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Treatment with low-temperature atmospheric pressure plasma enhances cutaneous delivery of epidermal growth factor by regulating E-cadherin-mediated cell junctions

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The barrier system of the skin not only defends against antigens and harmful substances, but also hinders the permeation of medicines and cosmetics into the dermis. Several strategies have been developed to enhance the absorption ability of skin, including the use of chemicals and skin ablation devices. However, the cost and inconvenience of these strategies highlights the need for a novel and safe method for increasing skin absorption. In this study, we examined the effect of low temperature atmospheric pressure plasma (LTAPP) on the efficiency of drug penetration through the skin, as well as its mechanism of action. HaCaT human keratinocytes and hairless mice were exposed to LTAPP treatment, and the cellular and tissue gene expression, and morphological changes were monitored. We found that the LTAPP exposure reduced the expression of E-cadherin in skin cells and led to the loss of cell-cell contacts. The exposure of mouse skin to LTAPP also reduced the expression of E-cadherin and prevented intercellular junction formation within the tissue, leading to enhanced absorption of hydrophilic agents, eosin and epidermal growth factor. The reduction in E-cadherin expression and reduced skin barrier function recovered completely within three hours of LTAPP exposure. Taken together, these data show that LTAPP can induce a temporal decrease in the skin barrier function by regulating E-cadherin-mediated intercellular interactions, leading to the enhanced transdermal delivery of drugs and cosmetics.

Biography

Gyoo-Cheon Kim is a Professor of Department of Oral Anatomy at School of Dentistry, Pusan National University and a Member of the Board of Directors in Korean Academy of Oral Anatomy. He was educated in various biomedical areas including Molecular Biology, Histology and Human Anatomy. His research interest is to induce apoptosis in oral cancer cells by means of specific bacterial proteins. Currently, he has focused on the area of plasma medicine including induction of selective cancer cell death, tooth whitening, treatment of oral diseases, wound healing, and skin rejuvenation. Since 2014, he has been a CEO of Feagle Corporation, which produces plasma medical devices.

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