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Infrared radiation and it's applications in medicine.

Infrared radiation is invisible to human eye part of electromagnetic spectrum, it occupies the sphere between the red end of visible part and microwave radio emission. Infrared radiation is called thermal radiation, because human skin perceives it like heat and the source of this radiation are heated objects.
The whole range of the infrared radiation is divided into three components:
shorter wavelengths: temperatures over 800 ° C, λ = 0,74-2,5 microns;
medium wave field: the temperature to 600 ° C, λ = 2,5-50 microns;
longwave field: temperature to 300 ° C, λ = 50-2000 microns.

Wavelengths emitted by the object depends on heating temperature by Wein's law: $\lambda_{max} = \frac{b}{T}$ the higher the temperature, the shorter the wavelength and higher radiation intensity. Unlike other types of radiation, such as X-ray, microwave and ultraviolet radiation, infrared radiation of normal intensity has no negative effect on the human body. The penetration depth and respectively heating on the body by infrared radiation is wavelength dependent. Short-wave radiation can penetrate into the body to a depth of several centimeters and can heat the internal organs, while the long wavelength radiation is trapped moisture contained in the tissues, and increases the temperature of the integument. Especially dangerous is the impact of intense infrared radiation on the brain, it can cause heat stroke.

In nature, the most common infrared radiation in the range of 7 to 14 microns, most intense emission occurs at a frequency of about 10 microns. The human body emits in the range of 3-50 microns and the most intense radiation of about 10 microns (specifically, 9.6 mm). On the same frequency occurs most intense infrared absorption by the human body, and this range radiation penetrates deeper into the body only. This property of the infrared radiation is used in medicine.

The danger of infrared radiation depends on its intensity. Under normal circumstances, it should not exceed 350 W/m^2. Also, the temperature of the heated surfaces is limited - if the radiating element has a temperature of 100 ° C, the surface of objects should not be warmer than 35 ° C, if above 100 ° C - not more than 45 °. Radiation from the human body is the result of numerous chemical (photochemical) processes. Any pathological processes entail a change in the energy state of the body, its parts or the whole body. As a result the wavelength of infrared radiation for medical applications should not be the quantum energy higher than that which produces the man himself; otherwise it might cause some damaging processes. At the same time it must be of such a kind that could be used to equalize the velocities of photochemical processes in the body, normalization of immune processes, dissolution pathological entities (e.g., collagen, atherosclerotic plaques and etc.), killing bacteria, fungi and radiation viruses. Human body has different strength (thickness) depending on the age, existing diseases, but the radiation frequency or wavelength is the same for all the individuals. In various pathological conditions there is a change of speed and sequence of photochemical reactions, respective changes and the power of the

radiation. Correction of these reactions is possible by means of a normal infrared radiant energy which is understood as self-radiation of the human body. That is the mechanism of action of radiators series K. Now emitters KL, KH and KB are widely used. KL emits energy at a wavelength of 0.2% higher than the human and ,respectively, to accelerate slow reactions. CN radiates energy by 0.2% lower, acting is softer and longer than the previous and also has a normalizing effect on the speed of metabolic processes in the body. Transmitter KB acts specifically on bone fractures, helping them to coalesce faster.

Infrared radiation has many applications in medicine, here are some of them. Asthma is one of the most common diseases. This disease affects between 4 and 8% of the population. Considering that in recent years has been an increase in the number of cases after taking the medication, a lot of attention is paid to the methods of non-pharmacological treatment.

One of the fields of non-pharmacological treatment is the use of infrared radiation. However, the broad spectrum of infrared radiation is composed of the spectrum of radiation that is above the healthy organism and it can have a negative impact on healthy organs and tissues. So it is of great interest to use narrow spectrum infrared radiation having a wavelength less than the human body radiation in therapy.

We use IR emitters that have anti-inflammatory and antimicrobial effect, normalize the immune system and micro circulation, stimulate microsomal enzymes and reduce the level of free radicals by recombination processes and effects on lipid peroxidation.

Peroxy compounds, ozone, ultraviolet radiation, excessive heat, carcinogens lead to the formation of free radicals in the body with high activation of energy causing cancer. Impact of RC emitter is directed to the elimination of free radicals in the human body. This radiator has been used successfully in the treatment of benign and malignant tumors. The mechanism of antioncological action of this radiator is to neutralize the active radical atypical cells, promotes its infinite division and growth. RC emitter emits two consecutive pulses in a very short time - millionths of a second. The first pulse has the necessary energy activation to generate active radicals of ionized water and compiles 10-14% of the total body water. The second pulse causes the active radical of dividing cancer cells to connect with formed water radicals, and thus to stop the growth of cancer. During a person's life on the sides of his blood vessels and in the intercellular space is the deposition of insoluble compounds (thrombi, atherosclerotic plaques, the pathological collagen) leading to the development of diseases. Abnormal collagen, resulting in diseases of connective tissue is characterized by natural incompleteness of their structure and higher molecular weight. Molecular link of all the pathological deposits is instable, because it is made of hydrogen bonds, etc. .. The mechanism of action emitters of Z series is "undermining", these weak intermolecular bonds and translation of insoluble compounds are in a soluble state deducing them from the body without the risk of thrombosis. Radiators of Z series are used in the treatment of hypertension, atherosclerosis, stroke, spinal diseases (under the influence of the radiator its mobility is restored by improving the elasticity of the intervertebral discs). When treating patients with diabetic angiopathy due to the normalization of the microcirculation

symptoms such as numbness, cold extremities disappear, it also prevents the development of ulcers and gangrene. There are four types of radiators of series Z. They differ from each other radiated power. In ascending order radiated energy emitters are located as follows: ZB> ZC> AK> AV. ZB is often used to clear the circulatory system and the normalization of the microcirculation. ZC and AK are used in systemic diseases of connective tissue for resorption of keloid scars. AV is used in diseases of the veins (varicose veins, thrombophlebitis).If cell division of bacteria is seen at the molecular level, this process will look like a chain of successive chemical reactions with a certain speed. If we stop this chain of at least one of the necessary processes, or suppress it, the reproduction (division) of the bacterial cell will stop and it will die. It is based on this principle of the radiator GI. Its carefully calculated emission spectrum aims to interrupt the chemical reactions involved in cell division pathogens. Micro-organisms (bacteria, protozoa), that do not have opportunities for further dividing, die as the cycle of their life is very short. The transmitter does not have a damaging effect on human cells, since the emission spectrum of dividing cells of pathogenic flora is different from the emission spectrum of human. The use of traditional medicine with broad spectrum of activity may lead to overheating of the body as a result of the predominance of the processes of absorption of the radiation and vice versa. Concerning this, the use of it is contraindicated during acute inflammation, while emitter GI has no such a negative effect due to selective wavelength radiation, without causing body overheating. The transmitter generates a GI IR spectrum and the energy of the timing like when you use a fully restored intestinal microflora combined with effects of emitter ZB normalizes balance of lipoproteins, cholesterol, and glucocorticoids.

The mechanism of heat action on the body of an infrared sauna is the same as usual. The principal difference between the two is that in the usual bath body is heated indirectly, first the air is heated and then it heats the body. In the infrared sauna infrared radiation heats the body directly, rather than air (for air heating takes no more than 20 percent of the emitted energy, whereas in the conventional bath - 80). Infrared cabin has infrared radiation sources emitting infrared wavelengths of 4.5-5.5 microns that means that the human body is heated to a greater depth - 4 cm, as compared to conventional heat bath (sauna - 3-5 mm.). As a result, the body is under more intensive therapeutic effect than in the sauna. Infrared waves heat tissues, organs, muscles, bones and joints, accelerating the flow of blood and other body fluids.

The deep heating of the body is more profuse sweating (2-3 times more than in a traditional sauna), pores open wider, toxins appear more intense. If a conventional sauna perspires from the human body 5% of fat and toxins, the infrared sauna - 20% of fat and toxins. There is a general cleansing of the body, the body charges with energy, significantly improves well-being.

Therapeutic effects of infrared cabins are multifaceted. As a result, the regular use of infrared procedures reduces the cholesterol content in the blood, thereby reducing the risk of cardiovascular disease and stabilizes blood pressure. Blood vessels sides become more elastic and strengthened. It improves the functioning of the immune system, increases the overall resistance of the organism, and this in turn

can effectively resist colds and flu (in addition, bacteria and viruses are killed due to an increase in body temperature up to 38.5 degrees, as in the natural body's response to disease). Heavy sweating facilitates kidney vasodilation and stimulates circulation. Infrared radiation helps to treat chronic diseases of the ear, nose and throat, relieves pain in joints, muscles, leading to the rapid healing of wounds, bruises, injuries, fractures, resorption of hematomas. Comfortable warm infrared radiation has a calming effect on the nervous system, removing insomnia, stress, nervousness. Thus, we can say that an infrared sauna provides comprehensive disease prevention and general health of the body.

Profuse sweating requires considerable energy consumption, burning a lot of calories. During one session in the infrared sauna the same amount of calories as during the 10-kilometer run can be lost. Therefore, the use of infrared cabin, especially in combination with a diet, can help to lose successfully weight. Admission procedures in the infrared sauna and gives a wonderful cosmetic effect. Under the influence of infrared radiation pores disclose and starts sweating, resulting in a deep cleansing of the skin, it is freed from dirt and dead cells. Strengthening of blood circulation during the reception of infrared sauna is accompanied by an increase in blood flow to the skin, resulting in increased supply of nutrients to the surface. The skin becomes smooth, elastic, supple and younger looking. After application nourishing creams to the skin the infrared procedures give much greater effect. Regular visits to the infrared cabin helps to heal a number of skin diseases such as dermatitis, eczema, acne and pimples, dandruff, and according to some, and psoriasis. The deep penetration of infrared radiation (along with physical activity and a balanced diet) can effectively fight with cellulite.

Externally the standard infra-red cabin is a cabinet of environmentally friendly materials (natural wood), with a glass door. Infrared emitters are mounted in the walls and under the seats. Depending on the size, it can contain from 1 to 5 persons. Bath procedure in the infrared sauna differs from the traditional. Normal session has to be continuous and last about an hour. The ideal position in the infrared cabin is sitting, pulling down the legs, back straight and arms stretched along the body. Many of the illnesses faced by modern society originate from an unfavorable environment. Diseases unknown 20 years ago, such as chronic fatigue syndrome, there are now in epidemic proportions and continues to grow every year.

The concentration of accumulated toxic substances in the body can be the primary factor in ill-health of millions of people. Heavy metals, pesticides, combustion products and other chemical elements can be found in significant amounts in the body virtually of every person on the planet.

Recent studies have shown that infrared radiation stimulates cells to excrete toxic substances, including plumbum and mercury. Cleansing the body of toxins is a prerequisite for prevention of various diseases and disorders. Along with a healthy diet, fasting and various diets, the infrared system offers a wide range of proven capabilities beyond conventional medicine.

Therefore, regular sessions of infrared radiation are the best way of removing harmful substances from the body. We have in mind not only the toxic substances that enter the body through food, but alcohol and nicotine.

It is better to begin to work with the kidneys, liver, lungs freed from the harmful effects of toxins.

Long-wave infrared radiation normalizes processes of an exchange and eliminates the cause of the disease rather than just its symptoms.
The studies on the use of infrared radiation penetrating continue around the world.

Список использованной литературы:

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