2nd EURO*SKIN* Conference

"Children under the Sun"
UV-Radiation and Children's Skin

WHO Workshop
Children's Sun Protection Education

Recommendations

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Foreword

The development of joint activities, particularly in the area of primary and secondary protection, is needed to counter the increase in the incidence of skin cancer in Europe. An important part of such a strategy is to promote increasing awareness and bringing about behavioural changes in Sun exposure at as early an age as possible EURO*SKIN*'s first Conference, "Towards the Promotion and Harmonisation of Skin Cancer Prevention" held 2 to 5 May 2000 in Hamburg established a European platform for harmonised and co-ordinated activities in this field. One of the main aims of EURO*SKIN* is to work towards a valid consensus for Europe with respect to future measures, actions and programmes, particularly the education of children about exposure to solar and artificially ultraviolet radiation and to facilitate research and other scientific evaluation.

There is global concern that changes in the environment may cause adverse effects on human health and particularly on the health of children. In accordance with the declaration of the G8 Environment Ministers on the protection of children's environmental health, EURO*SKIN* considers it important to direct preventive measures relating specifically to children. Thus, the risks might be recognised and reduced as early as possible in life.

Accordingly, EURO*SKIN* organised its Second **Workshop "Children under the Sun – UV-Radiation and Children's Skin"**, 1-5 October 2001, in Orvieto Italy, in collaboration with the World Health Organization and the Association of Dermatological Prevention (Germany). The aim of the Conference was to identify deficits in the fields of skin cancer prevention and public health programmes dealing with the effects of UV radiation on children's skin. A WHO International Workshop "Children's Sun Protection Education" was held in association with the EURO*SKIN* Conference.

This document summarises the recommendations related to the different thematic sessions of the Conference and to the WHO Workshop.

The recommendations are intended to provide guidance to EURO*SKIN* and others on research needs and ways to expand and improve the quality of research and public health actions. They also indicate important areas for funding support to national and international potential funding agencies in respect of all aspects of primary and secondary prevention of skin cancer and particularly on those measures that can be taken to protect children's health.

We are indebted to the Chairmen, rapporteurs and speakers from all of the Sessions of the Conference and the WHO Workshop listed below for their valuable contributions to these recommendations and for carefully editing and correcting my errors.

A McKinlay
Conference Rapporteur

Session Rapporteurs

Session I - Experimental Biological Research
J-P Césarini and R. Greinert

Session II – Epidemiology
P Boukamp, G Draper, J Moan, D Sliney and A Stang

Session III – Primary Prevention
G Mariutti and D Sliney

Session IV – Secondary Prevention
U Ringborg

Session V – Communication Strategies
E Breitbart

WHO International Workshop – "Children's Sun Protection Education"
E Rehfuess, C Roy and C Sinclair

Session VI – Public Health Strategies and Implementations
L. v. Karsa

Session I - Experimental Biological Research

Background

The presentations and discussions in this session emphasised the lack of biological data specifically of relevance to UVR exposure of children and associated adverse health effects and sought to identify what relevant child-specific data were lacking and to suggest research initiatives that would provide such potentially useful information.

There is indicative epidemiological evidence that exposures of children younger than about 10 y are linked with an increased risk of skin cancers later in life. However, an important area of uncertainty relates to lack of knowledge of the sun-sensitivity of children's skin both absolutely and relative to that of adult's skin.

For example, due to the nature of the anatomical structure of children's skin, there are indications for children's skin being (adversely) exposed (on the top of the papilla) before a significant exposure manifests itself as visible damage to the skin (for example, erythema). It may be hypothesised that damage to the basal epidermal layer (keratinocytes and melanocytes) may not parallel erythema.

Data on immune function in children with respect to UVR exposure are lacking as are studies on models of immune response in infancy.

Existing animal models provide useful data and should continue and transgenic mouse model studies should also be encouraged.

Recommendations

1. Investigations on whether the DNA damage and repair systems before age ~ 10 y are or are not identical to the adult system should be carried out.
2. Clinical trials for validation of skin colour measurement, non-invasive evaluation of Sun-sensitivity should be carried out.
3. Studies on models of immune response in children should be carried out with a view toward immune suppression and possible effects upon the effectiveness of immunisation.
4. Studies on animal models and transgenic mice should be carried out. This is of particular importance with regard to melanoma models and studies relevant to the molecular background of understanding precursor lesions are important.
5. Studies on human skin lesions and cells isolated from such lesions should be conducted to map the sequence of oncogenic events leading to skin cancer and to analyse a possible contribution of UV radiation to these changes.

Session II - Epidemiology

Background

At the outset it must be emphasised that skin cancer is a rare disease in children and when combined with problems related to the reporting and lack of uniformity in the registry of cancer skin cancer statistics, these together present severe logistical problems in relation to its epidemiological investigation. However, the effects of exposure in childhood should be investigated in relation to disease, not only in children but also in older age groups.

The presentations and discussions in this session emphasised the importance of the multidisciplinary nature of epidemiological research aimed at investigating skin cancer. This is reflected in the recommendations that are intended to promote studies with good epidemiological methodology and the development of complementary tools such as the use of bio-markers and state of the art dosimetry and exposure measurement. They also provide suggestions as to epidemiological support for the evaluation of public health programmes aimed at reducing skin cancer.

Although the initial evaluation of public health programmes may be in terms of public awareness and changes in behaviour, measures of the success of such programmes must ultimately be in terms of reductions in skin cancer incidence and mortality rates. Incidence may appear to increase because of greater professional and public awareness, improved ascertainment and changes in diagnostic criteria. Other factors may influence incidence and mortality may decrease because of improved treatment.

There exists considerable experience in evaluating cancer prevention/detection programmes, some of which is at least relevant to skin cancer. Possibilities include analyses of trends, geographical comparisons, case-control studies and cohort studies. Analysis of non-melanoma skin cancer (NMSC)

rates presents particular problems. The mortality is low and the registration of incidence is often generally much less complete than for other cancers. Although the focus of this Conference on effects and preventive measures is on children, the number of cases in children aged 0-14 y is low and thus changes in this age group are likely to be small and evaluations will have to be based on other age groups,.perhaps mainly young adults (20-30 y), but the validity of such an approach remains unclear.

The use of bio-markers in epidemiology is a topic of increasing importance.

Since it has been known for a long time that the basal cell nevus syndrome has a strong genetic determinant, a world-wide initiative was able to identify the chromosome and finally clone the patch gene. This allowed the identification of the sonic-hedgehog pathway and demonstrated that this gene is also responsible for the sporadic cases. Furthermore, this knowledge allowed the establishment of several relevant mouse models for basal cell carcinomas within a short time period.

The genetics of squamous cell carcinomas (SCC) is still inconclusive. So far, genetic analysis still concentrates on p53 and a few other genes. From the LOH or tumour screening studies by comparative genomic hybridisation (CGH) it is suggested that SCCs are genetically much more heterogeneous than basal cell carcinomas (BCCs). There are, however, some families with multiple SCCs and this should be considered for a combined European effort to determine whether also SCCs have a common basic genetic mechanism. As demonstrated for BCC, this does not need to be one gene but can be due to different genes in the same pathway. If such a pathway is found, molecular screening of risk groups would provide a relevant additional initiative. In summary, the important questions that might be addressed are:

- What are the primary genetic events in SCC development?
- Do families with a history of SCCs show common genetic aberration which allow the identification of candidate genes or candidate pathways and can these be used to determine risk factors?
- Do polymorphic markers exist that characterise such families as risk groups?

The base line for work in this area is that in order to get informative data on the value of genetic markers for screening risk groups, we need to collect all the possible information from the same tumour material (different genetic analyses) and patient, blood for DNA screening for several markers as well as epidemiological data and this can only be done in a combined European network program. The research recommendations for this area are based on addressing these issues.

An important complementary issue is knowledge of the UVR exposure of subjects in epidemiological studies. The literature on Sun-exposure of children is sparse. However, there are some indications at least that patterns of exposure may be changing to be more and more intermittent with children carrying out more indoor pursuits (for example the increased time spent using computers) than previously and with “beach holiday” type exposures becoming more prevalent.

While there are many national programmes of environmental UVR monitoring with published geographical data stretching back many years, these resources have not been widely exploited in epidemiological studies. It is recognised that the metric of key importance for an epidemiological study will be the one that most closely describes the spatial and temporal distribution of the subject’s biologically significant exposure over the period of the investigation. However, it is suggested that combining environmental measurement data (with its indicative trends of general exposure) with knowledge of the spatial (both with respect to the immediate environment and anatomical) and temporal exposures obtained from small-scale personal dosimetry studies should be explored. However, it is suggested that combining environmental measurement data with knowledge of the spatial and temporal exposures obtained from small-scale personal dosimetry studies that also include questionnaire-based exposure assessments should be taken into account.

Recommendations

1. EURO*SKIN* should facilitate close co-operation with the European Network for Cancer Registries and the International Agency for Research on Cancer, firstly to get an overview of the reasons why many population-based cancer registries did or do not register NMSC. Second, to try to improve the population-based registration of these tumours.
2. It should be determined which registries attempt to register all NMSC or might be able to do so. This needs to be done quickly so that any necessary changes in cancer registry procedures can be implemented as soon as possible to ensure that comparable data can be collected before and after intervention programmes are introduced. If data on NMSC cannot be made available, then there is a need to consider whether evaluations can be based on malignant melanoma data alone.
3. In addition to these uses of routine data sources, consideration should be given to specifically designed studies and appropriate data collection to evaluate specific interventions.

4. A case-controlled study of those patients who develop malignant melanoma between the ages 20 and 30 should be considered, since their recall of childhood exposures and behaviour patterns in sunlight would be better than that of older patients. There also could be some population-based studies amongst cohorts that had suspected or known risk factors. Population-based studies will enable the calculation of attributable risk.
5. Despite the challenges posed to design good retrospective studies, it is recommended to build on current studies and those already completed, to examine the correlation of anti-oxidant status with regard to malignant melanoma, since some correlation has been made in specific conditions.
6. The identification of "high risk" groups is clearly important for individuals concerned but the significance of their inclusion in a general health programme is less certain. However, it is recommended that further studies should be carried out of those special patients with impaired immune response to UVR, e.g., Cockayne Syndrome and Xeroderma Pigmentosa patients.
7. The question - What are the primary genetic events in SCC/BCC development? could be answered by a gross search for common genetic changes in patients with multiple SCCs/BCCs. Immuno-suppressed patients who show a significantly increased number of SCCs/BCCs should be good candidates because they exhibit fewer aberrations but should carry the initial ones required for tumour growth. Such studies are recommended for support.
8. It is recommended that studies should be undertaken to investigate families with a history of SCCs/BCCs who show common genetic aberration that allow the identification of candidate genes or candidate pathways and whether these can be used to determine risk factors. For this, families need to be collected that are genetically characterised (tumour profiling) by groups with different expertise.
9. Studies should be carried out to investigate whether polymorphic markers exist which characterise such families as risk groups. This can only be done in a large collaborative effort because it requires the expertise of different disciplines and that the same samples are used.
10. Personal molecular markers of UV exposure should be developed to improve assessments of exposure in epidemiological studies.
11. Studies on correlation between environmental UVR measurements and personal dosimetry studies should be carried out to provide predictive models of childhood exposure with daily and seasonal change. Valid questionnaires that link personal exposure patterns with these dosimetry studies is critical.
12. Investigations should be done on whether Sun-sensitive and less sensitive children behave differently in outdoor activities and whether there are country-to-country variations? Further studies of childhood and adult exposure should be carried out with improved personal UV dosimeters.
13. Inasmuch as the action spectra for different skin cancers may be different, dosimeters of widely different spectral response in the UVA region could be useful. Dosimetry studies using the same dosimeter(s) over all regions of Europe would be a useful approach to exploiting the wide variety of behavioural differences available for different cohorts.
14. The maintenance of existing global UV measurement networks should be supported. Furthermore, the addition of UVR monitors that monitor the angular distribution of exposure, or at least monitor the averaged horizon-sky UVR would be helpful for both ocular and skin exposure studies.
15. UV dosimetric studies of ocular exposure for both UVB and UVA that take into account the geometrical factors of lid opening (ocular field-of-view) and ground reflection should be carried out.
16. Research that evaluates the substantial impact upon the distribution of UVR exposure on the skin surface that occur with changing geometrical distributions of UVR resulting from overcast and cloudy weather or lack thereof should be supported.
17. The development of improved anthropomorphic mathematical models to relate ground-surface environmental global UVR measurements to site-specific exposures of the body should be supported. It has been predicted that there are real differences between southern and northern Europe in this regard resulting from different weather patterns and solar zenith angles.
18. Following the experience from ionizing radiation dosimetry, a dosimeter should be designed and developed to predict the "depth dose," i.e., the photo-biological fluence, since there are data available for skin optics in the UVR.
19. The validity and reliability of questionnaire instruments when assessing sun exposure patterns, sun sensitivity and sun protective behaviours should be investigated and summarised to allow for cross-country comparisons (International Epidemiological Association (IEA) European Questionnaire Group, "Epidemiology deserves better questionnaires", Int. J. Epidemiol., Dec:27 (6):935 (1998)). A workshop specifically to address this issue is recommended.
20. Studies on basic interaction mechanisms of UVR with the eye and epidemiological studies of cataract should be supported to provide a clearer understanding of such interactions and their underlying mechanisms. This is vital for the planning and development of ocular exposure reduction strategies and the development of public health policies.

Session III - Primary Prevention

Background

The underlying premise for employing sun-protection strategies for children is that by protecting children's skin from excessive exposure to UVR the risk of skin cancer later in life will be reduced. A protective strategy involves decisions on options and ranking based on likely results with respect to avoiding or reducing adverse effects on health. Such measures require an acceptance that there is a risk, an understanding of the nature of the risk, the magnitude of the risk and knowledge of the mechanism in order to quantify the risk and to measure exposure. Research addressing these fundamental issues is thus important.

The session specifically addressed influencing the Sun-exposure behaviour of children and the design, testing, provision and use of physical protection agents such as shade, clothing, hats, protective eyewear and sunscreens. It was recognised that all of these have complementary important roles to play in Sun protection.

The importance of inducing good habits early in life rather than to reverse bad Sun-habits later should be emphasized. It is important to note that the UN Convention on the Rights of the Child also highlights the responsibility of parents to educate children in good habits regarding health. Multiple factors affect any human behavior and there is clearly a challenge in modifying the Sun behaviour of adolescents, highlighted by the fact that this age group appears collectively to know the most about the hazards of Sun exposure, yet appears to have the greatest exposure. Recognising the key role that parents, carers of children and teachers have to play, an important challenge is how to convince teachers to take time out of their curriculum teaching time to include this type of education. Identifying "champions" and "advocates" in the education administration may be a fruitful way forward.

Physical and chemical barriers to UVR include the use of suitably UVR-protective shade, clothing, hats and sunscreens.

The need for standardised testing, labelling and provision of information on "Sun Safe" products is important. In this respect the activities of European and International Standards Bodies were welcomed for setting out standards for uniformity of information and product labelling across many countries. There was general agreement that the proposed EN PreNorm technical standard on clothing protection is important in this regard. Generally, in respect of such standards it is important that they provide clear simple unambiguous information (perhaps as a single minimum UPF value) to the consumer to allow selection of a product that will provide adequate protection for the purpose worn.

With such merited emphasis on the vulnerability of children's skin it is important not to overlook possible adverse health effects of UVR on the eye. A key issue that should be addressed is to what degree eye protection is indicated for children. Because of its specific and complex optical properties with respect to absorbing UVR, consideration of the spatial and spectral distribution of solar UVR exposing the eye is particularly important. There are indications that children's eyes may be more susceptible to the effects of UVR exposure but more data are needed to clarify this issue. However, what is clear is that where protective eyewear is merited and its use advised, it is important that it is properly designed, not only from the lens transmission point of view, but equally importantly from the geometrical design point of view. With respect to the latter, the provision of protection against "glancing UV rays" is particularly important.

The use of sunscreens is positively indicated for protection against UVR exposure in children, but not as a means to extend the time spent in the sun. However, its use should be regarded as subordinate to the use of shade (natural and artificial), clothing and hats. The International Agency for Research on Cancer (IARC) have carried out a study on sunscreens and prevention of skin cancers and concluded that there is:

- No evidence of the use of sunscreens preventing malignant melanoma.
- Inadequate evidence of prevention of basal cell carcinoma.
- Limited evidence of prevention of squamous cell carcinoma.
- Sufficient evidence of skin cancer prevention in animals.
- Evidence that its use reduces the risk of sunburn and probably reduces squamous cell carcinoma.

Further specific recommendation on the protection of children are presented in the recommendations of the WHO Workshop on Children's Sun Protection Education.

Recommendations

1. Health authorities and relevant international responsible bodies, such as the EC should be reminded of the importance of addressing the UVR health messages to the parents, teachers and other carers of children using key interventions and of the importance of providing support for resources to achieve this.
2. Conduct epidemiological studies of ocular exposure to UVR with the aim of better understanding the relative impact of UV-B and UV-A radiation and exposure geometry
3. EURO*SKIN* should encourage a harmonized approach to UPF specifications and marking. International inter-comparisons of UPF measurements and testing procedures should be supported. In respect of inter-comparisons, further structured work comparing *in vivo* and *in vitro* measurements are merited. It would appear that the appropriate body to promote and possibly mandate such work is the European Commission – in respect of its interests in occupational and general public health, wellbeing and safety.
4. Where provided, exposure advice for limiting exposure of children should contain clear messages covering:

- The avoidance of exposure of children where possible
- Advice that babies should NEVER be exposed to excessive UVR
- That the use shade, protective clothing and sunscreens should be recommended
- That the use of sunscreens is recommended but as a complementary not a sole defence (sunscreen manufacturers should be urged to provide adequate guidance at the point of sale and on the product packaging as to the product's appropriate use).
- If sunglasses are recommended for use, the geometrical protection should be considered.

5. Studies on the diffuse reflectance and transmittance appropriate to child exposure within and under shade structures should be supported.

Session IV - Secondary Prevention

Background

The basic objectives of secondary prevention of skin cancer are to decrease mortality and morbidity due to malignant melanoma and squamous cell carcinoma and morbidity due to basal cell carcinoma. There is clear indication from the scientific literature to support the idea that "early detection" of malignant melanoma decreases mortality due to this disease. Molecular genetic techniques might allow the identification of high-risk individuals among children and could lead to targeted primary prevention in children.

Taking screening and total populations into consideration, skin cancer, as a group of tumours, is highly prevalent. Skin examination and excision of tumours are arguably good methods of prevention. Usually the end-point for cancer screening is mortality reduction. Still insufficient data show that mortality in malignant melanoma is around 20%. Mortality in squamous cell carcinoma is < 5% and in basal cell carcinoma it is virtually zero. The low mortality rates, especially for non-melanoma skin cancers, do not permit screening of total populations with mortality as an end-point. However, because of the high incidence of skin cancer, increasingly useful end-points for early detection are decreased morbidity and savings on health care costs.

Recommendations

1. The identification of high-risk groups for prevention programmes is important. Methods of identification and prevention should be evaluated regarding both effectiveness and costs.
2. Molecular genetics should be further developed and employed as a tool for the identification of high-risk groups and implemented in prevention programmes.
3. Screening of the total population may be effective in the identification of high-risk individuals.
4. Screening programmes of total populations for the early identification and management of skin tumours should be developed and evaluated regarding reduced morbidity and the resulting care cost. It is important that such programmes are effectively quality assured and managed.
5. Develop effective self-screening techniques for high-risk individuals

Session V – Communication Strategies

Background

This session of the Conference focused on identifying strategies whereby the conclusions, recommendations and information from the other specific areas of activity related to the UVR-protection of children could be effectively communicated with target audiences that include the media, health professionals, the general public educators, teachers, and carers. It also addressed how EURO*SKIN* could provide communication tools that would improve the sharing of relevant scientific information

among the many scientists in different disciplines working in the field. The recommendations set out below reflect the experience of those present at the conference who have already developed communication strategies in many countries and the needs of those scientists present in respect of the sharing of scientific (often highly technical) information. In all of these respects, the clear message to emerge was the increasing importance of the INTERNET in providing relevant information.

Recommendations

1. The EURO*SKIN* Web-Site should be further developed to enable its use as an effective communication vehicle. The relevant activities of all members should be set out on the Web-Site and members should be reminded frequently of the need to provide updated material. Links should be provided to the Web-Sites of all members and all others that can be identified as dealing with skin cancer prevention. The Web-Site should be periodically evaluated (by e-mail?) with respect to its usefulness to users and providers of information.
2. There is need to communicate simply and effectively the concept and use of the Global Solar UV Index in cooperation with the media. EURO*SKIN* should address and seek to influence how this might be done – for example through national weather organisations in Europe or at an EC level. The understanding of the UV Index by the general public should be evaluated.
3. EURO*SKIN* should develop strategies to provide simple and effective communication of the meaning and safety significance of clothing protection factors and sunscreen protection factors.
4. EURO*SKIN* should seek to convince national health authorities of the need to have an identifiable person who has responsibility within that country's health programme for skin cancer prevention and to co-ordinate national efforts.
5. There is a need for a more qualitative evaluation of existing Web-Sites – and to design a comprehensive structure of existing web links.
6. In all its communication to the public, the media etc., it is important for EURO*SKIN* to present simple, direct messages.
7. The key focus for EURO*SKIN's* first structured activity is "Children under the Sun". It is recommended that the EURO*SKIN* Board of Directors, its Scientific Advisory Committee and newly formed Steering Groups define the planning and organisation of this activity.

WHO-Workshop: Children's Sun Protection Education

Background

UV radiation exposure and sunburn during childhood constitute an important risk factor for several long-term health effects, among them skin cancer and cataract. Damage is largely preventable through sensible sun exposure behaviour. It is important to target children's attitudes and behaviour at a young age, particularly at primary school, when they tend to be most receptive. Schools are vitally important settings to promote sun protection, as during the first 18 years of life a significant proportion of time is spent at school or as part of school-based activities.

Experts from all over the world participated in an International Workshop organised by WHO to develop a comprehensive package of materials for children's sun protection education. This includes:

(i) an advocacy document that lists arguments to make sun protection a priority in schools and outlines necessary steps for establishing a school programme,
(ii) a practical resource for primary school teachers that provides a starting point to incorporate sun protection into the curriculum and school activities, and
(iii) a rough guide to evaluating the implementation and effectiveness of school programmes at schools, local educational authorities or at the state level.

The materials were discussed and revised during the workshop. WHO's Intersun programme will publish and disseminate this comprehensive package on sun protection education to Ministries of Health and Education and other related bodies worldwide.

Recommendations

1. To ensure that the health message is well supported by scientific evidence to avoid loss of credibility. In addition, to balance the need for sound science against the need for precautionary action, and to identify the appropriate authority that will assess scientific evidence as it applies to policy.

2. To include political considerations in the formulation of research goals that will enable the conduct of studies to prove cost-effectiveness in financial as well as human cost terms.

3. To establish baseline markers and goals that are both relevant and achievable in relation to a country's cultural and geographical situation for measuring the performance of skin cancer control programmes. To ensure that practical and achievable evaluation strategies form an integral part of school-based sun protection programmes.

4. To ensure that the content of school programmes is culturally and geographically relevant, and that the introduction of a school-based programme is complemented by changes in school policy and environment which in turn should be mirrored by family, community and ideally national actions.

5. To align sun protection education with global environmental responsibilities, using children's interest in global environmental issues as an entry-point for environmental education.

6. WHO/EURO*SKIN* to approach the European Commission and national authorities, as well as other bodies such as paediatric and dermatological associations with common goals, recommending the development, implementation and evaluation of skin cancer control programmes across Europe, and the provision of resources towards the implementation of this recommendation.

7. EURO*SKIN* to facilitate the trial and evaluation of the primary teaching resource as part of a pilot study in one or several European countries.

Session VI - Public Health Strategies and Implementations

Background

In this session it was discussed to develop public health strategies which accompany individuals in some kind of a "lifetime programme". Therefore information and education about save UV-exposure should already given to parents before the birth of their children to ascertain save conditions especially for young child Education and information has then to be continued on the level of kindergarden and at school with appropriate materials and implementation of programmes in the different organisations responsible for education of children. It will be of special importance to reach the group of adolescents.

Recommendations

1. EURO*SKIN* should mobilise its interdisciplinary resources to promote development and implementation of evidence-based public health strategies for skin cancer prevention.

2. International cooperation and exchange of experience and expertise is essential to assure effectiveness and maximise return on expenditure in this field and should be expanded.

3. EURO*SKIN* should further develop its role as the umbrella organisation for promotion of skin cancer prevention activities in Europe and seek appropriate financial support for such activity from the European Commission.