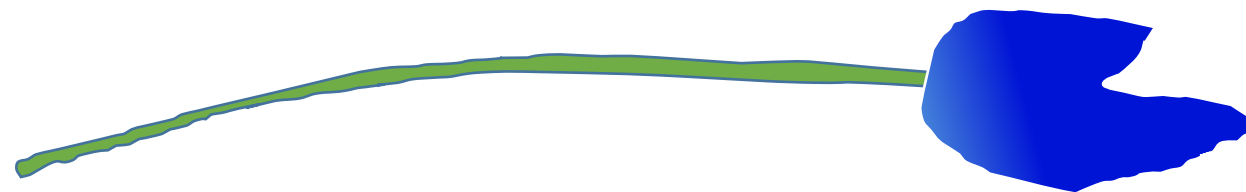


Underestimated health exposures and effects: UV skin exposure and outcomes

-disseminating the knowledge of STANDERM COST Action-

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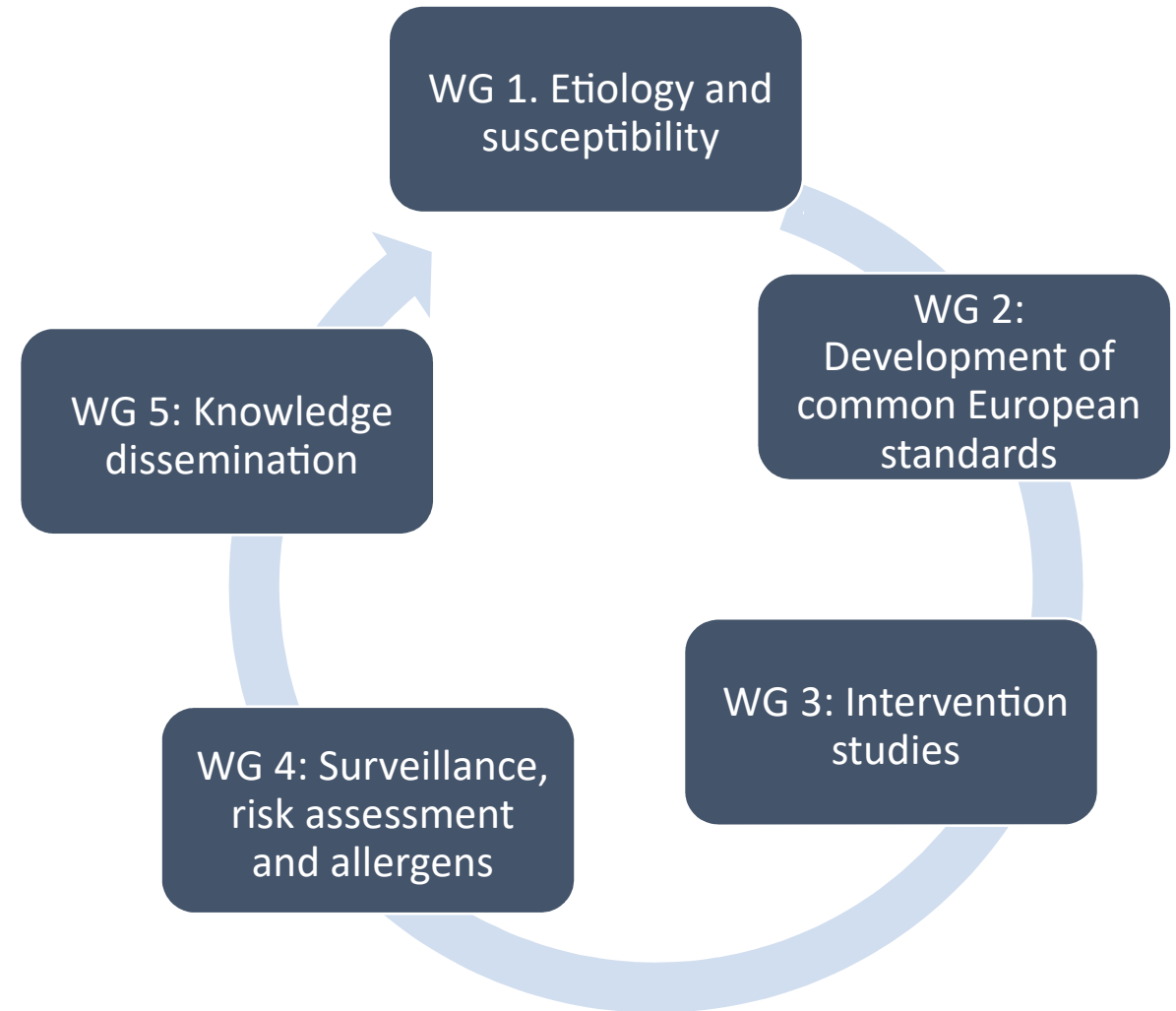


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Sanja Kezic

- “Interpretative Document” to the EU Strategic Framework Health and Safety at work 2014–2020 aimed at DG EMPL and EU OSHA.



Exposure to solar ultraviolet radiation (UVR)

- Classified by the IARC and the WHO as a recognized group one carcinogen associated with the highest level of causality for skin cancers, both melanoma and non-melanoma skin cancer (NMSC)

IARC. Solar and ultraviolet radiation. IARC Monographs on the evaluation of carcinogenic risks to humans, Vol. 55. International Agency for Research on Cancer Press, Lyon, 1992: International Agency for Research on Cancer.

Cogliano VJ, Baan R, Straif K et al. Preventable exposures associated with human cancers. J Natl Cancer Inst 2011; 103: 1827–1839.

NMSC

- NMSC is the most common cancer in the world and incidences are increasing.
- Considered a tumor typical for elderly, male farmers
- 2 - 3 million people diagnosed worldwide each year
- Age-specific incidence rates increase steadily from age 20–24 years, with increase being sharper for males from age 55–59 years onwards.

Guy GP Jr, Machlin SR, Ekwueme DU, Yabroff KR. Prevalence and costs of skin cancer treatment in the U.S., 2002-2006 and 2007-2011. *Am J Prev Med* 2015; 48: 183–187.

Trakatelli M, Ulrich C, del Marmol V, Euvrard S, Stockfleth E, Abeni D. Epidemiology of nonmelanoma skin cancer (NMSC) in Europe: accurate and comparable data are needed for effective public health monitoring and interventions. *Br J Dermatol* 2007; 156(Suppl 3): 1–7.

Diepgen TL, Mahler V. The epidemiology of skin cancer. *Br J Dermatol* 2002; 146(Suppl 61): 1–6.

CRUK. Skin cancer incidence statistics. [WWW document] 2015. URL <http://www.cancerresearchuk.org/cancer-info/cancerstats/types/skin/incidence/#age>

North-south gradient for SCC incidence

- NMSC comprises cutaneous squamous cell carcinoma (SCC) and basal cell carcinoma (BCC)
- Population-based cancer surveys conducted by the National Cancer Institute in the US have shown a north-south gradient for SCC incidence with low rates in northern states and high rates in southern states
- Estimated 50–70% of SCC and 50–90% of BCC in fair-skinned people are caused by UV radiation

Diepgen TL, Fartasch M, Drexler H, Schmitt J. Occupational skin cancer induced by ultraviolet radiation and its prevention. *Br J Dermatol* 2012; 167(Suppl 2): 76–84.

Karia PS, Han J, Schmults CD. Cutaneous squamous cell carcinoma: estimated incidence of disease, nodal metastasis, and deaths from disease in the United States, 2012. *J Am Acad Dermatol* 2013; 68: 957–966.

Lucas RM, McMichael AJ, Armstrong BK, Smith WT. Estimating the global disease burden due to ultraviolet radiation exposure. *Int J Epidemiol* 2008; 37: 654–667.

AK

- Actinic keratosis (AK) is an in situ SCC which may develop where skin has been exposed to the sun over time.
- AK is caused by cumulative exposure to the sun and can take years or even decades to appear in the form of noticeable skin changes.
- Elderly people living with AK are six times more likely to develop any type of skin cancer than those without AK. ¹³
- The vast majority of invasive SCCs begin as AK

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Rosen T, Lebwohl MG. Prevalence and awareness of actinic keratosis: barriers and opportunities. *J Am Acad Dermatol* 2013; 68: S2–S9.

Berman B, Cockerell CJ. Pathobiology of actinic keratosis: ultraviolet-dependent keratinocyte proliferation. *J Am Acad Dermatol* 2013; 68: S10–S19.

Chen GJ, Feldman SR, Williford PM et al. Clinical diagnosis of actinic keratosis identifies an elderly population at high risk of developing skin cancer. *Dermatol Surg* 2005; 31: 43–47.)

Criscione VD, Weinstock MA, Naylor MF, Luque C, Eide MJ, Bingham SF. Actinic keratoses: Natural history and risk of malignant transformation in the Veterans Affairs Topical Tretinoin Chemoprevention Trial. *Cancer* 2009; 115: 2523–2530.

Increasing risk

- Systematic reviews and meta-analyses have demonstrated that occupationally UV-exposed workers are at least:
- at a 43% higher risk of BCC [pooled odds ratio (OR) 1.43; 95% confidence interval (CI) 1.23–1.66; $P = 0.0001$]
- and 77% higher risk of SCC (pooled OR 1.77; 95% CI 1.40–2.22) compared to the average population,
- with risk increasing with decreasing latitude.

Bauer A, Diepgen TL, Schmitt J. Is occupational solar ultraviolet irradiation a relevant risk factor for basal cell carcinoma? A systematic review and meta-analysis of the epidemiological literature. *Br J Dermatol* 2011; 165: 612–625.

Schmitt J, Seidler A, Diepgen TL, Bauer A. Occupational ultraviolet light exposure increases the risk for the development of cutaneous squamous cell carcinoma: a systematic review and meta-analysis. *Br J Dermatol* 2011; 164: 291–307.

BCC, SCC, AK

- outdoor workers have higher risk behaviour, with more UV exposure (during both occupational and leisure time) and less sunscreen use.
- combined with lower health literacy results in higher exposure, more photo-damage and increasing risks of AK, BCC and SCC.
- The risk for BCC, SCC and AK among workers who have worked outdoors for more than 5 years is 3-fold higher than the risk among those with no years of working outdoors.

Trakatelli M, Barkitzi K, Apap C et al. Skin cancer risk in outdoor workers: a European multicenter case-control study. *J Eur Dermatol Venereol* 2016; 30(Suppl. 3): 5–11.

de Vries E, Trakatelli M, group at E. Outdoor workers and skin cancer risk. World Congress of Dermatology. Vancouver, Canada, 2015.

Primary prevention

- Occupational exposure limits and safety standards
- The two most widely used guidelines:
 - International Commission on Non-Ionizing Radiation Protection (ICNIRP 2004) and the
 - American Conference of Governmental Industrial Hygienists (ACGIH 2004) guidelines
- the exposure guideline is based on a normal 24 hours light/dark cycle where cellular repair can take place after the exposure is discontinued.
- need for a clear definition of outdoor work and high-risk activities,
- BUT!!, outdoor workers, such as agricultural and construction workers, gardeners, police officers, physical education teachers, ski instructors, lifeguards and fishermen have an increased risk of skin cancer.

What is needed now

- Personal UV dosimetry
- An international database on factual UVR exposure comparable data in outdoor workplaces
- This will help define the needs for improved health and safety and workers' education.
- Regulation to protect outdoor workers from UV radiation in the workplace
- *Serrano et al* conducted a study of construction workers in Spain using personal dose-meters found median UV exposure was 6.11 (SED) per day.
- Comparison with the occupational UV radiation exposure limit showed that the subjects had received UV erythemal radiation exposure in excess of occupational guidelines, indicating that protective measures against this risk are highly advisable.

Wittlich M, Westerhausen S, Kleinespel P, Rifer G, Stöppelmann W. J Eur Acad Dermatol Venereol 2016; 30(Suppl. 3): 27–33.

Serrano MA, Canada J, Moreno JC. Solar UV exposure in construction workers in Valencia, Spain. J Expo Sci Environ Epidemiol 2013; 23: 525–530.

Regulation: legislation and non-legislative documentation

- Prevention of occupational skin cancer (OSC) is easy and cost-effective
- The prevention of work-related and occupational diseases is among the three major challenges outlined for EUOSHA new Strategic Framework on Occupational Health and Safety at Work 2014–2020.
- In 2015, the European Commission started to review all EU existing legislation on health and safety at work.
- The 2006 EU Directive on Optical Radiation (2006/25/EC) is included in this review.

Carter R, Marks R, Hill D. Could a national skin cancer primary prevention campaign in Australia be worthwhile? an economic perspective. *Health Promotion Int* 1999; 14: 73–82.

Bundesrepublik Deutschland. Gemeinsamer Bundesausschuss. Tragende Gründe zum Beschluss des Gemeinsamen Bundesausschusses über eine Änderung der Krebsfrüherkennungsrichtlinie: Haut-Krebs-Screening. 2007.

European Commission. EU Occupational Safety and Health (OSH) Strategic Framework 2014-2020 [WWW document]. Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and the Committee of the Regions. 2014. URL <http://ec.europa.eu/social/main.jsp?catId=151&langId=en> (last accessed: May 2015).

European Commission, European Parliament and Council. DIRECTIVE 2006/25/EC. The minimum health and safety requirements regarding the exposure of workers to risks arising from physical agents (artificial optical radiation) (19th individual Directive within the meaning of Article 16(1) of Directive 89/391/EEC). [WWW document] 2006. URL <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:114:0038:0059:EN:PDF> (last accessed: May 2015).

Occupational diseases ILO and EUOSHA

- ILO maintains a list of occupational diseases, which acts as a worldwide benchmark for the establishment, review and revision of national lists
- The 2010 ILO list makes a general recommendation to include diseases caused by optical (ultraviolet, visible light, infrared) radiation in national lists, but does not specify diseases
- Another policy instrument of potential relevance is the European Schedule of Occupational Diseases, a list of occupational diseases that the European Commission recommends EU member states introduce into their national legislation.

International Labour Organization. List of Occupational Diseases (revised 2010). [WWW document] 2010. URL http://www.ilo.org/safework/info/publications/WCMS_125137/lang-en/index.htm

The Commission of the European Countries. DIRECTIVE 2003/670/EC. European Schedule of Occupational Diseases. [WWW document] 2003.

Employer and worker joint responsibility

- Employer: decrease risk factors, develop internal policies, and raise education and awareness among workers.
- UV exposure minimized with technical, organizational and personal strategies, combined with **adequate training**.
 - Examples: use of awnings, planning of work schedules optimal use of personal protective measures (clothing, brimmed hats with neck protection, sunglasses), and the use of sunscreens on uncovered skin surfaces.
- Worker acceptance of requirements is needed: many studies have shown that inadequate sun protection measures are utilized by outdoor workers.
 - A **change in health awareness** regarding exposure to UV radiation, knowledge of preventative measures and observing and regularly applying them (including clothing protection and sunscreens), are important for workers with high natural UV exposure

Hault K, Rönisch H, Beisert S, Knuschke P, Bauer A. Knowledge of outdoor workers on the effects of natural UV radiation and methods of protection against exposure. J Eur Acad Dermatol Venereol 2016; 30(Suppl. 3): 34–37

Kutting B, Drexler H. UV-induced skin cancer at workplace and evidence-based prevention. Int Arch Occup Environ Health 2010; 83: 843–854.

Diepgen TL, Fartasch M, Drexler H, Schmitt J. Occupational skin cancer induced by ultraviolet radiation and its prevention. Br J Dermatol 2012; 167(Suppl 2): 76–84.

Raising awareness among at-risk populations

- Both bottom up and top down approaches may be employed to raise awareness, to include the general public, healthcare professionals, vocational trainers, employers, single workers, schools, policymakers, social partnership organizations, prevention institutions, accident insurance companies and occupational bodies.
- Programmes to educate the outdoor workforce are developed:
- **Sun Safe Workplaces programme in the UK** aims to provide employers and workers with educational materials on suitable sun safe policies.
- **Sun at Work programme in Canada**
- **SunPass project in Germany**, which was implemented in 55 kindergardens in 2010

31. SunSafe. Sun Safe Workplaces programme. [WWW document] 2015. URL <http://www.sunsafeworkplaces.co.uk> SKCIN: The Karen Clifford Skin Cancer Charity.

32. Sun-at-work. Sun at Work: outdoor worker sun safety. [WWW document] 2015. URL <http://www.occupationalcancer.ca/2013/sun-at-work> Occupational Cancer Research Center.

33. Stover LA, Hinrichs B, Petzold U et al. Getting in early: primary skin cancer prevention at 55 German kindergartens. *Br J Dermatol* 2012; 167(Suppl 2): 63–69.

Need for clear defining whom to screen

- Notification and surveillance through OH services and public health programmes.
- The effectiveness of skin cancer screening programmes in Germany has been studied
- Importance of these programmes and collaboration with GPs is well established.
- A major risk factor for NMSC in outdoor workers are Fitzpatrick skin types 1 and 2.

Choudhury K, Volkmer B, Greinert R, Christophers E, Breitbart EW. Effectiveness of skin cancer screening programmes. *Br J Dermatol* 2012; 167(Suppl 2): 94–98.

Fitzpatrick TB. The validity and practicality of sun-reactive skin types I through VI. *Arch Dermatol* 1988; 124: 869–871.

Developing a universal NMSC patient pathway

- Variations across Europe in managing skin cancer patient from diagnosis to treatment.
- Improve in the accessibility of specialists and in the provision treatment were
- Needed:
 - optimal patient pathway through
 - development of a common patient management algorithm may help address health disparities,
 - educational materials targeted at people showing the early signs of skin cancer are warranted to halt the progression of further skin damage.

Educational Programs

- Training and Awareness Training programs must be tailored to local circumstances.
- The **nature of the outdoor work**, **social customs** and **skin phototypes** must be considered in developing educational programs.
- The following aspects of a training program should be considered:
 - an introductory talk on UV awareness and protection advice appropriate to the job
 - refresher briefings as appropriate, such as when moving to a new work site.
 - training of supervisory personnel on the UVR risks to outdoor workers and appropriate protective measures.
 - fact sheets made available for the outdoor worker on UV exposure risks and safe practice.
 - Locate them in briefing rooms and in modes of transport to the work site.

Obstacles in education and overcoming them

- Cultural attitudes toward sunlight exposure,
- perceptions of the “benefits” of tanning and any discomfort or inconvenience related to protective measures will mitigate against successful implementation of UVR protective advice.
- educational programs aimed at changing entrenched behavioral attitudes
- A special educational campaign can be effective, but must be carefully planned

Secondary prevention

- Improve considerable underreporting of OSC
- BCC and SCC are not reported to cancer registries in most countries, thus precise statistics of NMSC are generally not available.
- OSCs are not notified even in those countries where they would be recognizable as an occupational disease.
- Steps to drive screening for early identification of skin cancers particularly in defined high-risk populations like outdoor workers with more than 5 years' exposure.

Caroe TK, Ebbehøj NE, Wulf HC, Agner T. Occupational skin cancer may be underreported. *Dan Med J* 2013; 60: A4624.

Surdu S, Fitzgerald EF, Bloom MS et al. Occupational exposure to ultraviolet radiation and risk of non-melanoma skin cancer in a multinational European study. *PLoS ONE* 2013; 8: e62359.

Why continue-economical impact of OSC

- SCCs that can cause severe morbidity and mortality
- NMSC is ranked among the five most costly cancers to US Medicare
- The total annual budget for skin cancer in the US has escalated from \$3.6 billion in 2002–2006 to \$8.1 billion in 2007–2011
- The potential for the economic benefits are not only a reduction of costs but also a gain in quality of life, functional ability and health

Rees JR, Zens MS, Celaya MO, Riddle BL, Karagas MR, Peacock JL. Survival after squamous cell and basal cell carcinoma of the skin: A retrospective cohort analysis. *Int J Cancer* 2015; 137(4): 878–84.

Parikh SA, Patel VA, Ratner D. Advances in the management of cutaneous squamous cell carcinoma. *F1000Prime Rep* 2014; 6: 70.

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