

# ASTHMA

**Magnesium** Promotes relaxation of bronchial smooth muscle; Inhibits histamine release; Reduces tendency to develop anaphylaxis; Low intracellular levels linked to asthma severity.<sup>1,2,3,4</sup>

**Carnitine** Protects the surface of the lungs; Improves pulmonary function in asthmatics; Decreases inflammation in lung tissue.<sup>5,6,7</sup>

**Coenzyme Q10** Steroid medications for asthma cause damage to mitochondria (site of cellular energy production); CoQ10 repairs this damage and may reduce corticosteroid dosage in asthmatics.<sup>8,9</sup>

**Zinc** Regulates immune system including allergic response; Deficiency can exacerbate asthma symptoms.<sup>31,32</sup>

**Vitamin E** In pulmonary epithelial tissue (inside surface of lungs), vitamin E fights inflammatory enzymes that cause asthmatic symptoms.<sup>10,11,12,13</sup>

**Selenium** Part of the enzyme (called glutathione peroxidase) that protects against asthmatic lung tissue damage; Supplementation trials are promising.<sup>27,28,29,30</sup>

**Choline** Animal and human studies show that taking choline strongly suppresses oxidative stress in lung tissue caused by asthma.<sup>14,15</sup>

**Vitamin A** Prevents exercise-induced asthma; Regulates bronchial responsiveness.<sup>25,26</sup>

**Folate** Plays a key role in cellular immunity; Low folate status linked to severity of an allergic response.<sup>16,17</sup>

**Vitamin B6** Binds with the chemical that causes airway constriction (histamine) and inactivates it; The common asthma drug theophylline depletes B6.<sup>23,24</sup>

**Vitamin C** Dilates bronchial airways; Inhibits histamine-induced constriction of airways; Needed for production of epinephrine, which mitigates asthma attacks.<sup>21,22</sup>

**Vitamin D** Higher levels increase lung capacity in asthmatics; Deficiency increases severity of asthma attacks.<sup>18,19,20</sup>

## REFERENCES

- <sup>1</sup>Kazaks A, Uriu-Adams J, Albertson T et al. Effect of oral magnesium supplementation on measures of airway resistance and subjective assessment of asthma control and quality of life in men and women with mild to moderate asthma: a randomized placebo controlled trial. *J Asthma* 2010;47:83-92.
- <sup>2</sup>Ashkenazy Y, Moshonov S, Fischer G et al. Magnesium-deficient diet aggravates anaphylactic shock and promotes cardiac myolysis in guinea pigs. *Magnes Trace Elem* 1990;9:283-288.
- <sup>3</sup>Alamoudi O. Hypomagnesaemia in chronic, stable asthmatics: prevalence, correlation with severity and hospitalization. *Eur Respir J* 2000;16:427-431.
- <sup>4</sup>Emelyanov A, Fedoseev G, Barnes P. Reduced intracellular magnesium concentrations in asthmatic patients. *Eur Respir J* 1999;13:38-40.
- <sup>5</sup>Al-Biltagi M, Isa M, Bediwy A et al. L-carnitine improves the asthma control in children with moderate persistent asthma. *J Allergy* 2012;509730.
- <sup>6</sup>Asilsov S, Bekem O, Karaman O et al. Serum total and free carnitine levels in children with asthma. *World J Pediatr* 2009;5:60-62.
- <sup>7</sup>Uzuner N, Kavukcu S, Yilmaz O et al. The role of L-carnitine in treatment of a murine model of asthma. *Acta Med Okayama* 2002;56:295-301.
- <sup>8</sup>Gvozdzjakova A, Kucharska J, Bartkovjakova M et al. Coenzyme Q10 supplementation reduces corticosteroids dosage in patients with bronchial asthma. *Biofactors* 2005;25:235-240.
- <sup>9</sup>Gazdik F, Gvozdzjakova A, Nadvornikova R et al. Decreased levels of coenzyme Q(10) in patients with bronchial asthma. *Allergy* 2002;57:811-814.
- <sup>10</sup>Wang Y, Moreland M, Wagner J et al. Vitamin E forms inhibit IL-13/STAT6-induced eotaxin-3 secretion by up-regulation of PAR4, an endogenous inhibitor of atypical PKC in human lung epithelial cells. *J Nutr Biochem* 2012;23:602-608.
- <sup>11</sup>Hoskins A, Roberts J, Milne G et al. Natural-source d- $\alpha$ -tocopheryl acetate inhibits oxidant stress and modulates atopic asthma in humans in vivo. *Allergy* 2012;67:676-682.
- <sup>12</sup>Centanni S, Santus P, Di Marco F et al. The potential role of tocopherol in asthma and allergies: modification of the leukotriene pathway. *BioDrugs* 2001;15:81-86.
- <sup>13</sup>Lim Y, Vasu V, Valacchi G et al. Severe vitamin E deficiency modulates airway allergic inflammatory responses in the murine asthma model. *Free Radic Res* 2008;42:387-396.
- <sup>14</sup>Mehta A, Arora N, Gaur S et al. Choline supplementation reduces oxidative stress in mouse model of allergic airway disease. *Eur J Clin Invest* 2009;39:934-941.
- <sup>15</sup>Mehta A, Singh B, Arora N et al. Choline attenuates immune inflammation and suppresses oxidative stress in patients with asthma. *Immunobiology* 2010;215:527-534.
- <sup>16</sup>Matsui E, Matsui W. Higher serum folate levels are associated with a lower risk of atopy and wheeze. *J Allergy Clin Immunol* 2009;123:1253-1259.
- <sup>17</sup>Farres M, Shahin R, Melek N et al. Study of folate status among Egyptian asthmatics. *Intern Med* 2011;50:205-211.
- <sup>18</sup>Chinellato I, Piazza M, Sandri M et al. Vitamin D serum levels and markers of asthma control in Italian children. *J Pediatr* 2011;158:437-441.
- <sup>19</sup>Brehm J, Schuemann B, Fuhlbrigge A et al. Serum vitamin D levels and severe asthma exacerbations in the Childhood Asthma Management Program study. *J Allergy Clin Immunol* 2010;126:52-58.
- <sup>20</sup>Wu A, Tantisira K, Li L et al. The effect of vitamin D and inhaled corticosteroid treatment on lung function in children. *Am J Respir Crit Care Med* 2012; epub ahead of print.
- <sup>21</sup>Tecklenburg S, Mickleborough T, Fly A et al. Ascorbic acid supplementation attenuates exercise-induced bronchoconstriction in patients with asthma. *Respir Med* 2007;101:1770-1778.
- <sup>22</sup>Ness A, Khaw K, et al. Vitamin C status and respiratory function. *Eur J Clin Nutr* 1996;50:573-579.
- <sup>23</sup>Wu F, Christen P, Gehring H. A novel approach to inhibit intracellular vitamin B6-dependent enzymes: proof of principle with human and plasmodium ornithine decarboxylase and human histidine decarboxylase. *FASEB J* 2011;25:109-122.
- <sup>24</sup>Shimizu T, Maeda S, Mochizuki H et al. Theophylline attenuates circulating vitamin B6 levels in children with asthma. *Pharmacology* 1994;49:392-397.
- <sup>25</sup>Neuman I, Nahum H, Ben-Amotz A. Prevention of exercise-induced asthma by a natural isomer mixture of beta-carotene. *Ann Allergy Asthma Immunol* 1999;82:549-553.
- <sup>26</sup>McGowan S, Smith J, Holmes A et al. Vitamin A deficiency promotes bronchial hyperreactivity in rats by altering muscarinic M(2) receptor function. *Am J Physiol Lung Cell Mol Physiol* 2002;282:L1031-1039.
- <sup>27</sup>Gazdik F, Kadrabova J, Gasdikova K. Decreased consumption of corticosteroids after selenium supplementation in corticoid-dependent asthmatics. *Bratisl Lek Listy* 2002;103:22-25.
- <sup>28</sup>Hasselmark L, Malmgren R, Zetterstrom O et al. Selenium supplementation in intrinsic asthma. *Allergy* 1993;48:30-36.
- <sup>29</sup>Norton R, Hoffmann P. Selenium and asthma. *Mol Aspects Med* 2012;33:98-106
- <sup>30</sup>Hoffmann P, Jourdan-Le Saux C, Hoffmann F et al. A role for dietary selenium and selenoproteins in allergic airway inflammation. *J Immunol* 2007;179:3258-3267.
- <sup>31</sup>Morgan C, Ledford J, Zhou P et al. Zinc supplementation alters airway inflammation and airway hyperresponsiveness to a common allergen. *J Inflamm* 2011;8:36
- <sup>32</sup>Murgia C, Grosser D, Truong-Tran A et al. Apical localization of zinc transporter ZnT4 in human airway epithelial cells and its loss in a murine model of allergic airway inflammation. *Nutrients* 2011;3:910-928.

Additional references at <http://www.spectracell.com/online-library-mnt-asthma-abstract/>