

Sunlight exposure on human health and vitality

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Abstract. This paper studies the influence of sunlight on various aspects of human life, primarily on the skin. It destroys its components, such as collagen and melanin, and leads to various diseases, including skin cancer. It analyses the peculiarities of the sun's effect on the human body, its performance and the consequences of constant or one-time exposure. The work details the risks of sunlight exposure, including an increased risk of skin cancer, pigment spots, blisters, premature ageing, chronic inflammation, burns, as well as the exposure of high temperatures on humans, causing heat stroke and dehydration. It also characterizes two types of UV rays that can penetrate the skin – UVA and UVB rays – and emphasizes the danger of tanning, which is the protective reaction of our skin, and the consequences of which are various negative effects on the skin. The main part of the paper makes clear recommendations on how to prevent sun rays on the skin to ensure safe human activity. In conclusion, the important role of sunlight for our planet and the harm to human health, which can be prevented by observing the rules under

1 Introduction

It is crucial to be aware of the dangers of the sun's rays. Prolonged exposure to ultraviolet (UV) rays can lead to a number of serious health problems, including the development of skin cancer. Eye damage is also a potential consequence of sun exposure, causing impaired vision and damage to the eyeball. However, the harmful effects of UV radiation extend beyond this. Ultraviolet radiation can also weaken the body's immune system, making it more susceptible to various diseases. The sun's rays can also cause premature ageing of the skin and wrinkles, making it less firm and elastic. Therefore, it is crucial to take measures to protect your skin and eyes from ultraviolet radiation. This includes using a sunscreen with a high protection factor, which helps to create a barrier between the skin and the harmful rays, preventing them from penetrating deep into the epidermis. Wearing hats and sunglasses is also an essential part of measures to counteract ultraviolet radiation. Wide-brimmed hats protect the face and neck, and sunglasses with carbon filters are the best way to protect the eyes from direct sunlight.

Sunlight can have a significant impact on human safety in various ways. Firstly, prolonged exposure to UV rays is one of the main sources of danger as it can lead to various skin diseases including skin cancer, which is a serious threat to human life.

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Secondly, the sun's radiation can cause burns, which in addition to noticeable pain, can also lead to other health problems. Burns require long-term treatment and can impair skin function, causing discomfort and discomfort. Third, high temperatures due to sun exposure can lead to dehydration and heat stroke, which is also a serious health risk. Dehydration can lead to serious body problems, and heat stroke, in turn, can be dangerous and even fatal. Road safety is also affected by solar radiation. It creates glare in drivers and makes visibility difficult, which can lead to accidents and dangerous situations on the road. All these factors emphasize the importance of taking measures to protect oneself from the harmful effects of solar radiation and being cautious on the road on bright sunny days [1-2].

Many scientists have conducted studies on the effects of sunlight on living organisms and the environment. For example, Niels Finsen, a Danish physicist and radiation therapist, received the Nobel Prize in Physiology and Medicine in 1903 for his research on radiation therapy for skin diseases such as leukoderma. Harry Klein, an American scientist who investigated the effects of ultraviolet rays on skin and human health, should also be noted. He showed that the Sun rays can cause skin cancer and that sunscreen can help prevent this effect. James Hansen, an American climatologist, researched the effects of sunlight on climate and Earth's changing climate. He warned about global warming and its effects as early as the 1980s and has become one of the leading experts on climate change [3].

The study of sunlight is an extremely relevant topic, not only in terms of science and technology, but also on the practical side. The diverse research conducted in this field plays an important role in understanding the effects of solar radiation on human health and the environment. For example, research on solar radiation can help in developing better methods of protection against ultraviolet rays that can lead to skin cancer and other diseases [4].

Thus, solar radiation research has a wide range of applications and can help in solving many important health problems. The purpose of this paper is to investigate the effects of sunlight on human life safety.

2 Materials and Methods

The most dangerous sunrays in Russia are usually observed in the south of the country, in regions with high solar activity and less cloud cover. For example, Krasnodar Krai, Rostov Oblast, Astrakhan Oblast and Crimea are regions where solar activity is usually higher than in other regions of Russia. In these regions, it is important to take measures to protect your skin from ultraviolet radiation. There, it is especially important and advisable to avoid prolonged exposure to the sun during periods of maximum solar activity, which are usually during the sunny hours of the day between 11:00 and 16:00. In addition, it is important to keep an eye on weather forecasts and solar activity warnings that may be issued by local weather services [5].

Despite society's preference for an even tan, imposed beauty standards, there are dangers of tanning. A tan is not a mere decoration, but is a protective response of our skin. The skin has undergone many thousands of years of evolution to protect us from the sun's harmful rays. People who actively and purposefully visit beaches and sunbathe, can have unpleasant consequences such as: blisters - a kind of protective reaction of the body to excessive exposure to the sun; premature aging - due to the destruction of collagen; age spots - uneven placement of melanin pigment, which is responsible for skin color; chronic inflammation, burns, and skin cancer - one of the most serious consequences of prolonged exposure to ultraviolet rays.

Modern research has proven that prolonged sun exposure leads to skin pigmentation and wrinkles. There is such a concept as "solar radiation". Solar radiation is electromagnetic and corpuscular radiation from the Sun, measured in power, the energy it transmits per unit

surface area (W/m^2) (see Solar Constant). Solar waves in their pure form can be dangerous to humans because of high radiation levels that depend on the sun's position. The greatest amount of radiation exposure occurs in desert areas, where cloudless weather and high solstices are common. Day length and atmospheric features also play a role in this process [6].

There is a definition of "insolation". It means the exposure of houses, public places and urban areas to direct sunlight. Based on the term, we can conclude that insolation in the cities of the Russian Federation is diverse, and therefore the danger of being in the sun is quite distinctive. Normative documents state that the duration of exposure in hours is considered a quantitative measure of insolation (Fig. 1).

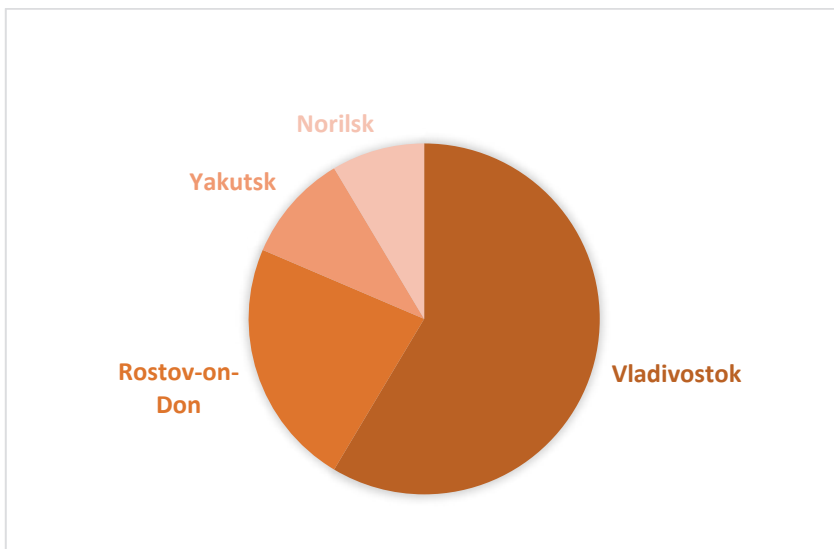


Fig. 1. Insolation in Russian regions

Due to the huge vast territories, the level of irradiation varies in Russia. Therefore, solar irradiation in the northern regions is approximately - 810 kWh/m^2 for 365 days, and in the southern regions - more than 4100 kWh/m^2 [7].

The duration of sunshine also plays a vital role. The duration also varies regionally, but it also depends on the presence of mountains. But how does this exposure occur? Electromagnetic waves are not a holistic phenomenon, it consists of certain parts. There are invisible, infrared and visible, ultraviolet rays. Therefore, all radiation flows have a different energy structure, from this we can conclude that they also affect people differently. It is important to realize that sunlight brings far from only harm, light streams even have a healing effect on the body. Since they pass through the visual organs, regulate our metabolism, even sleep and general condition. And of course, light energy causes a sensation of warmth. With a little skin irradiation, photochemical reactions occur in the body, and they favorably affect metabolism [8].

The well-known ultraviolet also has a positive effect. Its wavelength reaches from 290 to 315 nm. Waves produce vitamin D in the body, and from this comes out that they can fight tuberculosis and even destroy it in a couple of minutes, for a longer time ultraviolet can fight staphylococcus and typhoid fever. The effects of irradiation depend on the degree of its penetration into the body. That is, the longer the wavelengths, the stronger the force of radiation. So according to research results it is proved that infrared waves penetrate up to 23 cm under the skin, visible fluxes up to 1 cm, and ultraviolet up to 0.5-1 mm [9].

Ultraviolet rays that penetrate the skin can be categorized into 2 types: UVA rays and UVB rays.

1. UVB rays, exposure to which is dangerous in spring and fall. They are a type of ray that penetrate the upper layers of the skin and cause sunburn, accelerated skin aging, skin cancer and eye damage.

2. UVA rays, which are a year-round hazard to humans. They account for nearly 95% of all UV rays that penetrate the Earth's surface. UVA rays can penetrate deeper layers of the skin, accelerating the aging process many times more than UVB rays, and can also cause allergic reactions, damage eye mucous membranes, weaken the immune system, and increase the risk of skin cancer [10].

UVA rays can cause skin aging, while UVB rays can cause burns. Both types of rays also pose a risk of developing skin cancer. Tanning, though associated with looking beautiful and healthy, is actually a potential health hazard. Sunburns and tanning are among the major risk factors for melanoma, a dangerous type of skin cancer characterized by rapid spread and the ability to metastasize. It is extremely difficult to treat melanoma in its advanced stages, so sunburn is considered a serious factor that can cause the development of this malignant tumor. It is especially important to note that if a person has already had severe sunburns in the past, the risk of developing melanoma increases by 50% [11].

Often people mistakenly think that a burn is only the appearance of blisters on the skin. In fact, already reddening of the skin can be considered the initial manifestation of a burn. Huge amounts of ultraviolet rays cause damage to skin cells by breaking their DNA. Enzymes in our body usually repair such damage, but if they are insufficient or complications arise, the cells begin to self-destruct to prevent the transmission of mutations. Thus, in a complicated burn, DNA remains without mutations and is not passed on to future generations [12].

Another interesting property in which our skin reacts differently to sunlight is natural tone. Many people can be exposed to the sun all day long and feel fine, while others begin to feel ill after as little as 10 minutes. This is due to melanin, the pigment that gives color to hair and skin. However, a lot depends on the kind of skin you have. The oiliness of the skin is responsible for a factor such as heat exchange; it affects the susceptibility to the environment. In addition, the oiliness of the skin depends on the openness of the pores through which the skin breathes. Interestingly, the sun also affects the abundance of sweating: the stronger a person is predisposed to sweating, the easier it will be in the heat. After all, the evaporation of liquid cools the surface of the skin.

Turning to the question of skin color, it is important to note that people with darker skin color are prone to the fact that the sun's rays will stick to it more actively, because all that has a dark surface in the percentage absorbed by the sun's rays stronger. From a biological point of view, we can consider the heat tolerance factor of each individual organism. People with a strong and healthy immune system tolerate heat more easily than those who are prone to illness or weakness. This is especially true for people with abnormal blood pressure and heart disease. Many studies on the subject state that the tolerance of heat, and sunny people also depend on nationality. People who are born in a hot climate are tolerant to it from birth, it has long been the ancestral home of that person's ancestors, so there is a certain tolerance to the climate from birth [13].

Infrared radiation from the sun heats the external tissues of the human body, penetrating them by 2-3 centimeters, affecting blood vessels, expanding them and increasing blood circulation. These processes are not always dangerous and are called redox. Ultraviolet radiation, in turn, penetrate the tissue to a depth of only 1 mm, but at the same time carry quite a lot of energy, so their direct exposure is small and limited to the surface layers, irradiating the skin and mucous membranes. Ultraviolet radiation can also affect the increase in the level of defense mechanisms, stabilize the blood clotting process and

improve lipid (fat) metabolism, i.e., sunlight and sun exposure cannot be called harmful, as they carry benefits for the body [14].

3 Results and Discussion

There is no denying that all people at some point in time face the need to be in the sun, whether it is their own desire to get a beautiful tan or a forced measure, in any case it is advisable to know about the rules of healthy attitude to your body, there are a number of recommendations for being in the sun.

It is important to avoid being outdoors between 11 and 15 hours or between 12 and 16 hours of the day, at this time the sun is particularly strong and dangerous. Do not be in the sun without specialized SPF creams, it is desirable to combine several means, as sunburn can be obtained in the shade. Clothing, hat, glasses should be used to protect oneself from the sun. The same sunscreen should be chosen with a marking of mineral filters. It is advisable to wear things with sleeves, hats made of dense materials and dark colors. Do not save on sunglasses, you need to choose quality glasses capable of filtering UVA and UVB rays in full, it is a necessity, excessive exposure to the sun without glasses can cause cataracts. Really high quality and safe glasses are marked with the "CE" mark, it guarantees quality according to legal criteria. When choosing, it is important to know that wide lenses are best, they provide protection to a fuller extent. And the color of the glass is not so obviously indicative of quality, the darkest glasses, of course, are often without glare, but this does not mean full protection from ultraviolet rays [15].

To be in the sun, to go on vacation, the skin must be prepared. When the sun appears on the horizon it is recommended to start sessions of exposure to sunlight for a few minutes a day, this helps the body to form a natural defense. Such actions lead to the desired effect, namely the thickening of the stratum corneum and an increase in the production of melanin. It is important to realize that such a phenomenon as "tanning" is completely natural for being in the sun, but ultraviolet rays are still a danger, tanning can really protect from them, but it does not happen to the full extent.

Children's bodies are more sensitive to the sun than adults. The fact is that UV rays penetrate deeper into the child's skin and damage it. According to the expert opinion of the World Health Organization, sun rays when exposed to children and adolescents lead to the development of melanoma or other types of skin cancer. Therefore, children are protected with SPF 50+ creams. There are also some rules for children being in the sun, children under 12 years old should be in the shade, babies under 6 months old should not be in the sun in general as there is no sunscreen for them. Children under three years old can only keep their hands and feet in the sun and only with sunscreen [16].

Sunscreen, despite its important function to the world, is still a cosmetic product and therefore it is important to research it, read the precautions and not mix it with other cosmetics. It has been proven that many perfume or cosmetic ingredients can cause allergies to sunlight, this can lead to age spots. So, for example, insect repellent, applied only half an hour after sunscreen, but dermatologists do not recommend this.

A special danger to human skin is a solarium. Ultraviolet lamps are no less harmful than the rays of the sun, not for nothing to be in the solarium must wear sunglasses. Dermatologists advise to exclude tanning bed from life forever, research in the field of oncology attributes tanning bed to a particularly dangerous carcinogenic element. Studies have found that going to a tanning bed leads to skin cancer and melanoma of the eyes [17].

Another important condition to keep the skin in a safe condition is to respect through nutrition and drinking plenty of water, so the body is more protected from the sun. The sun's rays are only one aspect that affects our health, so to protect the body as a whole it is important to consider other things that bring harm to the human body [18].

Thus, sun rays are considered really dangerous, however, in order to bring this information to everyone, it is important to emphasize not only medical research but also to turn the beauty industry where tanning and love for the sun are considered popular and still not left behind. In order to keep people safe from sun exposure it is necessary to talk about this problem as much as possible, trying to get the information to everyone. Therefore, not only medical institutions, but also glossy magazines should talk as much as possible about tanning, about the harm of sunlight on human skin [19, 20].

4 Conclusions

Sunlight is a phenomenon that accompanies people everywhere and affects many aspects of their lives. On the one hand, solar radiation is essential for life on Earth, as it provides the heat and light that plants and animals need to grow. On the other hand, the sun's rays can have harmful effects on human health and the environment, especially if we do not take appropriate protective measures.

The study of solar radiation is an important area of science to better understand the effects of solar radiation on human health and the environment. Solar radiation can be both beneficial and harmful, so it is important to know how to protect yourself from its harmful effects. Taking appropriate protective measures, such as using sunscreen, wearing hats and sunglasses, and avoiding sun exposure during periods of maximum sun exposure will help prevent many of the problems associated with sun exposure to human health. Knowledge of environmental education and human health and safety will help lead a healthy lifestyle when exposed to sunlight.

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