

Enhancing the Expression of Barrier Structure Proteins in Human Colon Organoids: An In Vitro Study of Combined Mesalamine and Aquamin Treatment

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Introduction: Inflammation and gut barrier dysfunction are salient features of Ulcerative Colitis (UC). This study aimed to explore the interactions between Aquamin and Mesalamine, assessing their combined potential as a treatment for UC.

Methods: Aquamin, a multi-mineral supplement derived from red marine algae, contains calcium, magnesium, and 72 additional trace elements. It has been shown to improve barrier structure and function. Mesalamine, an approved drug for treating ulcerative colitis, was studied alongside Aquamin in this in-vitro trial. Human colon organoids, maintained in either control culture medium or exposed to a proinflammatory stimulus (lipopolysaccharide with a combination of three pro-inflammatory cytokines [tumor necrosis factor- α , interleukin-1 β and interferon- γ] - LPS-cytokines), were treated with Aquamin, Mesalamine, or their combination for 14 days. Proteomic analysis was conducted on the organoids to evaluate protein changes induced by the treatments, both individually and combined, under normal and inflammatory conditions.

Results: Upon proteomic assessment, the barrier proteomic expression with Aquamin was consistent with previous studies. The combination of Aquamin and Mesalamine increased the expression of numerous proteins involved in barrier structure. These proteins include mucins-related proteins (Mucin-3A, Mucin-3B, and Zymogen granule membrane protein 16), Junctional adhesion molecule A, cadherins (Cadherin-17, Cadherin-13, Cadherin-3, and Protocadherin-1), desmosomal proteins (Desmoglein-2 and Desmocollin-2), and proteins involved in the basement membrane (Nidogen-1, Nidogen-2, Laminin subunit alpha-1, beta-1, gamma-1, beta-2, alpha-4, and alpha-2 and heparan sulfate proteoglycan core protein). Stimulation with LPS/cytokines caused an upregulation of multiple proinflammatory moieties, which were decreased with the combination of Aquamin and Mesalamine.

Conclusion: These findings suggest that Aquamin, a multi-mineral supplement, may offer benefits as an adjuvant therapy with Mesalamine for UC. It achieves this by upregulating proteins involved in gut barrier structure and suppressing the expression of specific pro-inflammatory proteins.