does oral magnesium offer asthmatics some protection against future attacks? One study compared the results of oral and intravenous magnesium supplementation in people who were found to be magnesium-deficient on the basis of a magnesium loading test. The authors concluded that oral administration of magnesium (magnesium lactate/citrate 5 mmol three times daily) has satisfactory bioavailability and may restore magnesium depots in six weeks in patients with magnesium deficiency.<sup>18</sup>

Also, a double-blind crossover study explored the efficacy of oral magnesium supplementation in asthmatics following three weeks of a low magnesium diet. Although no objective improvements could be demonstrated, magnesium supplements were associated with a significant reduction in asthma symptom scores.<sup>19</sup> These findings suggest that oral supplementation may reduce the tendency towards bronchoconstriction in magnesium-deficient asthmatics.

The efficacy of long-term magnesium supplementation in preventing asthma attacks, especially as to how it relates to borderline magnesium deficiency, needs further clarification. Part of the problem is due to the failure of most investigators to assess the baseline magnesium status of their asthmatic patients. Moreover, the studies of magnesium in bronchial asthma that have looked at magnesium nutriture have usually only assessed serum magnesium levels, an insensitive measure that may remain normal even when the magnesium content of muscles is low.<sup>20</sup> Given the safety of magnesium supplementation, I suggest that asthmatics deserve a trial of oral magnesium, say 600 mg daily for six weeks, to see if they develop symptomatic improvement.

### Notes

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More information on the influence of nutrition on bronchial asthma can be found in the second edition of Dr. Werbach's classic SourceBook, *Nutritional Influences on Illness* and in his CD-ROM with the same title. A free brochure on his publications is available from Third Line Press, 4751 Viviana Drive, Tarzana, California 91356, USA; 800-916-0076; 818-996-0076; Fax: 818-774-1575; e-mail: [tlp@third-line.com](mailto:tlp@third-line.com); Internet: [www.third-line.com](http://www.third-line.com).

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