

A Review on Prevention against Sun Damage

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Abstract— Tanning is the increase in skin pigment- melanin; it causes the change in color of our skin. Excessive tanning causes skin damage. It is over- exposure to the UV rays from the sun. The supreme cause of skin cancer is believed to be the over exposure to the solar radiation which is the medley of ultra-violet radiation (UVA, UVB, and UVC), and visible light. UVB is the stronger component amongst the three, when it comes to causation of cancer, sunburn to humans or damage to DNA. In this review paper, the measures taken to avoid sun damage are discussed. The ancient approach to this included the use of herbal sunscreen. Whereas, new advancements include, a tan timer bikini which beeps at a particular interval, reminding you to cover yourself. The other device is a French company (Spinali Design) based bikini, named Neviano, which reminds the user to re-apply sunscreen.

Keywords- Melanin, UV rays, visible light, DNA, UV sensor

I. INTRODUCTION

An excessive exposure of the skin to ultraviolet radiation which is followed by an acute cutaneous inflammatory reaction is what we call sunburn. There are various sources of UVR exposure, some of which include: sun, sun beds, sunlamps, phototherapy lamps, and arc lamps[1]. Melanoma and Keratinocyte Carcinoma are majorly caused by solar ultraviolet radiation[2]. As aesthetically pleasing tanning can be, when done in excess; it can be very harmful.

As the indoor tanning beds have an inbuilt timer, they are used for a limited amount of time. But, sun- tanning is done without knowing when it gets too much. A tan timer, device which is used to protect the user from sun damage is made to meet a demand in the industry.



Figure 1: Acute sunburn of face after a soccer match in a 15 year- old female [3]

UV Radiation

Electromagnetic (EM) radiation is divided into three:

- Ultra-violet radiation
- Visible light
- Infra-red radiation

Infra-red radiation (heat) is not detectable by the human eye. Visible light is the wavelength which is visible to the human eye; it is the range for general illumination [4]. Ultra-violet radiation is further sub-divided in three categories; they all affect the human skin differently. Listed below:

- UVA (320-400 nm)
- UVB (290-320 nm)
- UVC (200-290 nm)

95% of UVA and 10% of UVB rays strike the earth. UVC is filtered by the ozone layer. UVB induces a fall in quantity of- mediators in the skin which affect the diameter of blood vessels and the neural tissue, cytokines (molecules that aid cell communication for an immune response); that together result in an inflammatory response and causes “sunburn” [5]. It is more effective compared to UVA in the aspects of: DNA damage, sunburn, tanning, and skin cancer.

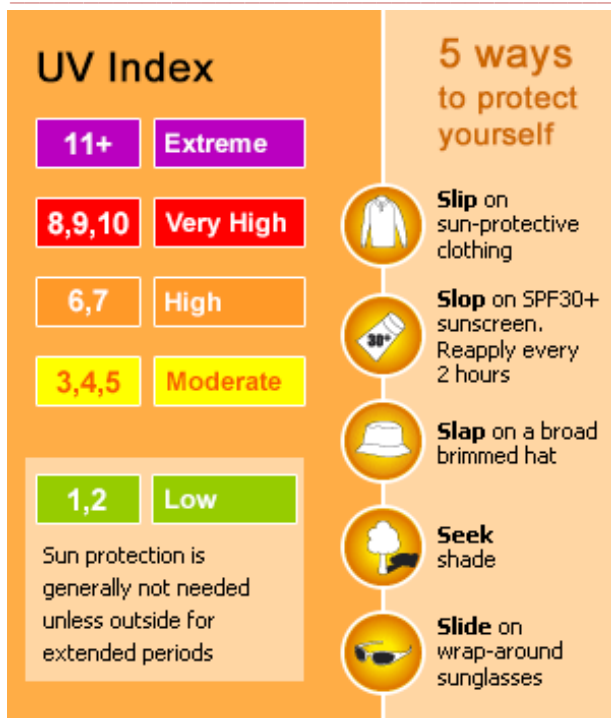


Figure 2: Image courtesy of Bureau of Meteorology

II. LITERATURE REVIEW

Egyptians were the pioneering ethnic group to bring about the concept of sun protection. They used several ingredients, like- rice bran, jasmine, and lupine. Rice bran; which is recently found to be a UV light absorbent, jasmine; which helps repair the DNA, and lupine which lightens the skin color. Olive oil and Tsugacanadensis; type of pine needle which soothes sunburn, were also used by the ancient Greeks and Native American tribes, respectively[6].

It is astonishing how our ancestors found a way to protect our skin from sunburn long before the effect of sun damage was known. Despite the fact that sunscreen prevents sunburn, and that they have shown some effectiveness towards protection against squamous cell carcinoma, both the most numerous (basal cell carcinoma) and the most deadly (melanoma) skin cancers have little evidence for efficacy of sunscreens.

This is where the tan timers come in use.

- Tan timer bikini:



Figure 3: Tan timer bikini[7]

This device is not the most useful but it does work towards alerting the user, advising them to seek shelter or change positions. It has an electronic timer which beeps every 15 minutes[7]. It ensures that you do not get sunburn by over-exposure to the sun.

- Neviano

This is a French invention of the company- Spinali Design by Marie Spinali. It has a connected detachable, waterproof UV sensor which is used to detect the intensity of UV radiation.



Figure 4: UV sensor [8]

To use this bikini, user has to get the application on the phone which is available for iOS and Android- Spinali Design. To begin, the user has to login to their account. After which the user has to enable the UV connect option followed by switching the UV sensor on. Then the user selects their skin type on the application and the SPF of their sunblock.

It sends an alert when it is time to re-apply the sunscreen. It also has a “Valentine” option which sends the alert to the partner for them to apply the sunscreen on the user. [8]



Figure 5: Signals from UV sensor going to the smartphone [8]

The main component of this bikini is the Silicon Labs 1132 Card. It is a low power, ultraviolet (UV) index, and ambient light sensor[9], the user can be notified in case of risk of sunburn, thanks to the sensor interaction with the mobile app for IOS and Android [8]. A Low Energy Dina Stream Bluetooth Chip is also used which connects the UV sensor to the smart phone.



Figure 6: Smartphone alerts the user [8]

The Spinali Design UV sensor is able to interact with the user's smartphone and has a service life of 80 and 360 days in full use (12 hours a day) in function of the consultation

frequency. It is connected to the user's dedicated mobile app and is parameterized based on the information that the user enters at the time of its activation. [10]

III. DISCUSSION

The sole purpose of avoiding sun damage is to avoid getting skin cancer. While sunscreens protect us from getting sunburn, they have not shown much diligence when looked at cancer protection. Therefore, using sunscreens as a go-to option for skin cancer prevention for skin cancers like, basal cell carcinoma or cutaneous malignant melanoma, at this point in time is unsupported[11].

The tan timer bikini, compared to having no device in the ancient times, is an effort taken in order to prevent sunburn and skin cancer. It acquires the user to be able to judge when it gets too much. The prime advantage of this device is that it prevents the user from falling asleep in the sun which can cause a lot of harm.

The Neviano, despite its high cost, is like a light at the end of the tunnel for those seeking a good tan but not wanting to get their skin burned. It is a highly effective way of preventing sunburn while also enjoying a tan at the same time. The drawback being: it does not protect the user from skin cancer. It allows the user to sit in the sun for as long as they please, if they keep re-applying the sunscreen.

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