Protection against Solar Ultraviolet Radiation in Childhood

Nives Pustišek¹ and Mirna Šitum²

¹ Children’s Hospital Kliačeva, »Sestre milosrdnice« University Hospital Center, Zagreb, Croatia
² Department of Dermatology and Venerology, »Sestre milosrdnice« University Hospital Center, Zagreb, Croatia

ABSTRACT

In the last decade, awareness of the harmful effects of solar ultraviolet radiation has increased. Modern lifestyles, outdoor occupations, sports and other activities make total sun avoidance impossible. Children spend more time outdoors than adults and there is compelling evidence that childhood is a particularly vulnerable time for the photocarcinogenic effects of the sun. Sun exposure among infants and pre-school age children is largely depend on the discretion of adult care providers. It is important to learn safe habits about sun-safety behaviours during the childhood. Children deserve to live and play in safe environments, and it is the responsibility of every adult to help children stay safe. Protecting children from excessive sun exposure is protection from sunburn today and other forms of sun damages, especially skin cancers, in the future.

Key words: ultraviolet radiation, photoprotection, childhood

Introduction

In the last decade, awareness of the harmful effects of solar radiation has significantly increased¹. Modern way of life, outdoor activities and sports among other occupations make total sun avoidance impossible. Children spend much more time outside than adults, and it has been shown that childhood and adolescence are particularly vulnerable periods for the photocarcinogenic effects of the sun². Negative effects of solar radiation accumulate during lifetime and up to 80% of total lifetime accumulation takes place in childhood and adolescence. Child skin is more sensitive than the adult skin because natural defence mechanisms are not fully developed. A short exposure to midday sun may result in sunburns. Epidemiological data demonstrate higher incidence of melanoma among individuals who suffered from sunburns in childhood and adolescence¹,². During childhood, the behaviour of children is determined by the behaviour of their social environment: parents, carers and others. Maternal sun habits are predictive of the level of sun exposure in children³. It is important to pass on to children knowledge about solar radiation and positive sun habits. Sun protection is not about avoiding outdoor activities, but about protecting the skin from excess sun effects. Correct sun protection includes protection from solar radiation, sunburns today and other forms of skin damages, especially skin carcinoma, in the future.

Avoiding Excess Sun Exposure

More than 70% of ultraviolet (UV) solar radiation reaches the surface of the earth between 10 am and 4 pm. During this period of the day it is best to stay away from the direct sun effect. Shade provides only partial protection, because of reflection. Reflection from the surface of the snow ranges from 30 to 80%, from the surface of the sea 20%, of the sand 6 to 25%, and from the grass 0.5 to 4%⁴. Exposure to artificial sources of UV radiation is as dangerous as the exposure to natural sun. Sun or tanning beds (solaria) are popular among adolescents, poorly supervised and often do not conform to regulations⁵.

Clothing and Hats

Clothing provides an excellent method of sun protection, though it protects much better from UVB than UVA rays⁴. In 1996, the concept of ultraviolet protection factor (UVF) was first introduced. It refers to clothing, de-
fining the level of protection as the factor of time that may be spent in the sun without the risk of sunburns6. UPF is analogous to sun protection factors (SPF) in sunscreens. Spectrophotometer is used to measure the transmittance of UVA and UVB rays through the fabric. According to the European Committee for Standardization, for the clothes to be photoprotective, its UPF must be over 30 and the average transmittance of UVA rays under 5%. Clothing must cover upper and lower trunk, from the base of the neck to the thighs, over the shoulders covering ¾ of the arms and then from the waist down to the knees7. Factors affecting UPF are the permeability of the fabric; type of the fabric; washing of the clothes; stretchiness and colour of the clothes as well as its distance from the skin8,9. Tightly woven, impermeable fabric provides a higher level of protection. Wool and synthetic fibres such as polyester have a high UPF, while the UPFs of cotton, linen and artificial silk are all below 1510. A typical summer cotton T-shirt has an UPF of 5–9, and when wet just 3–411. It has been shown that UPF increases significantly after washing of the clothes and especially after the first wash because the clothes shrink11. Stretchy fibres, such as lycra, block UV 100% when they do not adhere to the body; yet stretched, tight lycra is far less effective and has an UPF of 212. Dark clothes provide a much higher level of protection than light clothes, and the closer the clothes is to the skin, the lower the sun protection factor9,10.

There is now clothing made of fabric with added protection, treated during production with finely distributed particles of titanium dioxide of the size of 500 nm. Except repelling UV rays, this clothing also repels infrared or heat rays so the temperature is up to 10 degrees cooler than in «normal» clothes12,13.

A wide-brimmed hat is a compulsory item of clothing in the sun. Hats with narrow brim (under 2.5 centimetres) provide an SPF of 1.5 for the skin of the nose and almost no protection for the chin and the neck. Hats with medium-sized brims (2.5 to 7.5 cm), so-called baseball hats, provide protection at the level of SPF 3 for the nose and SPF 2 for the cheeks and neck, but the chin remains unprotected. Only a hat the brim of which measures over 7.5 cm provides adequate shade for the face (nose SPF 7, cheeks SPF 3, neck SPF 5 and chin SPF 2)14,8.

Sunglasses

Sunglasses must have glass with UVA and UVB protection14,15. The effectiveness of sunglasses against UV radiation depends on their shape, size, UV-absorbent materials built in the glass and reflection from the posterior surface of the glass. Usually the glass blocks rays the UV rays under 320 nm. UVA rays pass through «normal» glass so a plastic film containing zinc, chrome, nickel and other materials is used to protect from UVA rays. The USA Ophthalmological Association recommends wearing glasses that absorb 99–100% of UV spectrum (400 nm), while the additional retinal protection may be achieved using glass that reduces UV light transmission. To com-
spectrum and UV radiation. The most commonly used physical UV filters are titanium dioxide, zinc oxide, magnesium silicate and oxide, iron oxide and barium sulphate. Today the most commonly used products from this group are titanium dioxide and zinc oxide. Titanium dioxide and zinc oxide in the form of micro particles may absorb UV rays and reflect and scatter the visible spectrum and UV radiation. Zinc oxide protects from UVB and a wide spectrum of UVA radiation including UVA1 spectrum and UV radiation. Titanium dioxide has a higher index of refraction, which makes it whiter. Physical filters for sun protection are easy to use and can cover a wide area fast, but may be difficult to apply evenly. Sunscreens may also be divided with respect to their water resistance. The label of a water-resistant product confirms that the product will retain its SPF level after 40 minutes of immersion into water. The label very water-resistant or water-proof product denotes retaining the SPF level after 90 minutes of immersion into water.

Using sunscreens in infants

In 1999, FDA recommended against the use of sunscreens in children under 6 months of age, as the infant skin has different absorption characteristics and the ability to metabolize and excrete the absorbed medication may not be fully developed. The best method of protection for this age group is to avoid direct exposure to sun and to use appropriate clothing and shade. If necessary, controlled and occasional use of sunscreens is allowed on the exposed parts of the body.

Educational Programmes

Protection from harmful effects of the sun is becoming the focus of health educational programmes in Australia, New Zealand, North America and Europe. Numerous studies have shown that sun protection is still inadequate. Only 20% of school-age children receive adequate sun protection, and 78% of the examined believe that sun exposure is associated with temperature of the environment. In spite of the numerous warnings, especially girls and young women (16–34 years of age) use sunbeds. In the U.S., the sunbed industry earns up to 5 billion $ per annum.

Education should start at the earliest possible age. Its purpose is to increase awareness, knowledge and understanding of the harmful effects of sun radiation and means of skin protection. The goal of education is prevention of short-term and long-term harmful consequences of excess harmful sun effects upon children’s health.

Conclusion

Negative effects of sun radiation accumulate during lifetime and it has been proven that up to 80% of the total lifetime accumulation takes place before 18 years of age. This is why it is essential to introduce sun protection at the earliest age and to teach children positive habits and attitudes. Infants under six months of age should not be exposed to direct sun. For older children, avoidance of direct sun exposure between 10 am and 4 pm, when sun radiation is the strongest, as well as wearing suitable hats and sunglasses, along with regular application of sunscreens with UVA and UVB filters, will provide adequate protection.

REFERENCES


N. Pustišek

Children’s Hospital Klačeva, «Sestre milosrdnice» University Hospital Center, Klačeva 16, 10 000 Zagreb, Croatia
e-mail: nives.pustisek@kbsm.hr

ZAŠTITA OD SUNČEVOG ULTRALJUBIČASTOG ZRAČENJA U DJETINJSTVU

SAŽETAK

U posljednjih desetak godina osvježivanje o štetnosti sunčevog zračenja značajno je poraslo. Suvremen način života, igre na otvorenom, sportske aktivnosti i drugo onemogućavaju potpuno izbjegavanje sunčevog zračenja. Djeca provode puno više vremena na otvorenom nego odrasli, a dokazano je da je djetinjstvo i adolescencija posebno vulnerabilno razdoblje u fotokarcinogenom djelovanju sunca. Tijekom djetinjstva, ponašanje djece je određeno ponašanjem njihove okoline, roditelja, odgajatelja itd. Vrlo je važno znanja i pozitivne navike o pravilnoj zaštiti od sunčevog zračenja. Svrsna zaštita od sunčevog zračenja ne realistično zaštićenje kože, osobito kožnih karcinoma u budućnosti.