CUTANEOUS MICROBIAL IMBALANCE IN ATOPIC DERMATITIS: PATHOGENIC ROLE AND THERAPEUTIC PERSPECTIVES

Avazov Jamshid Orzikulovich,
Ziyadullaev Shukhrat Khudaiberdievich,
Khatamov Khairulla Musurmonovich
Institute of Immunology and Human Genomics of the Academy of Sciences of the Republic of Uzbekistan, Military Hospital

Background: Atopic dermatitis (AD) is a chronic, relapsing inflammatory skin condition characterized by immune dysregulation, impaired epidermal barrier function, and severe itching. Recent research highlights the importance of the skin's microbial ecosystem in regulating local immunity and maintaining homeostasis. In AD, disruption of this delicate balance—especially the overrepresentation of *Staphylococcus aureus*—has been linked to disease exacerbation.
Objective: To evaluate the contribution of microbial imbalance on the skin surface to the pathogenesis of atopic dermatitis and to explore targeted interventions aimed at restoring microbial harmony.
Methods: A comprehensive review of clinical, microbiological, and translational studies was performed. The analysis focused on changes in the composition and diversity of resident skin microorganisms in AD patients, the pathogenic role of *S. aureus*, and the loss of protective commensal species. Additionally, novel therapeutic approaches—including topical bacteriotherapy and beneficial microbial supplementation—were examined.
Results: Individuals with AD exhibit markedly reduced species diversity on their skin, with *S. aureus* colonization found in up to 90% of cases, particularly during flares. This pathogenic dominance correlates strongly with inflammation and barrier dysfunction. Simultaneously, protective microbes such as *Staphylococcus epidermidis*, *Cutibacterium acnes*, and *Corynebacterium* are significantly diminished. These resident species typically help control pathogenic bacteria through the production of antimicrobial compounds and modulation of immune responses. Promising results have been observed in early-phase clinical trials using topical application of live beneficial bacteria (e.g., *S. hominis*, *Roseomonas mucosa*) and phage therapy to reduce *S. aureus* load and improve skin integrity.
Conclusions: Disruption of the skin's microbial environment plays a pivotal role in the development and persistence of atopic dermatitis. Restoring ecological balance through targeted interventions offers a promising avenue for long-term disease management. Future research should aim to develop personalized strategies that enhance protective microbial communities and suppress pathogenic overgrowth without compromising skin immunity.