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ORIGINAL ARTICLE

Impact of Adverse Environmental Conditions on Cutaneous Deep Microflora and Systemic Antibody Responses

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ABSTRACT

An important aspect of studying human adaptation to changing conditions is the investigation of patterns associated with the body's restructuring under the influence of environmental, social, and occupational factors. Despite the significant amount of research in this area, there are still no generally accepted criteria, including laboratory diagnostic ones, for assessing and predicting the course of the adaptation process. In this regard, one promising area is the study of immunobiological indicators of nonspecific resistance (NSR), which are known to allow the detection of very minor changes in the body that arise under the influence of various adverse environmental factors.There is literary data indicating that the nature of human microbiocenoses (including skin microbiota) is directly dependent on the state of the macroorganism and, in particular, on the effectiveness of non-specific resistance mechanisms . In this regard, the development, standardization and implementation in laboratory practice of methods for assessing the state of skin automicroflora seems to be a promising direction for studying the level of the body's defenses. At the same time, the available data on the degree of information content of the parameters of the state of skin automicroflora are contradictory, and the significance of changes in the quantitative and qualitative indicators of aerobic automicroflora of the skin in health and in various pathological conditions has not been sufficiently assessed .

Keywords: ***Skin microbiome, Humoral immunity, Environmental stress***

1. INTRODUCTION

It seems relevant to study the informativeness and suitability of methods for assessing the state of skin microbiocenoses and the bactericidal activity of the skin, correlated with indicators of the humoral component of immunity in various models of the impact of unfavorable environmental factors on the human body. The aim of this study was to develop informative indicators for assessing the body's resistance to adverse environmental conditions by studying the nature of changes in the deep automicroflora of the forearm skin and certain parameters of the humoral component of human immunity.

Research objectives.

1. To determine the parameters of the microbiocenosis of the deep layers of the skin of the forearm in practically healthy individuals.

2. To study changes in the deep automicroflora of the skin, its bactericidal capacity, and individual indicators of the humoral component of immunity during the adaptation of military personnel to military service, including in the extreme conditions of Afghanistan.

3. To assess the state of skin microbiocenoses, its bactericidal activity and some indicators of the humoral component of immunity in individuals exposed to a complex of factors associated with the Chernobyl nuclear power plant accident.

4. Determine the most informative indicators that can serve as criteria for reducing the level of the body's resistance and be used to monitor the effectiveness of adaptation processes.

Scientific novelty. The research revealed the specific features of the development of dysbacteriosis of the deep skin microflora, which occurs in individuals exposed to various extreme factors.

Based on the data obtained: qualitative and quantitative standards for the normal deep automicroflora of forearm skin were established for the first time; changes in the microbiocenosis of the deep automicroflora of forearm skin, observed in cases of disruption of adaptive mechanisms under extreme environmental conditions, as well as as a result of exposure to radiation accident factors, were identified for the first time; the possibility of using changes in the quantitative and qualitative composition of the deep automicroflora of forearm

skin, as well as its bactericidal activity, to determine risk groups due to a decrease in HP was experimentally demonstrated.

Practical significance of the study. A standard method for assessing the quantitative composition of deep automicroflora of the skin has been developed. An accessible and reproducible method for determining the state of the human body's HP is proposed for diagnostic laboratories (including field work). This method is based on assessing the quantitative and species composition of deep automicroflora of the forearm skin. This method is more informative than some humoral immunity indicators. This method can be used to assess the effects of adverse environmental factors on the human body. The results of assessing the state of the deep automicroflora of the forearm skin can be used to select individuals suitable for work in challenging climatic and geographical conditions. The method is included in the screening program for Chernobyl disaster liquidators at the our center

CONCLUSIONS

1. The parameters of the microbiocenosis of the deep layers of the skin of the forearm in practically healthy individuals are: the number of colony-forming units (3-5 per 1 cm), the frequency of isolation of representatives of normal automicroflora (Staphylococcus spp. - 40-50%, Micrococcus spp. - 30-40% and Corynebacterium spp. - 10-20%), as well as the proportion of hemolytic (up to 10%) and mannitol-positive (up to 15%) colonies.

2. During the first month of military service, 72.8% of service members were diagnosed with grades II and III deep automicroflora dysbacteriosis of the skin. After four months, 67.9% of those in the group with diagnosed dysbacteriosis demonstrated normalization of quantitative and qualitative automicroflora indicators, while grade I dysbacteriosis persisted in 32.1%. Changes in the studied humoral immunity indicators in this cohort were within the control range.

3. An assessment of the state of nonspecific resistance in conscripts exposed to extreme environmental and professional conditions (in the Republic of Afghanistan) revealed grade III skin dysbacteriosis, a significant increase in IgA and IgG levels, and a decrease in serum lysozyme levels. During a three-month readaptation period in central Russia, no restoration of

the normal deep autobiocenosis parameters was observed, while the studied humoral immunity parameters returned to control values.

4. In individuals permanently residing in radioactively contaminated areas, disturbances in the skin microbiocenosis with the development of grade III and IV dysbacteriosis were observed, as well as reliable changes in individual indicators of the humoral component of immunity: IgA and IgG, acute phase proteins (alpha-2-macroglobulin, transferrin, and prealbumin), complement component C3, and circulating immune complex (CIC). The nature and depth of the detected changes in the skin microbiome depended on the level of radioactive contamination of the area.

5. In a cohort of liquidators of the Chernobyl nuclear power plant accident, significant changes in the automicroflora of the skin (with the development of dysbacteriosis of grades II–V) and a decrease in its bactericidal activity were identified; these disturbances were dependent on the documented dose of external irradiation.

6. The most informative criteria for the state of the body's resistance level, obtained during the studies, are: the number of colonies of microorganisms of the deep automicroflora of the skin per unit of its area, the characteristics of the species composition of the microflora, the specific gravity of hemolytic and mannitol-positive colonies.

Ethical Approval:

All ethical issues were approved by the author. Data collection and patients enrollment were in accordance with Declaration of Helsinki of World Medical Association , 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

6. BIBLIOGRAPHY

1. *Bukharin OV, Deryabin DG. Taxonomic significance of the ability of bacteria of the Staphylococcus spp. series to inactivate a number of factors of natural anti-infectious resistance. Microbiol Epidemiol Immunol. 2016;(4):24 6.*
2. *Eryukhin IA, Shlyapnikov SA. Extreme state of the organism. St. Petersburg: Eskulap; 2017. 228 p.*

3. *Ivanov AA, Ignatov AN, Klemparskaya NN, et al. Preclinical diagnostics of anti-infective resistance disorders using skin automicroflora test. In: Problems of Preclinical Hygienic Diagnostics. Proc Sci Conf. Leningrad; 2014. p.117 8.*
4. *Klemparskaya NN. Changes in skin microflora under the influence of exogenous and endogenous factors on the body. In: Microflora of human skin: clinical and diagnostic significance. Proc Sci Pract Conf. Moscow; 2015. p.17 22.*
5. *Bergey's Guide to Bacteria. Translated from English, edited by Zavarzin GA. Moscow: Mir; 2012. 2 vols.*
6. *Popov JN, Novikov VS. Deep autoflora of the skin in hospitalized patients with some inflammatory diseases. In: Problems of autoallergy in practical medicine. Tallinn; 2013. p.256 7.*
7. *Ushakov NA, Abramova OYu. The number and composition of bacteria on the skin of marine mammals as an indicator of the physiological state of animals. Microbiol. 2018;58(5):864 70.*
8. *Filimonov YuV, Naumov VA, et al. Characteristics of some indices of immunological reactivity of sailors' organisms before and after navigation. In: Autoflora of a healthy and sick organism. Proc Sci Conf. Tallinn; 2011. p.24 5.*
9. *Shubik VM. State of immunity during radiation exposure. Hyg Sanit. 2010;(1):25 8.*
10. *Smith RF. Lactic acid utilization by the cutaneous Micrococcaceae. Appl Microbiol. 2012;21:777.*
11. *Smith CCK, Bird EL, Carey-Smith KA. Bacterial substitution for staphylococcal infection. N Z Med J. 2014;67:407.*
12. *Smith JMB, Marples MJ. A natural reservoir of penicillin-resistant strains of Staphylococcus aureus. Nature. 2015;201:844.*
13. *Solberg CO. A study of carriers of Staphylococcus aureus. Acta Med Scand Suppl. 2012;178:Supplement.*
14. *Somerville DA. The normal flora of the skin in different age groups. Univ Otago Thesis. 2013;2:218.*
15. *Somerville DA, Murphy CT. Quantitation of Corynebacterium acnes on healthy human skin. J Invest Dermatol. 2016;60:231.*
16. *Somerville DA. A taxonomic scheme for aerobic diphtheroids from human skin. J Med Microbiol. 2011;6:215.*
17. *Stevens DL. New aspects of Streptococcus infection. Ibid. 2017;13(6):561–6.*

18. *Taplin D. Fungal and bacterial diseases in the tropics. Final Report to the US Army R&D Command, Contract DADA. 2010;17:1084.*
19. *Tylor GR, Henney MR, Ellis ML. Changes in the fungal autoflora of Apollo astronauts. Appl Microbiol. 2018;26:804.*
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