Antimicrobial peptides in atopic dermatitis

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The innate immune system of human skin contains antimicrobial peptides (AMPs) to defend against potentially invading microorganisms. AMPs are a unique and large group of compounds produced by multicellular organisms such as skin and gut. So far, more than 1,200 types of peptides with antimicrobial activity have been isolated from various cells and tissues. These molecules have pleiotrophic functions to not only kill microbes but also control host physiological functions such as inflammation, angiogenesis, and wound healing. Cathelicidins and human β-defensins (hBDs) were well known to be strongly induced in psoriatic lesions in comparison with normal skin, and this degree of induction mimicked expression expected when normal skin was injured. However, the induction of some AMPs such as cathelicidin and hBD-2 and –3 was found to be lower in atopic dermatitis (AD) lesions than expected, despite the presence of skin inflammation. In contrast, RNase7 and psoriasin are induced in atopic dermatitis lesional skin, and in this case AMP induction is appropriately upregulated by barrier disruption. The defective expression of some AMPs in atopic dermatitis has been linked to a higher propensity to Staphylococcus aureus colonization, which is known to have important roles in the exacerbation of the infection and is correlated with its extent and severity of atopic lesions. Decreased AMPs expression in AD are influenced by Th-2 cytokines IL-4 and IL-13 which suppress the expression of inflammatory cytokines such as TNF-α and IFN-γ. AMPs have several important physiological and immunomodulatory functions. hBD-2 activates immature dendritic cells through TLR4-dependent mechanisms, inducing a robust T helper type 1 response. Cathelicidin triggers inflammatory cell recruitment and cytokine release through various mechanisms. Recent paper suggested that the recognition of Staphylococcal molecules by TRL2 might be involved in the steady-state production of AMPs in keratinocytes and enhances resistance to infection. Thus the correlation between AMP expression and commercial microbiota may be very important to maintaining skin homeostasis. In future, understanding and control of AMPs will be an important field of the immunological revolution.
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