EVOLUTIONARY STUDY OF CHRONIC CUTANEOUS MODIFICATIONS CAUSED BY EXPOSURE TO ULTRAVIOLET RADIATIONS IN HAIRLESS MICE

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Abstract

Socio-economic development, increasing the living standard, pollution has resulted in decreased concentrations of the ozone layer in the stratosphere, which has fallen the power of selection to ultraviolet radiations that reach the Earth and consequently has increased their harmfulness, while demonstrating that they are more harmful than beneficial [1], [2], [3].

The tegument is an organ of the human body protection against many pollutants, but protection against ultraviolet radiation is guaranteed by the melanin pigment it contains [10].

Tegumentary protection is ensured against both ultraviolet natural radiation and artificial ones issued by the various solar lamps [11].

Photobiological response of the skin is in part determined by the penetration and absorption of radiation with wavelengths towards living cells are sensitive [3], [7].

Repeated and uncontrolled action of ultraviolet radiation on normal tegument or hypersensitive tegument may cause immediate or delayed, both macroscopic and histochemical level, which ultimately can lead to neoformation processes [11], [12].

Key words: tegument, ultraviolet radiations, melanin, erythema, sun protection creams, melanoma

INTRODUCTION

The exposure to ultraviolet radiation is highly involved in the etiology of melanoma and is considered both a major risk factor environment, and risk factor most easily controlled [5], [12].

Use of sun protection creams decreases DNA damage cell exposed to ultraviolet maintaining skin integrity, as demonstrated in the the study made for the realization of this work [7].

Cutaneous layer by epidermis or cornos is a major barrier to the transmission of ultraviolet B and less than 10% of incident wavelengths penetrate the the basement membrane in this region. Proteins and nucleic acids absorb the UVB short intense gamma radiation, in contrast UVA 1 and 2 effectively penetrate epidermis to reach the dermis, producing changes in

structural and matrix proteins that contribute to the appearance of aging skin exposed to natural or artificial ultraviolet [5].

Acute effects of exposure to ultraviolet are the sunburns [8].

Overall an individual's ability to tolerate ultraviolet radiation is inversely proportional to melanie pigmentation [8].

The melanin is synthesized by melanocytes and stored in melanosomi that are transferred to keratinocytes, which provide photoprotection [3].

There are two general theories about the pathogenesis of sunburn:

- Latency phase of skin exposure and the appearance of visible erythema that lasts between 4-12 hours.
- It is possible that the minimal amount of ultraviolet that penetrates into the dermis to be absorbed by blood endothelial cells thereby producing vasodilatation.

Erythema produced by the ultraviolet type A is weaker, but produce vascular endothelial lesions larger than ultraviolet type B radiation [5], [6], [8].

MATERIAL AND METHODS

The study was conducted on two batches of 35 white hairless mice. A standard batch, which was exposed without protection creams and a lot of examination that was protected with sunscreen with SPF 50.

For exposure was used a lamp that emits ultraviolet radiation with a wavelength between 100-400nm. The lamp was located at a distance of 40 cm, and the dose administered was 2, 4j/square inches per day for 15 minutes/ for 24 days.

After exposure the animals were examined macroscopically, both to the eye and using a magnifying glass, as well as microscopic.

Microscopic examination was performed after harvesting biopsy evidence of tegumentary fragment.

For histological research biopsy collected fragments were fixed in 10% formalin and then processed through the classic method of inclusion in paraffin.

Results of the research were supported by statistical validation of values [9].

RESULTS AND DISCUSSION

Were examined in parallel the two batches of animals.

The batch unprotected suffered obvious macroscopic changes manifested by:

- erythema on the skin;

- obvious thickening of the epidermis
- cutaneous roughness.

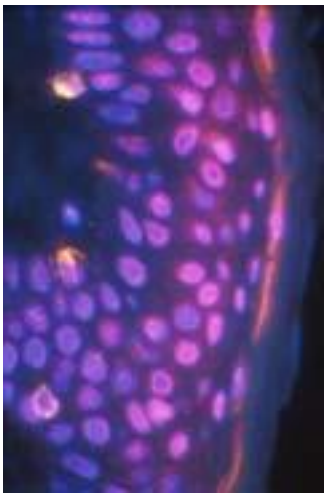
The batch protected with sunscreen with SPF 50 does not present any obvious macroscopic changes, although the animals were examined in detail with a magnifying glass.

After macroscopic examination, the animals were subjected to puncture biopsy to be taken tegumentary tissue fragments that were examined microscopically.

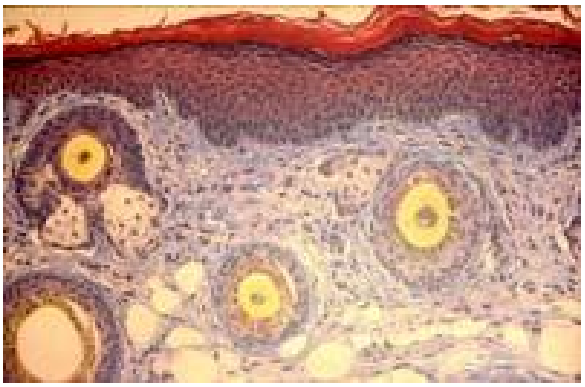
The batch protected with sunscreen had changes related to the number of melanocytes were more numerous, otherwise no structural changes were found.

The batch under irradiation without sunscreen has suffered many structural modifications, namely:

- in the epidermis is observed architectural changes and alterations of keratinocytes and melanocytes and Langerhans cell functional changes;
- irradiated epidermis becomes twice as thicker compared to the skin protected;
- becomes disorganized, showing signs of hyperkeratosis, parakeratosis and acanthosis;
- keratinocytes lose their alignment and progressive worsening showing typical intranuclear inclusions and excessive levels of melanosomes above the core complexes;
- dermo-epidermal junction loses its network of bridges forming a flat interface between the dermis and epidermis;
- this new structure is more susceptible to shear forces than the normal interplay between network bridges and dermil epidermal papillary;
- to the dermis, the ultraviolet causes unique changes as alterations in matrix composition architecture, structure and function of vascular and cellular activity;
- connective tissue immediately beneath the epidermis (Grenz zone) contains large bouquets of densely packed collagen fibrils and normal appearance;
- there are no data to demonstrate how the newly synthesized elastic fibers degraded or previously existing or contribute to forming this material;
- the abnormal collagen fibers can be mixed with the elastic substance.



epiderm ensure



melanocytes in UV light

Clinical evaluations:
Evaluations were conducted by the Screening visit on days 0 (baseline), 4, 8, 12, 16, 20, 24 irradiation.
Measures of effectiveness: the effectiveness of the variables evaluated at all study visits, exclude the following:

- mild erythema,
- medium erythema,
- strong erythema,
- Hyperpigmentation in spots,
- tactile roughness.

Measurement of OIA includes all individual photolesion signs (OIA-overall integrated assessment). A fotonumeric guide illustrating degrees of OIA:

- minimum,

- easy,
- moderate,
- severe

With the three each points, has been distributed to help me out in determining a correct score OIA.

Each of efficacy variables was evaluated on a scale of 6 points:

0 = indicates nothing,
1 = minimum,
2 = easy,
3 = moderate,
4 = severe,
5 = very severe

In order to assess the global response to irradiation, at each examination (visit), was compared the subjects' status with the start time and the answer was expressed on a scale of 7 points:

0 = Indicates the answer completely (100% integrity),
1 = mild erythema (90%),
2 = medium erythema (70%)
3 = strong erythema (50%)
4 = Hyperpigmentation in spots (25% improvements)
5 = Advanced roughness
6 = condition worsened

At the end of the study the mice were examined to assess the cosmetic characteristics of the study compared to the group that was treated with sunscreen with SPF 50 for it using a 5-point scale:

1 = greatly improved response
2 = somewhat improved response
3 = without modifications
4 = somewhat worse
5 = much worse

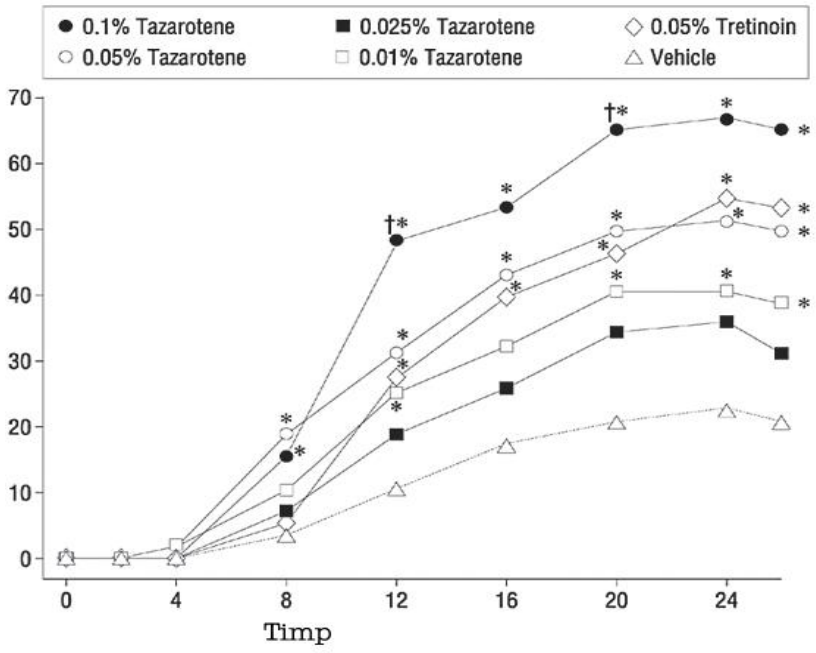
Effectiveness criteria: effectiveness of the product sunscreen was considered significant if the difference between the proportions of mice that have reached the irradiated skin and unprotected protection was at least 15%.

Incidents related to clinical improvement OIA Photo lesions were significantly higher for irradiated group protected with sunscreen SPF50.

Evaluation of biopsy samples:

Evaluation samples at endpoint in optical microscopy revealed a cellular atypia in almost all mice irradiated without protection, which has been linked to a moderate degree of photo lesion. Atypical keratinocytes was present and only minimal melanocytic atypia was present in only 10% of the samples. A characteristic "basketball mesh" of the stratum corneum was

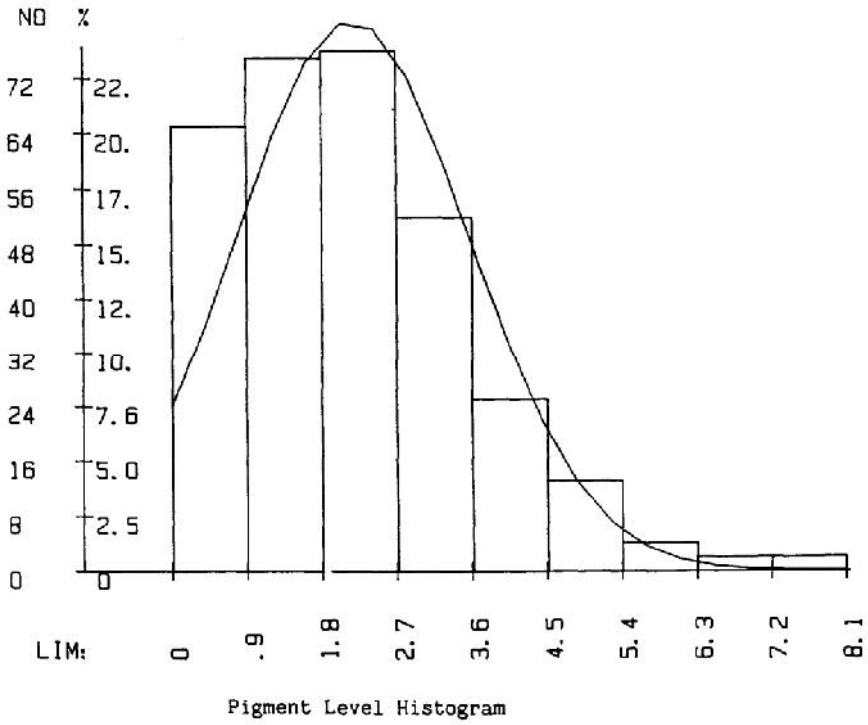
observed in 58% of samples at the time of start and a mixed aspect of compaction and "basketball mesh" was observed in 16% of samples - dermal solar elastosis was present in all samples, and a the perivascular lymphocytic infiltrate was observed in 13% of samples.



After day 24, all biopsy specimens showed an increase in thickness of the epidermis. This thickening of the epidermal layer was statistically significant when compared with the start.

CONCLUSIONS

From the study may be drawn the following conclusions:
1. Harmfulness of ultraviolet radiation is certain doses used were relatively small, yet obvious macroscopic changes have occurred in animals exposed and unprotected;
2. Use of sunscreen with SPF50 is mandatory, which is demonstrated in minimal histopathological changes present in protected animals;
3. Macroscopic changes appeared were as erythema, tegument thickening and roughness;
4. Histopathological alterations have been cell type were disorganization, especially keratinocytes and melanocytes and inflammatory infiltrate in the dermis type, up to the present elements metaplasia.



Pigment Level Histogram

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