

An Atypical Cure for Atopic Dermatitis: Investigating the Effects of L-Histidine on Filaggrin Expression

Hyun, Chaejeong (School: Concordia International School Shanghai)

Lee, Ivan (School: Concordia International School Shanghai)

Atopic dermatitis (AD) is a common chronic skin disorder most prevalent in children around the world. It causes red and scaly skin with constant itching symptoms. Genetically, the condition results from a mutation in the FLG gene, which lowers filaggrin protein concentration in epidermal cells. This increases the risk of allergen and microbe penetrating the skin layer and eliciting inflammatory responses. Recent studies have shown that L-histidine, an essential amino acid that is not synthesized by humans, increases filaggrin expression in human epidermal keratinocytes (HEK), making it a promising cure for AD. In our study, we established a more comprehensive understanding of L-histidine's interaction with the skin, demonstrating its ability to enhance filaggrin expression in human dermal fibroblast (HDF) and co-cultures of HEK and HDF. In addition, we gathered statistically significant evidence that L-Histidine supplementation could increase filaggrin levels, and consequently skin barrier strength, to similar, if not greater extents, than prevailing AD therapies such as emollients and corticosteroids. L-Histidine accomplishes all this without the adverse side effects of the aforementioned treatments. Inspired by and using the results from our study, we are currently designing a microneedle patch that will deliver L-Histidine into both the epidermis and dermis without pain.