

SUN BATHING: A CASE OF – TAN NOW ... PAY LATER ?

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The sun, the largest and brightest of the stars visible to the naked eye has always been regarded by man, from the earliest days, as a source of energy, good health and happiness. The Plains Indians of the 19th Century used to worship the sun by a most important and spectacular religious ceremony - the Sun Dance. This was held in early summer by each tribe and used to continue for many days and nights, the participants mutilating themselves and getting exhausted to the point of death (1). In an effort to curb such practices, the U.S. government outlawed the Sun Dance in 1904. Nowadays, the Sun Dance is largely over and done with, however, we still 'worship' the sun on our beaches with just as much fervour as the Plains Indians and with just as many mutilating results. It is perhaps high time that we curb such practices rather than tan now and have to pay later at a costly price.

Sunlight consists of a spectrum of wave bands. The part of the spectrum which is responsible for the harmful effects of sunlight is largely in the ultra violet region.

The Ultra Violet spectrum is further subdivided according to the wavelengths into UVA, UVB and UVC as shown in fig 1 above. The wave lengths of ultra violet radiation which are most likely to produce acute and chronic effects are within the short wave UVB range 290 - 320nm. Wavelengths less than 290nm are absorbed in the atmosphere and are therefore not transmitted to the earth's surface. Wavelengths ranging from 320-400nm are relatively inefficient in producing erythema but enhance UVB induced carcinogenesis in animal models and may enhance UVB induced skin aging. The intensity of ultra violet light

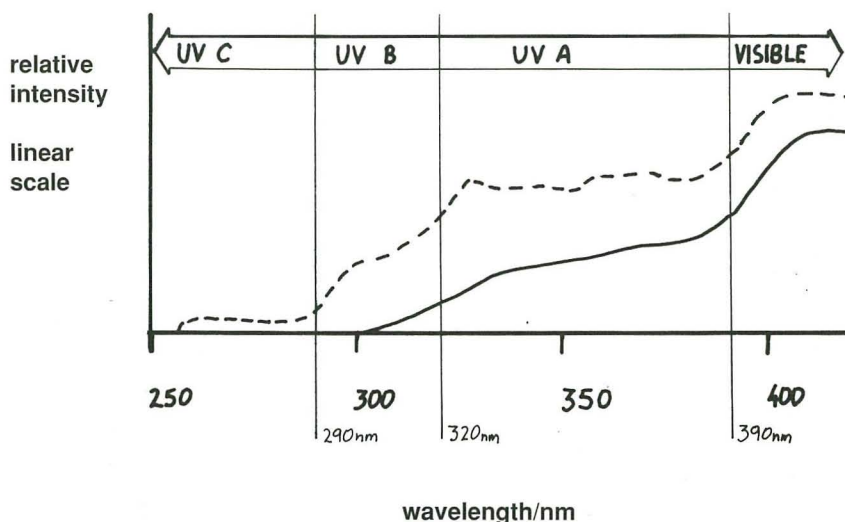


Figure 1. Relative intensity of Solar radiation in the UV spectrum showing atmospheric absorption

Key: — — — — — Emitted solar radiation
 ————— Radiation transmitted by atmosphere.

reaching the earth's surface varies with altitude, latitude, time of day, time of year, cloud cover and shade; so variations are very large. Cloud cover and moderate shade do not greatly attenuate ultra violet but ultra violet scatter from blue sky and ultra violet reflection from rippling water or sand may greatly increase ultra violet intensity. Sunlight is the only natural source of UVB. Artificial sources of ultra violet radiation include UVA and UVB sources used diagnostically and therapeutically in dermatology departments, sun beds, some lasers and some fluorescent and other lighting sources.

Acute and chronic effects of sunlight on human skin result from excessive exposure to sunlight. Excessive in this context means significant exposure to strong midday sun and any sun exposure that results in prolonged redness of the skin and discomfort, scaling or peeling. The acute effects of

excessive exposure to natural sunlight include sunburn, with erythema, sometimes swelling, blistering and subsequent peeling of the skin commencing within hours of exposure and taking several days to resolve. The severity of the acute reaction depends on both the individual's skin type and on the intensity of radiation. With regard to reaction to sun exposure, there are 6 types of skin (Melski J.W. et al 1979). See Table 1 below.

TYPE REACTION TO EXPOSURE TO SUNLIGHT

- 1 Never tans, always burns
- 2 Tans with difficulty, burns frequently
- 3 Tans easily, burns rarely
- 4 Always tans, never burns
- 5 Genetically brown skin (Asian and Mongolian)
- 6 Genetically black skin (Negroid)

TABLE 1

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The more chronic effects of ultra violet exposure basically consist of two major categories – skin cancer and premature ageing. One only needs to walk through the streets of one of the rural Maltese villages, where farmers spend most of the time in the scorching sunlight, to be aware of premature skin ageing, which is one of the most evident of the harmful effects of sunlight. This premature ageing includes dryness, wrinkles, laxity and patchy variation in skin pigmentation. All these have been traditionally associated with ageing but more recent studies comparing habitually exposed facial skin to habitually unexposed buttock skin in an elderly person, have shown that exposure to the elements is more important than age per se in causing these changes. Premature skin aging results largely from damage to the epidermis causing epidermal keratosis and to the connective tissue of the dermis. The latter has three components; cells – mast cells, histiocytes, fibroblasts; ground substance – mucopolysaccharides, lipids, glycoproteins and non-fibrous proteins: and lastly fibrous elements consisting of elastin, collagen and reticulin fibres. Sunlight mainly effects the ground substance and the fibrous elements of the connective tissue to result in premature skin aging also referred to as actinic elastosis. A study by Graham Smith et al (1968) showed that normally both hyaluronic acid and chondroitin sulphate decrease with age, the decrease in hyaluronic acid being greater than the decrease in chondroitin sulphate. However, in chronically sun damaged human skin there is an increase in hyaluronic acid with a slight increase in chondroitin sulphate.

As mentioned above besides the mucopolysaccharide component of the connective tissue, its fibrous element is also effected. Studies by several investigators have demonstrated that there is a decrease in soluble collagen and an increase in insoluble collagen as a function of age (Sobel et al 1959, Clausen 1962). On the other hand the elastin content of the dermal connective tissue increases with age (McGavack and Kao 1960).

An increase in the number of interstrand and intermolecular cross-links renders the collagen molecule less and less soluble. This effect was found to be enhanced by sunlight which acts as the hydroxyproline cross-linkages to result in an increase in insoluble collagen. The effect of sunlight on elastin results in a decrease in glutamine and lysine (Thomas et al 1963) and an increase in desmosine and isodesmosine and it has been postulated that desmosine may partly behave as the cross-linking unit of elastin.

The current increasing awareness by the general public and the media in the hazards of exposing the skin to sunlight are mainly founded on the association between excessive sun exposure and skin cancer. Studies in Australia (McLeod G.R. et al 1985), Scotland (Doherty, MacKie 1986) and certain parts of USA (Rieget et al 1986) have shown the clear association between excessive sun exposure and skin cancer and have given information on the early recognition of skin cancer.

There are basically three types of skin cancer; basal cell carcinoma, squamous cell carcinoma and malignant melanoma. Carcinoma of the skin is most prevalent in countries such as Australia, South Africa and the Southern part of the United States of America where fair-complexioned people are exposed to the sun. In these countries, which are only a few examples, there is a dry sunny climate and since the atmospheric filtration of UVB is increased as the angle of incidence of the solar rays decreases, there is an increased prevalence in these countries with decreasing latitude. In fact in the USA the incidence rate for white people of the same age group increases as their place of living becomes closer to the equator (Auerbach et al 1961). Caucasians are affected 15 times more than Negroes for the same degree of exposure. The relative immunity of dark-skinned people is found in all countries and is due to skin colour rather than any other racial characteristic, as is shown by the high incidence of skin cancer in

the albino Bantu (Cohen et al 1952). The most susceptible of the fair skinned people are those with blue eyes, red hair and freckles. As an index of susceptibility a light colour of the iris is more significant than fair hair. In sunny climates susceptible subjects develop their keratosis and skin cancer a decade or more before those who tan easily and have been exposed to similar conditions. However it would be a mistake to assume that skin cancer occurs mainly in people with skin which does not tan easily on sun exposure. In areas like Australia, the majority of the white population tan readily and tumours occur in such people although at a somewhat later age than those who do not tan. Earlier studies showed an increased association in incidence of skin cancer with changing age structure of the population, habits of dress and recreation (MacDonald 1959, 1964). In a way, this finding can be used positively since reversion to healthier habits especially recreational ones and the use of preventive measures can result in a significant decrease of skin cancer.

Genetic factors have an important role to play since it is the genetic code which determines the type of skin a person acquires. Patients suffering from Xeroderma Pigmentosa, a rare and significant genetically recessive condition are unable to break down pyrimidine dimers formed by ultra violet radiation. This results in a higher incidence of actinic carcinogenesis in such patients. A study by Hueper et al 1946 showed an association of long-term cumulative exposure to natural sunlight in outdoor workers, such as farmers, fishermen with the incidence of basal cell and squamous cell carcinoma. Also the commonest sites to be involved are those that are habitually exposed, that is, the face, the dorsum of the hand and the forearm.

Malignant melanoma, the most lethal of the skin cancers, has some features which are different from those of basal cell and squamous cell carcinoma. It tends to affect a younger age group, around 50 years of age,

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rather than the 70 year age group for non-melanoma skin cancer. Also melanoma is more common in professional and managerial groups, whilst basal cell and squamous cell carcinoma is commoner in those with unskilled occupations (Lee and Strickland 1980). In fact a study by Looke, Stregy and Fraser 1984, showed that the melanoma type of cancer is more common in indoor than in outdoor workers in contrast to other types of skin cancer. A study in Australia where there is the highest incidence of melanoma showed that possible childhood sun exposure is of critical importance since European immigrants arriving before the age of ten years have risks similar to those of the natives while arrival at any age after fifteen constitutes a lesser risk (Holman and Armstrong 1984). A Canadian study by Edward, Gallagher and Davidson et al 1985 has shown that the risk of melanoma is increased in individuals who have high levels of intermittent exposure to the sun from holiday or recreational activities, while there is no parallel increase in individuals whose excessive exposure has been the constant, everyday, occupation type of sun exposure. This has been further confirmed by Scottish and American studies (MacKie, Hitchison 1982). All these studies suggest that the increasing incidence of melanoma may be related significantly to intermittent exposure to excessive sunlight, often with a history of severe sunburn, but who otherwise have a low level of exposure throughout the year. This factor has a special relevance in countries like Malta where holiday makers especially from countries like the UK, grill themselves to a lobster red and then flock to the pharmacist for something to relieve their burning agony only when it is too late and when the actinic damage has already occurred. Persons who have large numbers of pigmented naevi, usually large, having an irregular edge, looking inflamed – the dysplastic naevus syndrome – are at an increased risk of developing melanoma. These persons even more than others, must be wary of excessive sunlight exposure

as shown in a study by MacKie 1982, where out of 12 patients who had both malignant melanoma and dysplastic naevi, 9 had a history of excessive sun exposure.

There is also an association between immuno-suppressed patients and cutaneous malignancy. Renal transplant patients, leukaemia patients on treatment and other immuno-suppressed patients have an increased incidence of cutaneous malignancies and this was found to be especially high in areas with high natural sunlight intensity.

The prognosis for skin cancer ranges widely with the type of neoplasia. Basal cell carcinoma has an excellent prognosis after local excision or radiotherapy. Squamous cell carcinoma has a very good prognosis if it is recognised and treated early. However if not, the prognosis deteriorates due to spread to lymph nodes later on in its course. Malignant melanoma has a much more sinister prognosis which depends very much on the thickness of the primary tumour. This can be measured by the Breslow technique, see Table 2.

If caught early, malignant melanoma can be treated with a good cure rate. In order for this to be possible public awareness to malignant melanoma must be increased. To the effect, in Scotland, a public awareness campaign included a 7-point check list with features commonly seen in malignant melanoma. See Table 3 below.

From the above one can easily come to the conclusion that the price we might have to pay for sun bathing unorthodoxly might be surprisingly high. Public awareness of this fact is still lacking and a campaign should be set rolling to this effect equally in Malta, where sun bathing is so popular amongst both locals and tourists. However sun bathing can be made much safer if the necessary precautions are taken. The most commonly used protection consists of topical sunscreens known as sunblocks. These topical agents have a variable Sun Protection Factor (SPF). Currently available preparations range from SPF 2 to 20. It is only agents in the range of SPF 8 to 10 which have significant protection against the acute and more importantly against chronic sun damage.

Thickness (mm)	5 Yr. Survival Rate (%)
1.5	91
1.5 - 3.5	67
3.5	38

TABLE 2

A revolutionary device in the field, which has been launched recently in the local market, is an umbrella of variable size which has complex light-absorbing chemicals bonded into its fabric. These chemicals block only the undesirable wave length of natural sunlight, see Table 4 below, while at the same time allowing the wave lengths necessary for sun tanning to pass through. In addition as shown in Table 4 it also blocks those wave

Points	Score
1. Presence of itch or altered sensation.	One point per feature
2. Diameter of 1 cm or greater	<3 pts. – 90% non-melanomatous pigmented lesion
3. Increasing size	
4. Variation in density of black or brown pigment within the lesion	>3 pts. – refer to specialist
5. Presence of an irregular or geographic lateral border	>5 pts. – 95% a melanoma
6. Inflammation	
7. Bleeding or crusting	

TABLE 3

lengths which produce heat and glare. Hence this fabric (SUN SELECT[®]) creates a cool comfortable shade in which to tan. The fabric offers protection equivalent to traditional sun care products with SPF 8-10. Due to the ability of this special material to selectively absorb only those wave lengths which cause burning, the sun's natural ability to tan will not be affected by the device.

Characteristics of SUN SELECT[®]

- BLOCKS 99% of UVB (290-320nm)
which causes sunburn
- ALLOWS up to 80% of UVA (320-400nm)
which allows tanning
- REDUCES heat and glare by 50%
(over 440nm)

TABLE 4

In conclusion whilst the sun really does wonders for our 'soul' – a fact that makes Malta such a popular tourist resort – it does nothing but damage to our skin. Taking a glance at the animal world, one notices that all creatures living in conditions that resemble those of our beaches, have through the process of evolution acquired some kind of protection either anatomical or behavioural. Perhaps it is about time that we follow the example of these creatures of lesser intelligence but surely with a greater survival instinct than ours.

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