

Cutaneous Microbiome Shifts During Scabies Infestation: An Empirical Analysis of Pathogen Interactions and Immune Response

Quinn Perez

PhD

Humboldt University of Berlin

Unter den Linden 6, 10099 Berlin, Germany

Jamie Scott

MD

Harvard Medical School

25 Shattuck Street, Boston, MA 02115, USA

Alex Edwards

Associate Professor

University of Toronto

27 King's College Circle, Toronto, ON M5S 1A1, Canada

Abstract. Scabies infestation remains a significant public health concern, particularly in immunocompromised populations. This study investigates the alterations in cutaneous microbiome profiles associated with *Sarcoptes scabiei* infestation. Utilizing metagenomic sequencing and bioinformatics analysis, we compared the skin microbiome of affected and unaffected individuals. Our findings reveal a marked reduction in microbial diversity in scabies-affected skin, alongside an overrepresentation of pathogenic taxa. Moreover, immune profiling indicated heightened Th2 responses in hosts with severe infestations. These results suggest that scabies not only disrupts the microbial ecosystem but also correlates with immune dysregulation, underscoring the necessity for integrated treatment strategies that address both the infestation and its microbiomic implications.

Keywords: scabies, cutaneous microbiome, *Sarcoptes scabiei*, immunocompromised, microbial diversity, th2 immune response, pathogen interactions

Introduction

Scabies, caused by the ectoparasite *Sarcoptes scabiei*, is a prevalent skin condition affecting millions globally and is particularly rampant in resource-limited settings. This ectoparasitic infestation is characterized by intense itching, inflammation, and secondary infections, often compromising the skin barrier. Recent estimates indicate that scabies affects over 200 million individuals worldwide, yet its epidemiological burden is frequently underestimated. The global resurgence of scabies, exacerbated by socio-economic factors and a growing population of immunocompromised individuals, necessitates a thorough understanding of its pathophysiology and its broader implications on skin health. The skin is not merely a passive barrier to pathogens; it hosts a complex and diverse microbiome that plays a crucial

role in immune modulation and homeostasis. Understanding the interaction between scabies and the skin microbiome is vital for developing effective treatment protocols. The disruption of the skin microbiome can lead to dysbiosis, promoting opportunistic infections and exacerbating clinical symptoms. While previous studies have focused on the clinical aspects of scabies infestation, there is a notable gap in research regarding the microbiome changes that accompany this condition. This study aims to fill this gap by exploring the microbiome profiles of individuals affected by scabies compared to healthy controls, with a focus on the implications of these microbial shifts for host immune responses. We employed metagenomic sequencing to accurately characterize the microbiome composition and diversity, alongside immunological profiling to assess any correlation with infestation severity. Our findings will contribute to the understanding of scabies as a multifaceted disease, highlighting the interplay between parasitic infestation and microbial dynamics. The structure of this paper is as follows: we begin with a literature review of current understanding of scabies and its impact on skin microbiota, followed by our methodological approach, results, and a discussion of the implications for future research and clinical practice.

This is a preliminary version. To read the full version of the article, please purchase a subscription.

References

1. Badyin, I., & Khomutets, V. (2025). The effectiveness of different massage techniques in the rehabilitation of patients with low back pain. *Journal of Education, Health and Sport*, 84, 65612-65612.