



The Potential Role of B-Hydroxy-B-Methylbutyrate in Preventing Muscle Loss in Chronic Diseases

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Editorial

Loss of lean body mass is apparent in many chronic diseases, such as cancer, chronic obstructive pulmonary disease, and heart failure. The loss is a combined consequence of clinical conditions, loss of appetite, and lack of physical activity. In addition, even short-term hospitalization would increase the risk for loss of lean body mass [1,2]. It has been shown that this malnutrition state significantly increased the length of hospitalization, readmission rate, and mortality [2,3]. With the high incidence of loss of lean body mass, even in the presence of enteral and/or parental nutrition support, dietary supplements that could prevent muscle loss under stressful conditions may be helpful in these patients.

β -hydroxy- β -methylbutyrate (HMB), a leucine metabolite, is a popular supplement in exercising populations. HMB has been shown to be effective in augmenting the gain in lean body mass in young and old subjects, in combination with resistance training [4-6]. HMB can increase muscle protein synthesis by activating mammalian target of rapamycin (mTOR) [7]. HMB can also attenuate muscle protein breakdown by inhibiting ubiquitin-mediated autophagy [8-10]. Its anti-catabolic effect has drawn interest from clinical settings. We have shown that a short-term HMB supplementation had anticatabolic effect and improved pulmonary function in chronic obstructive pulmonary disease patients in an intensive care unit setting [11]. HMB supplementation also improved nitrogen balance in critically injured [12] and hospitalized elderly patients [13]. Moreover, supplementation of HMB, arginine, and glutamine increased fat-free mass in advanced cancer [14] and Human immunodeficiency virus (HIV)-infected patients [15].

A recent meta-analysis has revealed that HMB can preserve muscle mass in generally healthy older adults [16]. With the growing evidence of its anti-catabolic effect in various chronic diseases, HMB supplementation should receive more attention in both clinical settings and scientific research.

Reference

1. Lim SL, Ong KC, Chan YH, Loke WC, Ferguson M, et al. (2012) Malnutrition and its impact on cost of hospitalization, length of stay, readmission and 3-year mortality. *Clin Nutr* 31: 345-350.

2. Rahman A, Wilund K, Fitschen PJ, Jeejeebhoy K, Agarwala R, et al. (2014) Elderly persons with ICU-acquired weakness: the potential role for beta-hydroxy-beta-methylbutyrate (HMB) supplementation? *JPEN J Parenter Enteral Nutr* 38: 567-575.
3. Giron R, Matesanz C, Garcia-Rio F, de Santiago E, Mancha A, et al. (2009) Nutritional state during COPD exacerbation: clinical and prognostic implications. *Ann Nutr Metab* 54: 52-58.
4. Nissen SL, Sharp RL (2003) Effect of dietary supplements on lean mass and strength gains with resistance exercise: a meta-analysis. *J Appl Physiol* 94: 651-659.
5. Vukovich MD, Stubbs NB, Bohlken RM (2001) Body composition in 70-year-old adults responds to dietary beta-hydroxy-beta-methylbutyrate similarly to that of young adults. *J Nutr* 131: 2049-2052.
6. Rowlands DS, Thomson JS (2009) Effects of beta-hydroxy-beta-methylbutyrate supplementation during resistance training on strength, body composition, and muscle damage in trained and untrained young men: a meta-analysis. *J Strength Cond Res* 23: 836-846.
7. Eley HL, Russell ST, Baxter JH, Mukerji P, Tisdale MJ (2007) Signaling pathways initiated by beta-hydroxy-beta-methylbutyrate to attenuate the depression of protein synthesis in skeletal muscle in response to cachectic stimuli. *Am J Physiol Endocrinol Metab* 293: E923-931.
8. Wilkinson DJ, Hossain T, Hill DS, Phillips BE, Crossland H et al. (2013) Effects of leucine and its metabolite beta-hydroxy-beta-methylbutyrate on human skeletal muscle protein metabolism. *J Physiol* 591: 2911-2923.
9. Giron MD, Vilchez JD, Shreeram S, Salto R, Manzano M, et al. (2015) beta-Hydroxy-beta-methylbutyrate (HMB) normalizes dexamethasone-induced autophagy-lysosomal pathway in skeletal muscle. *PLoS One* 10: e0117520.
10. Smith HJ, Mukerji P, Tisdale MJ (2005) Attenuation of proteasome-induced proteolysis in skeletal muscle by beta-hydroxy-beta-methylbutyrate in cancer-induced muscle loss. *Cancer Res* 65: 277-283.
11. Hsieh LC, Chien SL, Huang MS, Tseng HF, Chang CK (2006) Anti-inflammatory and anticatabolic effects of short-term beta-hydroxy-beta-methylbutyrate supplementation on chronic obstructive pulmonary disease patients in intensive care unit. *Asia Pac J Clin Nutr* 15: 544-550.
12. Kuhls DA, Rathmacher JA, Musngi MD, Frisch DA, Nielson J, et al. (2007) Beta-hydroxy-beta-methylbutyrate supplementation in critically ill trauma patients. *J Trauma* 62: 125-131.
13. Deutz NE, Matheson EM, Matarese LE, Luo M, Baggs GE, et al. (2016) Readmission and mortality in malnourished, older, hospitalized adults treated with a specialized oral nutritional supplement: A randomized clinical trial. *Clin Nutr* 35: 18-26.
14. May PE, Barber A, D'Olimpio JT, Hourihane A, Abumrad NN (2002) Reversal of cancer-related wasting using oral supplementation with a combination of beta-hydroxy-beta-methylbutyrate, arginine, and glutamine. *Am J Surg* 183: 471-479.
15. Clark RH, Feleke G, Din M, Yasmin T, Singh G, et al. (2000) Nutritional treatment for acquired immunodeficiency virus-associated wasting using beta-hydroxy-beta-methylbutyrate, glutamine, and arginine: a randomized, double-blind, placebo-controlled study. *Jpen: Journal of Parenteral & Enteral Nutrition* 24: 133-139.
16. Wu H, Xia Y, Jiang J, Du H, Guo X, et al. (2015) Effect of beta-hydroxy-beta-methylbutyrate supplementation on muscle loss in older adults: a systematic review and meta-analysis. *Arch Gerontol Geriatr* 61: 168-175.

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Received: December 02, 2017 Accepted: January 10, 2018 Published: January 17, 2018

Citation: Chang CK (2018) *The Potential Role of B-Hydroxy-B-Methylbutyrate in Preventing Muscle Loss in Chronic Diseases. J Clin Nutr Metab* 2:1.

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