

## **THE NEGATIVE EFFECT OF UV RADIATION ON THE HEALTH OF THE POPULATION**

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### **ABSTRACT**

*What are we going to do? We must be aware of the fact that the environment undergoes rapid changes. Just like flora and fauna, people need health care as well. We demand from those in power to make human health and healthy life style the essential part of their politics, to make an effort to protect health and population, and to grapple with the challenges of climate change. It is required of individuals to make their own personal choices so that we would improve the state of health and reduce the climate change effect.*

**Keywords:** Environment, Climate change, Radiation and Radiation protection of population

### **1. INTRODUCTION**

Climate change is one of the greatest challenges of our time. Climate change will inevitably exert adverse effects on crucial health factors such as food, air and water. Facing many challenges, we must struggle all over the world, working on the human health care programme and protection from climate change.

Threats induced by climate change hinder our struggle against illnesses caused by poverty. The chasm between health condition of rich and poor is becoming greater, which is unacceptable fact for public health professionals.

Climate change is our reality. It is human activities that are at the root of it, however they may be a solution to the problem. Now, we need to act together so that we can find ways to protect human health and people on this planet. All our efforts will be pooled together. We will be united in our effort. Let's make World Health Day 2008 „Protecting health from climate change” the slogan for global operation.

### **2. METHODS AND RESULTS**

#### **2.1. Key messages for World Health Day 2008**

- a) Health is one of the domains that are most affected by climate change-now!
- b) Health problems as a consequence of climate change mostly affect the poor
- c) Public health traditional means are important components of efficacious response to climate change
- d) Intersector, interdisciplinary partnerships are needful for confrontation with this global menace
- e) Action concerning health care must instantly start with adaptation and mitigation of aftereffects
- f) Climate change causes damage to our health
- g) Climate change will bring a great number of people to health services
- h) Health protection from climate change requires preventive public health approach
- i) Investment in health services means being prepared for climate change

- j) World Health Organization (WHO) responds to the challenge of climate change - WHO brings together the global community so that it can unitedly fight against the growing menace of climate change. The community will fight by means of supporting global efforts regarding climate change; actively supporting public health promotion on national, group and individual level; helping member states to prepare their health services for the growing challenges of climate change; and producing recommendations on how developmental decisions in other sectors might improve health, and at the same time reduce the emission of greenhouse effect.

## 2.2. The behavior of the population in the radiation

### *UV radiation*

The complete range of the wavelengths of electromagnetic radiation make electromagnetic radiation spectrum. A region of electromagnetic radiation of wavelength between 100 and 10 000 nm is called optical part of the spectrum. A part of the optical spectrum of wavelength ranging from 100 to 400 nm is ultraviolet (UV) radiation.

Since UV radiation is a subject of the study of many scientific disciplines, its uniform division does not exist. In this paper CIE (Commission Internationale de l'Eclairage, publication No. 69, 1985) division of UV radiation will be presented. On the basis of this division, UV radiation is divided into three regions:

- UV-C region from 100 nm to 280 nm
- UV-B region from 280 nm to 315 nm
- UV-A region from 315 nm to 400 nm

### *Radiation sources*

UV radiation sources can be divided into natural and artificial.

Artificial sources of UV radiation are lamps and fluorescent tubes used in biology, medicine and cosmetics. Devices used for sterilization of water, air, operating theatres and other rooms which need sterilization, also belong to the category of artificial UV radiation sources.

Natural source of UV radiation is the sun. UV radiation coming from the sun to the Earth is called solar UV radiation.

### *UV index and minimal erythema dose (MED)*

Since there are various biological effects caused by UV radiation effect exerted on living organisms, a biological spectrum for each kind of biological effect has been defined. The most important for a human is erythema spectrum, that is the radiation spectrum which causes skin redness. This spectrum of biological effect was defined in 1987 by Mc Kinlay and Diffey and it was accepted by CIE.

The UV index is defined as the downward spectral irradiance weighted according to the Diffey erythemal action spectrum and divided by 25 mW/m<sup>2</sup>. Consequently, the value of 1 UV index is equivalent to that of 25 mW/m<sup>2</sup>. The table below shows UV radiation division according to intensity expressed in UV index unit.

UV radiation division according to intensity	
UV index	Level
1-3	Low level
3-5	Medium level
5-7	High level
7-9	Very high level
9-	Extremely high level

If our organism is exposed to the sun day after day, physical processes such as: reflexion, refraction, diffraction or actual absorption occur. It is these processes on which radiation effects on the skin depend.

By the agreement in 1975, a classification into 6 main skin types was established. The classification was established according to a kind and rate of skin reaction to solar radiation.

- Skin type I, Celtic skin type, is the one that always becomes red but never dark. These are people who have exceedingly fair complexion, hair and bright eyes. For the skin type I 1 MED equals 200 J/m<sup>2</sup>.
- Skin type II, Germanic skin type, commonly becomes red and rarely dark. For the skin type II 1 MED equals 250 J/m<sup>2</sup>.
- Skin type III, Mediterranean skin type, is characteristic of people with brown hair and eyes. Their skin becomes dark but does not instantly become red. For the skin type III 1 MED equals 350 J/m<sup>2</sup>.
- Skin type IV, Mediterranean, Mongol, oriental or Hispanic skin type, is characteristic of people with dark complexion, hair and eyes. Their skin becomes dark and seldom red. For the skin type IV 1 MED equals 450 J/m<sup>2</sup>.
- Skin type V, Hispanic, Indian (American and Eastern Indians), seldom sun burnt, becomes dark brown.
- Skin type VI, Blacks (African and American Blacks, Austrian and South Indian Aborigines), the skin that does not burn, much coloured and completely dark although not exposed to the sun.

When the quantity of pigment in the skin is higher than regular, we talk about the so called innate pigmentation. It is only few tens of milligrams of pigment more than the usual concentration of melanin in the skin that protects our skin. Side effects of UV radiation are as follows: burns, photodermatitis, photosensitivity, ageing, immune system damage, skin cancer.

#### *The effect of UV radiation on eyes*

More than 99% of UV radiation is absorbed in frontal parts of the eye, however, a small dose of radiation reaches retina, a light sensitive part of the eye. UV radiation, directly next to the blue part of the spectrum, is neither needful nor useful for eyesight. UV radiation absorption in the eye helps to bring about changes concerning the ageing process as well as a significant number of serious eye diseases. The largest dose of UV-B radiation is absorbed by cornea and eye lens, thus it induces damages primarily in this part of the eye. However, if exposed to UV-B radiation, retina will suffer damage too. UV-A radiation penetrates much deeper in the eye and thus can induce damage on the bottom of the eye. UV radiation contributes to the development of cataract, pterygium, photokeratitis and degenerative cornea changes, malignant changes of the skin around eyes as well as to macular degeneration.

### **2.3. Sunbathing during pregnancy-yes or no?**

Whether pregnant or not, exposure to sun rays increases the risk of premature skin ageing as well as the risk of malignant skin melanoma (skin cancer).

When sunbathing during pregnancy is concerned, there are additional risks to the health of unborn child, risks that pregnant women tend to forget wishing to get a nice suntan which they relate to better and healthier look. According to psychologists, most pregnant women do not find themselves attractive, and therefore they want to make up for it by working on their suntan not thinking about possible aftereffects. The most frequent aftereffects of sunbathing during pregnancy, as indicated by doctors, are the following:

1. a pregnant women's body can overheat which can induce spinal malformation of the embryo and for that reason all activities which may bring about overheating are to be avoided (sunbathing, going to tanning salons, saunas etc.); overheating should be avoided especially in the first trimester of pregnancy;
2. exposure to UV rays is closely connected to a decrease in concentration of folic acid in bloodstream, whereas folic acid prevents the occurrence of neural tube defects, such as spina bifida, hence it is of utmost importance in the first trimester of pregnancy;
3. the skin of pregnant women is more sensitive due to changed hormonal status, so it is quite possible that allergies, irritations, rash, redness and burns might occur.
4. body dehydration can appear due to excessive sweating and not drinking enough water, which may result in reduction of the amount of amniotic fluid. During the pregnancy period the amniotic fluid replaces almost 200ml of water (a cup of water) existing in the body, which is thwarted in case of body dehydration.

5. melasma symptoms, i.e. the mask of pregnancy, or Chloasma faciei, present in most pregnant women, may develop, and it is manifested as a tan or dark skin discoloration of face, forehead, cheeks and nose.

Extremely frequent phenomenon occurs in 20% of population and it is constantly increasing due to severe ozone depletion, i.e. gradually larger ozone hole. We are referring to sun allergy, which is commonly very present owing to hyper-sensibility of the skin of pregnant women. The sun allergy, actually, is not a real allergy, but oversensitivity to sunlight. Most commonly it starts to occur in spring with the first sunny days, and with the summer arrival skin sensitivity gradually decreases in most cases and the symptoms are alleviated. Nevertheless, in more difficult cases the symptoms are not alleviated with the repeated exposure to the sun, nor they disappear, but on the contrary they reappear at every new exposure to the sun. The symptoms occur only on the body parts exposed to the sun rays: on face, neck, arms and legs. This problem is more common with women and it appears at the age of 25 to 35, therefore pregnant women should pay attention to sun protection measures. It is highly recommended to limit the exposure to the sun at the period from 10 to 15h, as well as to wear required sunglasses, trousers, T-shirts with long sleeves, and hats with wide brims.

For the purpose of preventing the aforementioned consequences the following measures are recommended:

1. to avoid sunbathing and solariums as well as spending too much time outside in shade;
2. to consume considerable amount of water in order to prevent possible body dehydration;
3. to wear hats with wide brims for the protection of face, shoulder and chest, as well as for the prevention of overheating of the body, and required sunglasses
4. to avoid exposure to the sun at the period from 10 to 15h, when the sun rays are at the peak of their intensity;
5. to use sun protection creams and lotions with sun protection factor (SPF should not be less than 15) which gives you high protection factor both from UVA and UVB rays. During summer months when the temperature and UV index are high, it is necessary that the sun protection preparation contains mechanical filters (titanium-dioxide and zincite) besides UVA and UVB filters with a high degree of sun protection, i.e. with SPF (sun protection factor) higher than 50. These sun creams will prevent not only skin redness and burn manifestation, but developing chloasma as well. They should be put on 30 minutes before exposure to the sun rays and afterwards they should be re-applied every 2 hours all over again.
6. natural preparations that contain high quality herbal substances, i.e. herbal oils (olive, almond, jojoba oil and others), extracts (camellia, marigold, aloe extract and others), ether oil, etc. are recommended for pregnant women. It is very important that the preparations do not contain mineral oils, artificial colours and aromas, and parabens which can additionally irritate the skin as well as block the pores and prevent the effect of active substances

### 3. CONCLUSION

Since the effect of UV radiation on the skin and eyes is very harmful, it is necessary to take some prevention measures before exposure to the solar UV radiation. The effect of UV radiation on the body is cumulative which means that the effect causing UV radiation depends on its intensity (UV index) and duration of exposure to the radiation. Nevertheless, the time during which the exposure to UV radiation is allowed (the period during which redness does not occur) is not the same for everyone and it depends on the skin type.

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