

## MALIGNANT SKIN TUMORS AND SOLAR RADIATIONS

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### **Abstract**

*Solar radiations and especially UV radiations are the major carcinogenous stimuli for the emergence of skin carcinomata and the malignant melanoma. Recent studies have shown that, during the last years, the frequency of malignant skin tumors has increased.*

*Based on these premises, the authors` aim was to accentuate and highlight the major role of solar radiations in the increase of the incidence of malignant skin tumors, as a result of prolonged exposure to solar radiations. The study was conducted on a number of 91 subjects diagnosed with epitheliomas and malignant melanoma, with ages between 20 and 71 years old, for a period of 2 years, more parameters being observed.*

*The results of the study have revealed the increase of the frequency of skin tumors because of the extension of sun exposure periods, the tumors being detected mainly on the exposed skin areas.*

**Key words:** *carcinomata, spinocellular epitheliomas, malignant melanoma, UV radiations*

### **INTRODUCTION**

Due to its radiant energy, sun has been influencing and defining the evolution of life on earth for billions of years. It emits a large spectrum of electromagnetic radiations. It is also known that the transmission of UV rays through the atmosphere varies exponentially with the concentration of ozone in the stratosphere. Nowadays, there are numerous sources of air pollution that lead to the diminution of the ozone layer and, therefore, numerous consequences upon the living matter.

Non-ionized electromagnetic radiations have a large spectrum, namely from UV radiations to infrared radiations. UVC radiations have a band between 200-290 nm. UVB radiations, with a band between 290-320 nm. UVA radiations have a band between 320-400 nm. The action of solar radiations upon skin determines a certain photobiological response, being partly a result of the penetration and absorption of radiations with bands to which living cells are sensitive.

Solar radiations that make contact with the tegument penetrate it and produce a series of reactions and effects, from normal, physiological effects to manifestations that characterize a pathological affection.

The main photobiological reactions are caused by UVB radiations and they result in erythema, sunburn, inhibit mitoses and the synthesis of

DNA, RNA and proteins and, very important, they induce the cutaneous carcinogenesis.

As a conclusion, one may say that UV radiations determine chronic phototraumatic reactions, and namely the cutaneous aging and photocarcinogenesis, the role of solar radiations in case of prolonged sun exposure being revealed by numerous clinical and epidemiological studies.

The malignant skin tumors, the skin carcinomata and especially the malignant melanomata, are related to residential or professional sun exposure, their incidence being higher in case of persons that activate in open-air or in sunny geographical areas. They represent 15-20% of the total number of cancer cases.

According to their histogenesis, skin carcinomata are divided into:

- Basocellular epitheliomas that evolve from primitive germinal cells of the epidermis and its annexes and represent about 1/2 of the total number of skin cancers. They can appear everywhere on the skin, except for palms and soles. They mostly appear in the 2/3 upper face areas – region of the nasogenian fold, orbital region, the internal eye angle, the free margin of the inferior eyelid, temples, forehead, ear, neck, trunk and seldom on the limbs. They have a slow evolution, reduced malignity and lead extremely rarely to metastasis.

- Spinocellular epitheliomas are less frequent compared to the basocellular ones. These evolve on the epidermis, have a high level of differentiation and maturation, are more aggressive, have a severer prognostic, more intense invasive activity and disseminate on a lymphatic way.

They may be localized in every region of the tegument and on the mucous membranes, 80% being localized at the level of the cephalic extremity, about 30% on the cheeks and 30% on the lower lip. They represent about 30-40% of the skin cancers and are twice more frequent in case of men compared to women.

Malignant melanoma is a malignant affection of the pigmentary system of the skin, evolving from melanocytes. It can appear everywhere where these cells exist, mainly on the skin and then on the mucous membranes.

It represents 1-2% of the cancer cases and between 2-7% of the skin cancer cases. The annual frequency is from 1 to 7 cases for 100.000 inhabitants. It is more frequent in case of women, before the age of 45 years old. The malignant melanoma evolves mostly on preexistent pigmented lesions, like the unicellular nevi etc., but many of them appear on the clinically healthy skin.

They are most frequently localized on the lower limbs, about 40% of the cases, head and neck 28%, trunk 19% and on the upper limbs about 10%. The evolution is quick and the prognostic is severe.

**Aim**

The aim of this study is to highlight and analyze the role of solar radiations in the increase of the incidence of skin cancers, as a result of extended sun exposure.

**MATERIAL AND METHOD**

The study was conducted in a private Dermatology medical practice and included 91 subjects diagnosed with skin cancers, respectively skin carcinomata and malignant melanomata. Most of the examined patients came for the tumorous affection and, in case of the other patients, the tumors were detected during the dermatological exam made for other skin affection for that they have initially come to see the doctor. The patients' age was between 20 and over 71 years old, males and females, coming from different residential environments, urban and rural. The study lasted for 2 years, January 2011 till the 31<sup>st</sup> of December 2012. The following parameters were monitored, studied and analyzed: patients' age and sex, residential environment, period of exposure to solar radiations, localization of the skin tumors and the type of skin cancer, skin carcinoma and malignant melanoma. Also the numerical distribution of the cases during the studied years was monitored.

**RESULTS AND DISSCUSIONS****RESULTS**

More results were obtained based on the conducted study. Out of a total number of 91 examined patients, 59 came from the urban area, 64,83%, and 32 patients came from the rural area, respectively 35,7%. According to sex, a number of 47 patients were males, 51,64%, and 44 patients were females, respectively 48,36%.

The greatest incidence of skin carcinomata was registered at the age groups 61-70 years old, with 22 cases, and at the age group over 71 years old, where were registered 35 cases. The examined patients' distribution according to age groups and residential environments results from table 1 and table 2.

The results obtained after conducting the study, regarding sex and type of cancers, in case of males there were examined 31 subjects with skin carcinoma, out of which 2 cases are of spinocellular epithelioma of the lower lip and 6 cases are of malignant melanoma. Among the carcinomata, 30 cases were diagnosed in case of patients coming from the urban area and 4 cases of malignant melanoma, and in the rural area 11 cases of carcinoma and 2 cases of melanoma. In case of females, there were registered 34 cases of skin carcinomata, out of which 16 cases in the urban area and 18 cases in

the rural area. The most frequent anatomic localization regions of skin carcinomata were, in case of women, according to the number of cases: face – 27 cases; thorax – 3 cases; leg – 2 cases; forearm – 1 case; neck – 1 case.

The same anatomic regions are indicated in case of men: face – 26 cases; thorax – 6 cases; ear – 3 cases; neck – 1 case

Table 1  
Distribution according to age groups and residential environments of skin cancers in case of females

Age group	Residential environment		Type of skin cancer	
	Urban	Rural	Carcinomata	Malignant melanomata
21-30	-	-	-	-
31-40	1	-	-	1
41-50	3	1	3	1
51-60	5	5	8	2
61-70	6	5	9	2
Over 71	9	8	14	3
<b>Total</b>	<b>24</b>	<b>19</b>	<b>34</b>	<b>9</b>

Table 2  
Distribution according to age groups and residential environments of skin cancers in case of males

Age group	Residential environment		Type of skin cancer	
	Urban	Rural	Carcinomata	Malignant melanomata
21-30	1	-	1	-
31-40	2	-	1	1
41-50	3	-	2	1
51-60	3	2	3	2
61-70	10	4	13	1
Over 71	15	7	21	1
<b>Total</b>	<b>34</b>	<b>13</b>	<b>41</b>	<b>6</b>

In case of women, the malignant melanoma was localized mainly in the thoracic region, 5 cases, 2 cases on the legs, 1 case on the face and 1 case in the abdominal region. In case of men, the most frequent localization of the malignant melanoma was also in the thoracic region, 4 cases, and 2 cases on the face. The most significant factor for the emergence of skin cancer is the length of the exposure period to solar radiations. The study reveals that the most cancer cases appeared on the healthy skin, after the excessive sun exposure, and namely in 82,41% of the examined cases, and only 12% of the cancers have appeared on preexistent lesions, respectively on actinic keratoses and 2 cases of melanoma on traumatic pigmented nevi.

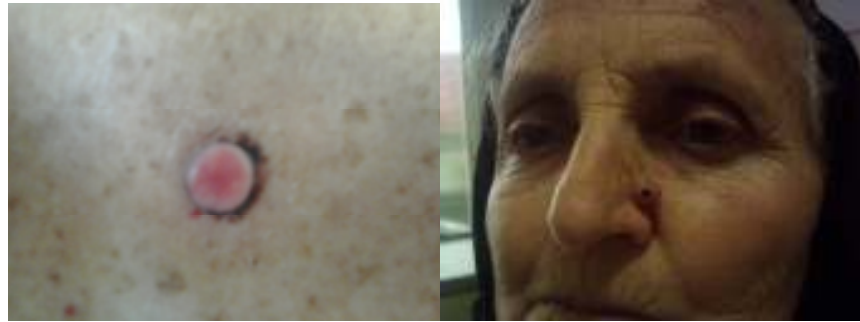


Figure 1 – Left – Malignant melanoma (Man, 54 years old)  
Figure 2 – Right – Carcinomata (Female, 72 years old)

Sun exposure repeated over long periods of time, for years, especially on uncovered areas, face, neck, limbs and, of course, unprotected, has led to the emergence of skin cancers. In case of male subjects, 61,70% (namely 29 subjects), repeated sun exposure over long periods of time was occasioned by their profession, especially in agriculture and building constructions, and in 38,30% of the cases, it was occasioned by prolonged sun exposure for tan purposes.

On the other hand, the emergence of cancers in case of women was occasioned by prolonged exposure to solar radiations for aesthetic purposes, for tan, in 24 cases, respectively 54,54%. In the rural area, the emergence of skin cancers was occasioned by repeated and prolonged exposure for performing activities in open-air, in agriculture, on uncovered skin areas. The study also reveals differences regarding the number of subjects diagnosed with skin cancers. So, in 2011, 39 subjects were diagnosed with carcinomata and 7 subjects with malignant melanoma, compared to year 2012, when 52 subjects were diagnosed with carcinomata and 9 subjects with malignant melanoma.

## DISCUSSIONS

It is known that solar radiations and especially UV radiations from beta range, with a band between 290-320 nm, play a major role in the human carcinogenesis and are the major factors among the carcinogenic stimuli for the emergence of skin malignant tumors. The epidemiological and clinical studies highlight the fact that the frequency and prevalence of baso- and spinocellular epitheliomas, but also of malignant melanoma, depend on the quantity of UV radiations that reach the surface of the earth, on the length of exposure to solar radiations, the localization of these tumors on the exposed skin parts, in 90% of the cases, but also on light-colored skin phototype.

The transmission of UV rays through the atmosphere varies depending on the concentration of ozone in the stratosphere and the numerous air pollution sources determine a rarefaction of the ozone layer. Human skin has natural defense ability against radiations that depends on the presence and quality of the horny layer and the content of melanin, skin protection being in direct ratio to the constitutional melanisation or achieved through bronzing. Melanin has a photoprotective role acting like a dense filter able to absorb radiations, especially the UV radiations.

The carcinogenesis process – at skin level – takes place through the direct action of UV rays at cellular level, more exactly, acting at the level of epidermal DNA cells of the basal layer, through recurrent exposures over long periods of time, years long, and produce here cumulative modifications, that result in the transformation of the basal cell into a foreign neoplastic cell, this being the origin of ulterior cellular proliferations.

Data from literature, after numerous experimental studies, show that UVB induce modifications between the neighboring pyrimidine bases on a DNA chain, also thymine dimers being generated, directly at the DNA level, and the action range in case of these modifications reaches a maximal value of about 300 nm. Prolonged, excessive and repeated long-time exposure, for years, was also in our study the main etiological factor for the emergence of skin cancers in case of the examined patients.

In case of most patients coming from the rural area, sun exposure was conditioned by their work, their activity in agriculture. In the urban area, prolonged sun exposure, in case of a part of the patients, was determined by their activities performed in open-air, in building constructions, but, in case of most of the women, was determined by prolonged exposures for aesthetic purposes, for tan.

The major role of solar radiations in the emergence of these malignant manifestations, in case of the patients included in the study, was demonstrated also by their localization on uncovered skin areas, and namely 53 skin carcinomata were localized at the face level, ear level, 3 cases, and limbs level, 4 cases. The age at which the maximal incidence was registered was between 61-70 and over 71 years old. The study revealed the existence of some small differences between sexes regarding the distribution of skin carcinomata, with a slight predominance in case of males, 41 cases, compared to females, 34 cases. According to age groups, there also existed small differences. So, for the age group 51-60 years old, the number of carcinoma cases is slightly bigger in case of women – 8 cases, compared to 3 cases at males. Small differences between the two sexes were observed also regarding the malignant melanoma; with it were diagnosed 9 women and 6 men, fact that confirms that the malignant melanoma is more frequent in case of females.

Recent data from the literature reveal the increase of the frequency of malignant skin tumors, of carcinomata and also malignant melanomata, a doubling of the cases of melanoma being noticed in the recent years. This aspect is also revealed in our study, an increase of the frequency of the epitheliomas and melanoma being noticed, therefore, in 2012, compared to 2011, 13 more patients were diagnosed with epithelioma and 2 more patients with malignant melanoma. But, disturbing is the fact that most of the patients have presented themselves late for specialized consultation and treatment, many of them presenting tumorous lesions for a longer time period.

## CONCLUSIONS

1. After conducting the study, we can draw the following conclusions:  
Increase of the incidence of malignant skin tumors by increasing the duration of the population's long-time and excessive sun exposure, especially in case of persons who work in open-air.
2. Increase of the incidence of skin tumors by increasing the quantity of UV radiations that reaches the surface of the earth, because of the rarefaction of the ozone layer, as a result of pollution.
3. Intensification of prophylactic measures and sanitary education, especially among the population with higher risk factors.
4. Importance of anti-solar protection means for the prevention of skin tumors.
5. Periodic examination of persons with higher risk regarding the emergence of skin tumors or those who present preexistent lesions.
6. Importance of early diagnosis of malignant skin manifestations for applying the correct treatment and preventing the metastases and obtaining an optimum prognostic, especially in case of malignant melanoma.

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