25TH NATIONAL & 11TH INTERNATIONAL ANNUAL CONGRESS | ON RESEARCH AND TECHNOLOGY OF IRANIAN MEDICAL SCIENCES STUDENTS
URMIA UNIVERSITY OF MEDICAL SCIENCES, URMIA, IRAN

Mycobiome Dynamics: Unveiling Its Significance in *Atopic dermatitiso*

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Citation:
Parsaie Borazjani M, Shamsizadeh F. Mycobiome Dynamics: Unveiling Its Significance in *Atopic dermatitiso*. *Iranian biomedical journal* 2024; 28(7): 423.

ABSTRACT

Introduction: Atopic dermatitis (AD) is a chronic inflammatory skin condition marked by eczematous lesions and itching, profoundly impacting quality of life. Emerging research underscores the role of the skin microbiome, particularly the mycobiome, in AD pathogenesis. This synthesis aimed to summarize pivotal findings regarding the skin mycobiome's involvement in AD.

Search Strategy: We conducted an exhaustive search of PubMed, Google Scholar, and Web of Science databases until February 2024 to find observational studies exploring the link between AD and the skin microbiome, focusing on fungal microbiota. Three independent reviewers analyzed published data for methodological quality and the risk of bias, resolving discordances through discussions with the corresponding author. We used MeSH terms and Boolean operators to combine the key search terms effectively, such as, "Atopic Dermatitis (AD)", "Atopic Dermatitis Skin Microbiome", "Atopic Eczema", "Mycobiome", "Fungal Microbiota" "Fungal Dysbiosis", "Topical Atopic Dermatitis", and "Allergic Atopic Dermatitis."

Results: From 1,050 published articles, we included 268 studies aligning with our criteria, focusing on AD and skin microbiome dysbiosis, particularly mycobiome dysbiosis. Our findings reveal AD lesions exhibit reduced Malassezia and elevated filamentous fungi. Specific Malassezia and Candida spp. may interact with pathogenic bacteria, impacting AD development. Non-Malassezia fungal diversity is prominent in AD patients. While *Malassezia globosa* and *M. restricta* are common in both AD and healthy individuals, *M. sloofiae* and *M. dermatis* are more associated with AD. Dysbiosis in the skin microbiome, including fungi, influences immune responses and AD development. The gut-skin axis suggests that both microbiomes could be targeted for AD treatment.

Conclusion and Discussion: Our systematic review highlights the crucial role of the skin mycobiome in AD pathogenesis. Fungal dysbiosis, marked by reduced Malassezia and increased filamentous fungi, is common in AD lesions. AD patients exhibit higher fungal species diversity, with specific Malassezia strains prevalent. These mycobiome changes correlate with immune response shifts and AD development. Restoring mycobiome balance, possibly through emollients, holds potential for AD management. Further research is warranted to understand the complex interplay between skin fungi and the host in AD.

Keywords: Atopic dermatitis, Dysbiosis, Skin microbiome