Magnesium Bioavailability: *In-vitro* and *In-vivo* Comparison of Magnesium Absorption of Marine Magnesium Oxide and LoMarine® Forms (Citrate, Citrate Malate, and Bisglycinate) and Their Activity on Inflammatory Response and Oxidative Stress

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Abstract

Although magnesium intake is relatively common in the diet, the bioavailability of this mineral is often low, and its deficiency is common in modern populations. This study aims to evaluate the absorption and biological activities of four distinct magnesium salts of marine origin: marine magnesium oxide, magnesium citrate (LoMarine® Citrate), magnesium citrate malate (LoMarine® Citrate Malate), and magnesium bisglycinate (LoMarine® Bisglycinate) for maximizing magnesium biological effectiveness.

Caco-2 intestinal permeability assay showed that marine magnesium oxide exhibits poor absorption while organic LoMarine® magnesium compounds are significantly more effective in terms of absorption, with magnesium citrate leading the group. In vivo bioavailability study demonstrated that organic LoMarine® magnesium compounds offer superior absorption compared to marine magnesium oxide. LoMarine® bisglycinate exhibits the highest peak absorption, whereas LoMarine® citrate and citrate malate display high and stable absorption, with the advantage of LoMarine® citrate-malate exhibiting rapid absorption.

Finally, organic LoMarine® magnesium compounds exhibit much more robust anti-inflammatory and antioxidant activities than marine magnesium oxide. Interestingly, LoMarine® Bisglycinate and Citrate Malate have stronger anti-inflammatory and antioxidant activities than LoMarine® Citrate.

In conclusion, these results demonstrate that organic LoMarine® magnesium compounds are significantly more effective in terms of both intestinal absorption and bioavailability compared to marine magnesium oxide. Additionally, these organic LoMarine® forms exhibit more robust anti-inflammatory and antioxidant activities, with Bisglycinate and Citrate Malate showing stronger effects than Citrate. In clinical applications, LoMarine® Citrate, Bisglycinate, and Citrate Malate may be the preferred options for individuals seeking efficient and prolonged absorption, and the LoMarine® Citrate Malate could be also more suitable for cases requiring rapid magnesium absorption.