SKIN BARRIER DYSFUNCTION AND IMMUNE INFLAMMATORY FACTORS IN CHILDREN WITH ATOPIC DERMATITIS

Muslimov Ganijon Inotullayevich
Assistant of Fergana Medical Institute of Public Health

Annotation: *This research provides comprehensive analysis of the interrelationship between skin barrier disruption and immune inflammatory processes in the pathogenesis of atopic dermatitis. The study examines molecular defects in epidermal barrier structure, filaggrin mutations, trans-epidermal water loss, T-helper cell polarization, and cytokine network dysregulation. The findings establish a fundamental foundation for developing pathogenetically grounded therapeutic strategies.*

Keywords: *atopic dermatitis, epidermal barrier, filaggrin mutation, trans-epidermal water loss, T-helper cells, interleukin-4, interleukin-13, Th2 polarization, ceramides, inflammatory cytokines.*

Atopic dermatitis represents one of the most prevalent chronic inflammatory skin diseases among children, affecting fifteen to twenty percent of children in developed countries and eight to twelve percent in the Republic of Uzbekistan. Disease prevalence has increased two to threefold over the past thirty years. The clinical challenge encompasses diverse manifestations, recurrent course, diminished quality of life, and a fifty to sixty percent increased risk of developing other atopic conditions including asthma and allergic rhinitis. Contemporary molecular genetic research demonstrates that skin barrier disruption constitutes the primary event in atopic dermatitis pathogenesis, while immune inflammation represents a secondary process. Understanding the interdependence of these two mechanisms and their

influence on clinical phenotypes possesses significant importance for developing effective therapeutic approaches.

Disruption of skin barrier function constitutes a fundamental component of atopic dermatitis pathogenesis. The stratum corneum layer of the epidermis executes protective functions through its lipid matrix, keratinocytes, and filaggrin protein. In atopic dermatitis, ceramide concentrations decrease by forty to forty-five percent, cholesterol by twenty-five to thirty percent, and free fatty acids by twenty to twenty-five percent. This disrupted lipid ratio leads to a three to fourfold increase in trans-epidermal water loss. In healthy skin, trans-epidermal water loss measures five to ten grams per square meter per twenty-four hours, whereas in atopic dermatitis this indicator reaches twenty to thirty grams per square meter per twenty-four hours. Filaggrin gene mutations play a fundamental role in atopic dermatitis development. In European populations, R501X and 2282del4 mutations in the filaggrin gene occur in twenty to thirty percent of cases. Filaggrin protein participates in proper keratinocyte structuring and upon degradation generates natural moisturizing factors including amino acids and their derivatives. Filaggrin deficiency elevates skin pH from 5.5 to 6.5-7.0, which intensifies protease enzyme activity two to threefold and disrupts desquamation processes. Consequently, skin permeability to allergens, microorganisms, and irritants increases five to sixfold.

T-helper cell polarization plays a central role in immune inflammatory processes. During the acute phase of atopic dermatitis, Th2 inflammation predominates, with significant elevation of interleukin-4, interleukin-5, interleukin-13, and interleukin-31 concentrations. Interleukin-4 levels measure five to eight picograms per milliliter in healthy children but reach forty-five to sixty picograms per milliliter in atopic dermatitis. Interleukin-13 inhibits filaggrin and involucrin transcription by fifty to sixty percent, leading to further weakening of the skin barrier. In the chronic phase, Th1 and Th22

inflammatory components emerge, with increased production of interferon gamma, interleukin-17, and interleukin-22. Interleukin-22 stimulates keratinocyte hyperproliferation, causing skin thickness to increase by one hundred fifty to one hundred eighty percent. Staphylococcus aureus colonization plays a significant role in atopic dermatitis pathogenesis. This microorganism is detected in seventy to ninety percent of cases on affected skin surfaces, with colony densities reaching ten to the sixth or seventh power colony forming units per square millimeter. Staphylococcus aureus toxins, including superantigens and hemolysins, amplify Th2 responses and further activate skin inflammation. Alpha-toxin induces keratinocyte apoptosis, leading to additional barrier disruption. Clinical severity of atopic dermatitis is evaluated using the SCORAD index. Mild disease ranges from zero to twenty-five points, moderate disease from twenty-five to fifty points, and severe disease exceeds fifty points. Research demonstrates that children with filaggrin mutations exhibit SCORAD indices fifteen to twenty percent higher on average. Serum immunoglobulin E concentrations in severe forms reach fifteen hundred to three thousand units per milliliter, representing ten to fifteen times above normal values.

Skin barrier disruption and immune inflammation constitute interdependent processes in atopic dermatitis pathogenesis. Filaggrin mutations, altered lipid composition, and increased Th2 cytokine production collectively determine disease progression. Pathogenetically grounded approaches must focus on skin barrier restoration and immune inflammation modulation.

REFERENCE:

1. Алимова, И. (2025). ПРОФИЛАКТИКА ИНВАЛИДНОСТИ ДЕТЕЙ РАННЕГО ВОЗРАСТА ГРУППЫ РИСКА И КЛЮЧЕВЫЕ АСПЕКТЫ КОМПЛЕКСНОЙ АБИЛИТАЦИИ И РЕАБИЛИТАЦИИ. Академические исследования в современной науке, 4(26), 12-16.

2. Камолова, О., & Алимова, И. (2025). ВИЧ ИФИЦИРОВАНИЕ У ДЕТЕЙ: СОЦИАЛЬНЫЕ И ПСИХОЛОГИЧЕСКИЕ АСПЕКТЫ. Педагогика и психология в современном мире: теоретические и практические исследования, 4(6), 96-99.

3. Anvarovna, A. I., & PNEUMONIA, I. 1-YEAR-OLD CHILDREN: SYMPTOMS, TREATMENT AND PREVENTION. SCIENTIFIC JOURNAL OF RESEARCH IN MEDICINE (SJRM) Vol, 1, 9-12.

4. Pattoyevich, G. A., & Nilufar, M. (2025, June). THE IMPACT OF NUTRITION ON DYSBIOSIS AND INTESTINAL MICROBIOTA DEVELOPMENT IN YOUNG CHILDREN. In Scientific Conference on Multidisciplinary Studies (pp. 188-194).

5. Abdullajonovna, N. X. (2025, February). ADVERSE EFFECTS OF SALICYLATES. In International Educators Conference (pp. 119-125).

6. Aliyevna, P. L. Z., & Ibroxim o'g, G. A. H. (2023). OBESITY-CAUSES, PREVALENCE, CLINICS, DIAGNOSIS AND TREATMENT MEASURES. INTERNATIONAL JOURNAL OF ADVANCED RESEARCH IN EDUCATION, TECHNOLOGY AND MANAGEMENT, 2(10).

7. Aliyevna, P. Z. (2025). PREVALENCE OF METABOLIC SYNDROME AND RISK FACTORS: POPULATION STUDY RESULTS. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 1(1), 168-169.

8. Aliyevna, P. Z. (2025). DEVELOPMENT OF AN INTEGRAL RISK INDEX FOR METABOLIC SYNDROME. GLOBAL TRENDS IN SCIENCE AND INNOVATION, 1(1), 166-167.

9. Тешаев, Ш. Ж., & Пулатова, З. А. (2023). ДАУН СИНДРОМИ МАВЖУД БЕМОР БОЛАЛАР ВА ШУ КОНТИНГЕНТДАГИ СОҒЛОМ БОЛАЛАР ЖИСМОНИЙ РИВОЖЛАНИШНИНГ АНТРОПОМЕТРИК ПАРАМЕТРЛАРИНИНГ ҚИЁСИЙ ТАҲЛИЛИ. Журнал гуманитарных и естественных наук, (4 [2]), 30-35.

10. Teshaev, S. J., & Pulatova, Z. A. (2023). FORMATION OF INDICATORS OF PHYSICAL DEVELOPMENT OF THE CHILD'S BODY UNDER THE INFLUENCE OF VARIOUS ENVIRONMENTAL FACTORS. Журнал гуманитарных и естественных наук, (3 [2]), 21-26.

11. Sheraliyevich, A. B. (2025, February). LASER HAIR REMOVAL: DIODE LASER. In International Conference on Modern Science and Scientific Studies (pp. 8-11).

12. Sheraliyevich, A. B. (2025). LASERS FOR ACNE, COMBINATIONS OF LASERS AND LIGHTS WITH MEDICAL THERAPIES. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(2), 422-425.

13. Исакёнович, С.М. (2025). ЭФИРНЫЕ МАСЛА И ИХ АНТИМИКРОБНОЕ ДЕЙСТВИЕ. Web of Medicine: Журнал медицины, практики и сестринского дела , 3 (5), 654-660.

14. Isakjonovich, S. M. (2024). THE EFFECT OF MEDICINAL PLANTS ON THE INFLAMMATORY PROCESS. Ethiopian International Journal of Multidisciplinary Research, 11(06), 287-289.

15. Саримсаков, М. М., & Султанова, Р. Х. ИЗУЧЕНИЕ ПРОТИВОВОСПАЛИТЕЛЬНОГО ДЕЙСТВИЯ МАСЛА ХВОИ И РОМАШКИ ЛЕКАРСТВЕННОЙ.

16. Kamalovich, S. I. (2025). ORGAN-PRESERVING SURGICAL TECHNIQUES AND PROGNOSIS IN PEDIATRIC PATIENTS WITH HEPATIC AND TUMOR PATHOLOGIES. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(5), 693-700.

17. Kamalovich, S. I., & Isroilovna, S. M. (2025, June). THE ROLE OF LAPAROSCOPY IN THE MANAGEMENT OF PEDIATRIC APPENDICITIS. In Scientific Conference on Multidisciplinary Studies (pp. 269-274).

18. Sharapov, I. K. (2024). CONGENITAL ESOPHAGEAL DEFECTS IN CHILDREN. Analysis of world scientific views International Scientific Journal, 2(1), 107-112.

19. Kamalovich, S. I. (2022). Modern Methods of Surgical Treatment of Gastric Ulcer and Duodenal Ulcer. Texas Journal of Medical Science, 15, 91-95.

20. Kamalovich, S. I. (2023). Congenital Esophageal Defects in Children. Research Journal of Trauma and Disability Studies, 2(12), 180-184.

21. Khodjiakbarovna, K. M. (2025, February). THE ROLE OF THERAPEUTIC PHYSICAL EXERCISES IN COVID-19 RECOVERY. In International Conference on Modern Science and Scientific Studies (pp. 3-7).

22. Khodjiakbarovna, K. M. (2025, February). NEGATIVE CONSEQUENCES OF HELMINTH INFECTIONS AND PREVENTIVE MEASURES IN TREATMENT. In International Conference on Modern Science and Scientific Studies (pp. 323-326).

23. Мурадимова, А. Р., & Ахмедова, Ф. Ш. (2019). Сестринский уход за пациентами при геморрагическом инсульте. In Инновации в медицине. Материалы I международной научно-практической конференции-Махачкала, 2019.-Том. II.-232 с. (p. 188).

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

25. Solijon o‘g‘li, A. S. (2025). Issue 5, May 2025 ISSN (E): 2938-3765 451| P age ETIOLOGY AND PATHOGENESIS OF BRONCHIECTASIS, A

DISEASE CHARACTERIZED BY CHANGES IN THE STRUCTURE OF BRONCHIAL TUBES AND CLINICAL MANIFESTATIONS. Web of Medicine: Journal of Medicine, Practice and Nursing, 3(5), 451-458.

26. Абдуллаев, С. (2025). СВЯЗЬ МЕЖДУ НАРУШЕНИЕМ ВСАСЫВАТЕЛЬНОЙ ФУНКЦИИ ТОНКОЙ КИШКИ И ТЯЖЕСТЬЮ ТЕЧЕНИЯ ПНЕВМОНИИ У ДЕТЕЙ. Модели и методы в современной науке, 4(7), 147-151.

27. Anvarovna, A. I., & PNEUMONIA, I. 1-YEAR-OLD CHILDREN: SYMPTOMS, TREATMENT AND PREVENTION. SCIENTIFIC JOURNAL OF RESEARCH IN MEDICINE (SJRM) Vol, 1, 9-12.

28. Алимова, И. А., & Марасулова, М. (2024). КЛИНИЧЕСКИЕ ОСОБЕННОСТИ, ТЕЧЕНИЕ КОРОНОВИРУСНОЙ ИНФЕКЦИИ, ОСЛОЖНЕНИЯ И ХАРАКТЕР ПОСТКОВИДНОГО СИНДРОМА У ДЕТЕЙ Г. ФЕРГАНЫ. INNOVATIVE DEVELOPMENTS AND RESEARCH IN EDUCATION, 3(30), 276-283.

29. Anvarova, Z. (2025). TIBBIY O ‘QUV MATERIALINI MUSTAQIL O ‘ZLASHTIRISHDA TALABALARNING KLINIK AUDIT KO ‘NIKMALARNI RIVOJLANTIRISH METODIKASI. Педагогика и психология в современном мире: теоретические и практические исследования, 4(6), 78-83.

30. Farinoz, A. (2025, January). EXTERNAL OTITIS IN CHILDREN AND ITS TREATMENT. In International Conference on Multidisciplinary Sciences and Educational Practices (pp. 48-55).

31. Muxammadrasul, M. (2024, May). Etiology and Pathophysiology of Diabetes Mellitus. In International Congress on Biological, Physical And Chemical Studies (ITALY) (pp. 92-96).

32. Саиджалилова, Д. Д., & Гуломова, Р. И. (2023). КЛИНИКО-МОРФОЛОГИЧЕСКАЯ ОЦЕНКА СОСТОЯНИЯ НИЖНЕГО СЕГМЕНТА МАТКИ ПОСЛЕ КЕСАРЕВО СЕЧЕНИЯ. ЖКМП, 4(4).

33. Гуломова, Р. И., & Алижонова, Ш. Т. (2022). Особенности операции кесарева сечения на современном этапе. Мировая наука, (6 (63)), 66-69.

34. Umarovich, B. M. (2025, June). PATHOGENESIS, IMMUNITY, PATHOLOGY AND CLINICAL MANIFESTATIONS OF MEASLES. In Scientific Conference on Multidisciplinary Studies (pp. 303-309).