



## RELEVANCE OF NARROW-BAND PHOTOTHERAPY IN THE TREATMENT OF PATIENTS WITH MICROBIAL ECZEMA

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**Abstract.** Analysis of domestic and foreign literature reflects the growing relevance of using phototherapy in dermatological practice. Currently, preference is given to narrow radiation spectra that selectively affect skin structures with minimal side effects. The article describes the direct and indirect antimicrobial properties of narrow-band phototherapy, which allows it to be used as a treatment option for dermatoses in the pathogenesis of which pathogenic microorganisms play an important role.

**Keywords:** microbial eczema, phototherapy, immunity, T-lymphocytes, clinical guidelines.

### INTRODUCTION

In the scientific text database PubMed, the query “phototherapy” returns about 40,000 results, and the wording “light therapy” returns more than 90,000, which indicates a constant scientific search for mechanisms, application points and therapeutic possibilities of using light waves. The very first mention of the phototherapy method in the database dates back to 1899 (Bie V. Remarks on Finsen’s Phototherapy. Br Med J. 1899), but the first known publications on the topic of light therapy were written back in 1893 by Niels Ryberg Finsen [1]. A Danish physiotherapist was the first to successfully use light radiation (“chemical rays”) to treat vulgar lupus, for which he received the Nobel Prize “in recognition of his services in the treatment of diseases, especially common (tuberculous) lupus, using concentrated light radiation, which has opened up new and broad horizons for medical science” [2]. In specialized periodical literature of the late 19th – early 20th centuries, the bactericidal, pro-inflammatory and penetrating properties of “chemical rays” were discussed as the main therapeutic mechanisms of action [3, 4].

### MATERIALS AND METHODS

Currently, four main types of phototherapy are used in dermatology:

- 1) selective phototherapy (a combination of medium-wave radiation of 295-330 nm with long-wave radiation of type A);
- 2) narrow-wave phototherapy with a wavelength of 311 nm;
- 3) photochemotherapy, PUVA (long-wave radiation using photosensitizers);
- 4) long-wave radiation of a narrow spectrum with a wavelength of 370 nm (type A-1) [5].

The first investigated mechanism of action of light rays is the inhibition of DNA synthesis due to the formation of pyrimidine dimers. In this case, the DNA molecule is an intracellular chromophore, the synthesis of which is thus suppressed [3]. This knowledge made it possible to target dermatoses characterized by increased epidermal proliferation (psoriasis) or malignant proliferation (mycosis fungoides) [4]. The spectrum of indications for narrow-band phototherapy 311 nm is very wide and includes such dermatoses as: psoriasis, atopic dermatitis and eczema, pruritus, parapsoriasis, lichen planus, solar urticaria, polymorphic solar dermatosis, vitiligo, alopecia [5].

### RESULTS AND DISCUSSION

Microbial eczema accounts for 2-5% of all diseases and 10-40% of all skin pathologies. In the structure of

eczematous lesions, microbial eczema is detected in 12-27% of cases. [2]. It is an eczematous process caused by sensitization of the skin to antigens of pyogenic biota and yeast fungi (Skripkin Yu.K. and Zverkova F.A. [3]). The main clinical manifestation of dermatosis is the occurrence of acute inflammatory vesicular rashes in response to antigenic stimulation from the infectious focus [4].

Immunological aspects of phototherapy.

#### 1. Local.

It is known that medium-wave ultraviolet radiation has immunosuppressive properties, largely directed at the T-cell link of immunity. It reduces sensitization to topical allergens when they are directly applied to an area of skin that has previously been exposed to ultraviolet radiation. The mechanism of such suppression remains debatable, but there is an assumption that hapten-specific tolerance develops, since the intensity of other immune reactions of the skin does not decrease [3].

#### 2. Central.

According to research, high frequency and intensity of ultraviolet radiation in childhood significantly reduce the risk of developing multiple sclerosis in the future [4]. Previously, this was associated exclusively with an increase in the level of circulating vitamin D3 [5]. But only part of the immunological effects of ultraviolet radiation on the central nervous system are provided by the regulation of vitamin D3.

A hypothesis was put forward about the involvement of the cellular migratory link of immunity. The effects on the CNS were studied in a mouse model with autoimmune pathologies of the CNS (experimental autoimmune encephalomyelitis), as well as in patients with intermittent multiple sclerosis who received phototherapy with narrow-band ultraviolet radiation of the spectrum B. Immunomodulatory effects were assessed using pathomorphological studies, studying serum samples and counting immune cells in peripheral blood [2]. Regulatory T-lymphocytes induced in response to irradiation in regional cutaneous lymph nodes transmit the immune response, initiating an immune reaction in the CNS by migrating to foci of inflammation (blood, spleen, CNS). There, T-regulators reduce the severity of the inflammatory response. Dendritic cells are required to induce a systemic immune response to ultraviolet irradiation, and they induce the maturation of T-regulators. Experimental removal of Langerhans cells abolishes systemic responses to irradiation. Local irradiation of the skin induces the work of dendritic cells, the formation of T-regulators, and thereby changes systemic immune responses, reducing autoimmunization by increasing the migration of T-regulators into the central nervous system [5].

### CONCLUSION

To summarize the above, we can talk about the multicomponent effect of ultraviolet radiation on the pathological process: both on immune mechanisms and on neuroendocrine mechanisms, which together makes it possible to successfully treat microbial eczema.

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