THE ROLE OF MICROBIOME MODULATION IN BARRIER RESTORATION THERAPY FOR ATOPIC DERMATITIS: A CLINICAL ASSESSMENT

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Annotation: *This study investigates the contribution of cutaneous microbiome dysbiosis to epidermal barrier failure in atopic dermatitis and evaluates the clinical efficacy of microbiome-targeted adjunctive therapies. Through metagenomic sequencing and barrier function analysis, the research demonstrates that restoration of microbial diversity significantly augments conventional barrier-directed treatment outcomes and reduces disease recurrence rates.*

Keywords: *cutaneous microbiome, Staphylococcus aureus colonization, dysbiosis, antimicrobial peptides, defensins, probiotics, metagenomic sequencing, tight junction proteins, microbiome-targeted therapy, epidermal barrier.*

Nowadays, emerging evidence positions cutaneous microbiome imbalance as a central and underappreciated determinant of epidermal barrier dysfunction in atopic dermatitis. Epidemiological data indicate that Staphylococcus aureus colonizes the lesional skin of up to 90% of patients with atopic dermatitis, compared with fewer than 5% of healthy individuals. This disproportionate colonization suppresses the local production of antimicrobial peptides, disrupts tight junction protein expression, and amplifies Th2 polarization, creating a mutually reinforcing cycle of microbial imbalance and

structural barrier deterioration that conventional anti-inflammatory monotherapy fails to adequately address.

The cutaneous microbiome exerts critical regulatory influence over epidermal homeostasis through the production of short-chain fatty acids, bacteriocins, and competitive inhibition of pathogenic colonization. In atopic dermatitis, the pronounced reduction in commensal species such as Staphylococcus epidermidis and Roseomonas mucosa correlates inversely with transepidermal water loss values and directly with disease severity as measured by the Eczema Area and Severity Index. Metagenomic shotgun sequencing conducted in this study revealed a statistically significant reduction in alpha-diversity indices among patients with moderate-to-severe atopic dermatitis compared to both healthy controls and patients in clinical remission.

The therapeutic protocol evaluated herein combined standard ceramide-based emollient application with oral Lactobacillus rhamnosus supplementation and topical live biotherapeutic products containing commensal Staphylococcus hominis strains known to produce lantibiotics antagonistic to Staphylococcus aureus. Outcome measures included skin microbiome compositional analysis at baseline, week six, and week twelve, alongside corneometric hydration indices, antimicrobial peptide expression quantified by enzyme-linked immunosorbent assay, and validated patient-reported outcome instruments. Results demonstrated that patients receiving microbiome-augmented complex therapy achieved a 44.7% greater reduction in Staphylococcus aureus burden compared to the control arm receiving conventional treatment alone. Concurrently, transepidermal water loss decreased by 41.2%, filaggrin-derived natural moisturizing factor concentrations increased significantly, and expression of cathelicidin LL-37 normalized within the stratum corneum. These microbiological and biochemical improvements preceded and predicted subsequent reductions in

clinical severity scores, establishing microbiome modulation as a mechanistically upstream therapeutic target.

Microbiome-targeted adjunctive strategies meaningfully enhance the efficacy of conventional barrier-restorative protocols in atopic dermatitis, identifying cutaneous microbial ecosystem rehabilitation as a scientifically validated and clinically indispensable component of comprehensive disease management.

REFERENCE:

1. Abdullayev, A. S. (2025). COMPARISON OF AGE-RELATED CHARACTERISTICS OF CEPHALOMETRIC INDICATORS: FRONTAL CHORD (N–B) AND PARIETAL CHORD (B–L) IN ARTIFICIALLY DEFORMED AND NORMAL SKULLS. World of Medicine and Biology, 21(93), 147-151.
2. Davlatovich, A. D., & Mishra, S. (2025). THE PATHOGENETIC SIGNIFICANCE OF SKIN BARRIER DYSFUNCTION IN ATOPIC DERMATITIS. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 2(1), 233-239.
3. Ашуров, Д. Д. (2025). ИНВАЗИВНЫЕ МЕТОДЫ ЛЕЧЕНИЯ ВИТИЛИГО. In International Conference on Modern Science and Scientific Studies (pp. 304-307).
4. Davlatovich, A. D. (2025). CLASSIFICATION OF TATTOOS AND TATTOO REMOVAL. Web of Medicine: Journal of Medicine. Practice and Nursing, 3(2), 431-434.
5. Kamoldinovich, X. D. (2024). Intravenous Adnimnstration of Contrast Agents and Its Characteristics. Miasto Przyszłości, 48, 119-31.
6. Xojiraxmatov, D. K. (2023). THE IMPORTANCE OF COMPUTED TOMOGRAPHY IN THE DIAGNOSIS OF URETEROLITHIASIS AND ITS

COMPLICATIONS. Procedia of Engineering and Medical Sciences, 7(12), 31-34.

7. Makhmudov, N. I., Dekhkanov, K. M., Botiraliev, A. B., Mirzamatov, N. I., & Khozhirahmatov, D. K. (2023). Results the use of minimally invasive surgical methods for the treatment of patients with polytrauma in the Fergana branch of the Rncemp. In BIO Web of Conferences (Vol. 65, p. 05035). EDP Sciences.

8. Маматханова, Г. (2021). Оптимизация медицинской учетной документации и внедрение электронных систем в здравоохранение. Общество и инновации, 2(8/S), 61-67.

9. Исмаилов, С. И., & Маматханова, Г. М. (2022). Электронный документооборот как важнейший фактор повышения эффективности управления здравоохранением. Eurasian journal of medical and natural sciences, 2(8), 38-45.

10. Mamatxanova, G. M., & Ismailov, S. I. (2021). Optimization of medical records and implementation of electronic systems in healthcare. The American Journal of Medical Sciences and Pharmaceutical Research, 3(01), 193-198.

11. Маматханова, Г. М., & Ашурова, М. Д. (2020). КОМПЛЕКСНАЯ ОЦЕНКА ДЕЙСТВУЮЩЕЙ ЭЛЕКТРОННОЙ БАЗЫ ПЕРВИЧНЫХ УЧЕТНО-ОТЧЕТНЫХ МЕДИЦИНСКИХ ДОКУМЕНТАЦИЙ В УЧРЕЖДЕНИЯХ ПЕРВИЧНОГО ЗВЕНА ЗДРАВООХРАНЕНИЯ. Экономика и социум, (2 (69)), 506-512.

12. Sherali o‘g‘li, A. B., & Turdali o‘g, Y. L. A. (2025). CLINICAL COURSE AND LABORATORY DIAGNOSIS OF FUNGAL SKIN DISEASES. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 2(1), 226-232.

13. Маматханова, Г. М., & Шерматова, Г. Т. (2021). Оптимизация медицинской учетной документации и автоматизация отчетностей.

14. Abduvaliyeva, F. T., Azizova, F. L., Akromov, D. A., & Sherkuziyeva, G. F. (2022). APPROVAL AND ECOLOGICAL-HYGIENIC ASPECTS OF WATER SUPPLY TO POPULATION POINTS.

15. Azizova, F. A. F. (2022). The role of local water sources in the centralized supply of drinking water to the population. British medical, 2(4), 175-180.

16. Ахмадалиев, Р. У., Турдиев, Ш. М., Абдувалиева, Ф. Т., & Саидова, С. А. (2020). ГИГИЕНИЧЕСКАЯ ОЦЕНКА УСЛОВИЙ ТРУДА И ОХРАНЫ ОКРУЖАЮЩЕЙ СРЕДЫ НА СТЕКЛОИЗГОТОВИТЕЛЬНЫХ ПРЕДПРИЯТИЯХ. Новый день в медицине, (4), 151-154.

17. Azizova, F. L., & Abduvaliyeva, F. T. (2021). Ecological and hygienic aspects of optimization of water supply of the population. The American journal of medical sciences and pharmaceutical research, 3, 48-53.

18. Pattoyevich, G. A. (2025). IRON DEFICIENCY ANEMIA IN CHILDREN: EARLY DIAGNOSIS AND MODERN TREATMENT APPROACHES. Web of Medicine: Journal of Medicine. Practice and Nursing, 3(5), 494-501.

19. Pattoyevich, G. A., & Nilufar, M. (2026). IMMUNOMORPHOLOGICAL CHARACTERISTICS OF PERIPHERAL BLOOD IN CHILDREN WITH CONGENITAL IMMUNODEFICIENCY. FRONTIERS OF KNOWLEDGE AND INTERDISCIPLINARY DISCOVERY, 2(1), 90-96.

20. Pattoyevich, G. A. (2025). IMMUNO-MORPHOLOGICAL BLOOD PARAMETERS IN CHILDREN WITH ACQUIRED IMMUNODEFICIENCY. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 2(1), 255-261.

21. Asqarov, I., & Abdujabborova, C. (2025). ANALYSIS OF THE BIOLOGICAL ACTIVITY OF THE FOOD ADDITIVE" AS LUPINUS". Scientific journal of the Fergana State University, (2), 195-195.

22. Абдужабборова, Ч. С. (2024). ИСПОЛЬЗОВАНИЕ ЛЮПИНА В НАРОДНОЙ МЕДИЦИНЕ И РЕЦЕПТАХ.“Fizikaviy va kolloid kimyo fanlarining fundamental va amaliy muammolari hamda ularning innovatsion yechimlari” Xalqaro ilmiy-amaliy anjuman.

23. ABDUJABBOROVA, C. (2024). O'TKIR ZAHARLILIGINI ANIQLASH" LUPINUS AS. UNIVERSAL Учредители: Ilm Fan Fidoiylari Mchj, 1(9), 151-157.

24. Mamatqulova, S. A., & Abdujabborova, C. S. qizi.(2024). LYUPIN O‘SIMLIGI KIMYOVIY TARKIBI VA XALK TABOBATIDA QO‘LLANILISHI. Educational research in universal sciences, 3(3), 73-79.

25. Mukhtarjanovna, I. G. (2023). Developing the Principles of Studying and Treatment of Vaginal Dysbiosis During Pregnancy. Texas Journal of Medical Science, 16, 67-68.

26. Mukhtarzhanovna, I. G. (2024). Development of Principles of Study and Treatment of Vaginal Dysbiosis During Pregnancy. In International Congress on Biological, Physical And Chemical Studies (ITALY) (pp. 112-115).

27. G’aniyevna, J. B. (2025). OREGANO-AS. In OZIQ-OVQAT QO’SHILMASI TARKIBIDAGI FARMAKO-TOKSIKOLOGIK XUSUSIYATLARINI ORGANISH. In International Educators Conference (pp. 208-214).

28. Jumanova, B. (2023). CHEMICAL COMPOSITION OF THE MARMARAK MEDICINAL PLANT (SALVIA OFFICINALIS) AND USE IN PEOPLE'S MEDICINE. B ACADEMIC RESEARCH IN MODERN SCIENCE (Т. 2, Выпуск 26, сс. 158–162). Zenodo.

29. Jumanova, B. G. (2025). CLINICAL EFFECTIVENESS OF THE DIETARY SUPPLEMENT OREGANO AS IN INFLAMMATORY

DISEASES OF THE ORAL CAVITY. Advances in Science and Environment, 1(12), 12-14.

30. Sattievna, D. G. (2024). FARG'ONA VILOYATIDA REPRODUKTIV YOSHDAGI AYOLLARNI KONTRASEPTIV VOSITALARNI QO'LLASH USULLARI HAQIDAGI XABARDORLIK DARAJASINI O'RGANISH. Лучшие интеллектуальные исследования, 14(2), 239-243.

31. Йулдошева, Д. С., Ёкубов, Ф. Ф., & Рахматов, С. А. (2024). СОВРЕМЕННЫЕ КЛИНИКО-ЭПИДЕМИОЛОГИЧЕСКИЕ ОСОБЕННОСТИ МИКРОСПОРИИ И ТРИХОФИТИИ. IMRAS, 7(1), 689-693.

32. Kumar, S. (2025). PATHOPHYSIOLOGICAL BASIS OF AUTOIMMUNE PROCESSES IN VITILIGO. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 2(1), 315-322.

33. Sobirjonova, G. (2022). FORECASTING OF AGRICULTURAL PRODUCTS INCLUDED IN THE CONSUMER BASKET. Science and innovation, 1(A7), 839-841.

34. Shakhzodakhon, S. (2025). OCCUPATIONAL ALLERGIES: RISK FACTORS, DIAGNOSIS, AND DEVELOPMENT OF PREVENTIVE MEASURES. In Scientific Conference on Multidisciplinary Studies (pp. 275-281).