

**ЭКОНОМИКА И НАУКА В СОВРЕМЕННОМ МИРЕ.
РАЗВИТИЕ НОВЫХ ВОЗМОЖНОСТЕЙ**
BIOLOGICAL INFLUENCE OF VISIBLE LIGHT ON THE HUMAN BODY

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Abstract. An analysis of publications and literature data on the topic of the biological impact of visible light on the human body was carried out in this thesis, and the results of theoretical and experimental studies were summarized.

Keywords: Visible light, body, biology, method.

INTRODUCTION

Every day, a person is exposed to sunlight and light from artificial sources with a wide range of spectral characteristics and an extremely wide range of intensity: from 100,000 lux or more during the day in direct sunlight and up to 0.2 lux at night in moonlight. It was long believed that lighting was needed primarily to see. However, in addition to vision, many other photobiological processes occur in the body under the influence of light. Visible light plays an important regulatory role. It is known that on cloudy days, many people experience the syndrome of "autumn sadness", accompanied by mental depression and sometimes even leading to suicide. It has been experimentally proven that such depression can be relieved if a person is placed in a brightly lit room for several hours over a number of days in a row [1].

MATERIALS AND METHODS

Recently, the main factors associated with the performance of visual tasks, such as illumination, brightness, glare, color rendering, etc., have been intensively studied and discussed in the press. The corresponding results of these studies formed the basis of existing lighting standards. At the same time, much less knowledge has been accumulated about the effect of light on physiology. Nevertheless, the results of recent studies have shown how light can affect people's well-being. The relevance of studying the effect of light on the functioning of various body systems is evidenced by the huge number of publications on this problem. The results obtained in the course of these studies are of interest to many branches of science, including lighting engineering. The rapid growth in the number of publications indicates that this area of research is in the stage of rapid development. Over several decades of experimental research, a discrepancy has been revealed between the standardized characteristics of the light environment under artificial lighting and the real biological needs of the human body. The need to increase artificially created illumination by approximately 7-10 times compared to the illumination levels currently used has also been shown.

RESULTS AND DISCUSSION

The effect of lighting on vision and its practical consequences have been the subject of research for many hundreds of years. For over 150 years, researchers believed that the eye had only two types of photoreceptors: rods and cones. In 2002, David Berson discovered a new type of photoreceptor in the retina of mammals that is responsible for the biological effects of light [2]. The sensitivity of the new photoreceptor is not the same for light of different wavelengths. The authors [3] showed that optical radiation in the range of $\Delta\lambda = 430-470$ nm has a direct effect on the formation of the fatigue hormone melatonin in the human body. The human body was formed under the influence of a 24-hour biorhythm ("circadian rhythm") with an active daytime phase and a rest phase at night. Light synchronizes the repetition of this biorhythm. Light signals regulate the internal clock independently of the known photoreceptors (rods and cones), thanks to which a person sees. G. Van Beld claims that the effect of visible light depends on the level of illumination, spectral sensitivity, duration and time of day [4]. The illumination level of about 1000-2000 lux per eye for 3 hours can lead to

a phase shift of 2 to 4 hours depending on the time of day. The phase shift of the biological clock is a function of the spectral characteristics of the radiation.

The creation of a mathematical model of the phenomena of synchronization of the human body by light exposure allowed VNISI scientists to conclude that only the energy characteristics of light exposure, the time of their onset and duration are important [5]. As a standardized light value that ensures synchronization of the hypothalamic structures and the body as a whole, it is advisable to use the exposure on the pupil of the eye. When talking about illumination levels, we are talking about the amount of light entering the observer's eye. Illumination should be measured on the eyes, and not as illumination standardized on horizontal surfaces in rooms, which is currently standardized [6]. High illumination levels on surfaces inside rooms or on objects that are rarely in the field of vision do not have a significant biological impact, and the light energy is wasted.

When analyzing a variety of contradictory data obtained in the course of various studies of the impact of visible light on the human body, questions arise that require time to obtain sufficiently clear and definite answers for further development of practical recommendations. Indeed, light provides information for the work of the visual apparatus, and lighting installations are created to ensure visibility. But, today it has become known that other biological processes arise at the same time, which require a new approach to creating lighting while simultaneously solving the same problems. Medical aspect of the impact of visible radiation on the human body. Currently, much attention is paid to the study of the human body's response to light exposure. There are a large number of studies on the use of intense white light in the treatment of circadian rhythm disorders and depressive states. However, the literature does not contain enough data on the effect of visible light on the psychophysiological state of a person.

CONCLUSION

An analysis of publications and literature data on the biological impact of visible light on the human body, a summary of the results of theoretical and experimental studies allowed us to draw the following conclusions:

1. In addition to the formation of visual images, light has a biological effect on humans and their health. The standardized characteristics of the light environment under artificial lighting do not correspond to the real biological needs of the human body. Visible light is an effective regulator of biological rhythms, as well as a therapeutic factor.

2. The spectral sensitivity of a new type of photoreceptors, which has not been fully studied, shows that the most effective exposure to radiation is in the range of 410-460 nm.

3. The effect of visible light depends on the level of illumination, spectral sensitivity, duration and time of day. For light adaptation, it is important to ensure not only the level of illumination, but also the color. An increase in illumination levels at a certain point in time, as well as a change in color temperature, especially during night shifts, leads to an increase in labor productivity.

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