USACHPPM
Readiness thru Health

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Just the Facts...

Medical Fact Sheet on Sunlight and Skin Cancer Risks

Introduction

All forms of skin cancer are steadily increasing—including the fatal melanoma—which will affect one American in 75. One American dies every hour from skin cancer at the present time. Most of these deaths could have been prevented by appropriate sun protection and following simple rules of sun safety. There is undisputable medical evidence that almost all skin cancers are related to solar ultraviolet (UV) exposure, and, specifically for melanoma—over-exposure during childhood of those having a familial genetic predisposition. Familial history of melanoma is a strong indicator, since in conjunction with UV over-exposure; one or two members of the family will have a cancer. Another risk-factor is the presence of more than 50 nevi over the body—a number that also depends upon both genetic factors and solar exposure.

Exposure History

Early childhood exposure of susceptible individuals creates sub-cellular "lesions" at the molecular level that may not show cellular changes for decades. Recent research clearly demonstrates that all forms of skin cancer are linked to the impairment of the molecular mechanisms that control cell division by mutation of the controlling genes. The mutations are specific for UV damage (the "UV signature") and cannot be caused by other environmental mutagens. Cumulative exposures are responsible for accelerated skin aging, which are generally found in connection with skin cancers of epithelial origins (basal cell and squamous-cell carcinomas). On the other hand, only one-halve of melanomas show these signs—a fact that had previously been interpreted by two different induction pathways. One pathway is related to excessive childhood exposure in coincidence with early development of melanomas in the 40s and 50s, mostly on the trunk. The other pathway is linked to a general over-exposure throughout a

lifetime, with a consequence of a late-appearance of the melanoma (in the 60s-80s), mostly located on the head and neck. This observation has important implications for primary protection (photoprotection) and secondary prevention (early diagnosis associated with excellent prognosis).

Primary Prevention

Primary prevention is largely achieved by all means of photoprotection (avoiding direct exposure during the midday hours; refraining from unnecessary exposures; protection by physical means, such as wearing long-sleeve shirts and long trousers, broad-brimmed hat (at least 7-cm brim reduces facial and neck exposure by five-fold), and the use of sunscreens on uncovered parts of the body. Health education remains a critical part of prevention.

Secondary Prevention

It has been widely accepted that early detection of abnormal skin proliferation is associated with a much better survival rate in the case of melanoma. More generally for squamous-cell and basal-cell carcinoma, early detection and surgical excision are associated with less scarring and better aesthetic results. Recognition of early *melanoma* by health professionals is essential, and standardized examination rules may help, such as the simple ABCDE rules:

A. Asymmetry of the lesion—a distortion of an oval or circular pattern
B. Border—irregular
C. Color variation—more than one uniform color
D. Dimension more than 5 mm
E. Elevation (indicating increased epidermal thickness as sensed by touch)

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After removal of the lesion, if the maximal thickness as assessed by histology is less than 1 mm, the expected complete cure is ~90%, providing the surgical margin of excision is sufficient (1-2 cm). Early recognition and proper surgery has changed the prognosis for survival from 10% to 90% in the last 40 years. Neither chemotherapy nor immunotherapy or vaccines have significantly improved the survival rate of the deeply invasive tumor (prone to metastasis; 50% survival for tumors thicker than 1.5 mm).

Dr. Martin Weinstock, Brown University, Providence, RI, reported at the World Congress on Melanoma (held in 2005) held in Vancouver that there is more than one pathway for the development or melanoma. Certain individuals (Group I) develop melanoma earlier with less UV exposure and may be more susceptible to intermittent exposure patterns. They are most likely to develop melanoma of the trunk. Others (Group C) may develop melanoma after reaching a threshold of cumulative exposure. These tumors are more likely to develop on the head and the neck. Primary prevention messages sun protection apply to both groups (I and C). The focus on Group I would be childhood exposure that are intense and less on moderate exposure.

Recruitment Examination

Ideally, a physical examination should take place by the age of 20 to identify those individuals having a high risk of skin cancer later in their life. Such an examination would:

1. Detect signs of skin sensitivity to UVR—minor freckles on the face and/or shoulders, sun-induced, star-like, large freckles, and determine the number of nevi on arms, legs and trunk

2. This should be supplemented by an historic record of the number of severe sunburns, travels in sunny countries, practice of outdoor sports in open fields or water sports.

The net result will be the assessment of the risk of developing later in life all forms of skin cancer and, as a consequence, the following counseling can be made:

-orientation toward assignments with minimal sun exposure
-necessity to adopt strict photoprotective measures

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