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Occupational exposure levels of solar ultra violet radiation: an EPHOR review

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Introduction: Solar ultra violet radiation (UVR) causes malignant melanoma, squamous cell carcinoma, and basal cell carcinoma of the skin, is a risk factor of cataract, and the primary predictor of vitamin-D levels. The UVR exposure level depends on several factors such as time of the day, season, activity level, latitude and altitude, and vary across occupations, with high levels reported in different outdoor jobs. Personal measurements are typically reported as full shift cumulative Standard Erythema Dose (SED).

Objective: To conduct a systematic review of occupational solar UVR exposure levels.

Methods: We performed a PubMed search for literature presenting personal solar UVR levels measured by wearable UVR sensors during work and supplemented with papers identified from reference lists. We screened title and abstract of 1005 papers, full text reviewed 113 papers, and extracted data from 42 included papers. Job descriptions were coded according to the International Standard Classification of Occupations (ISCO-88) on the 4-digit level.

Results: In total, UV exposure levels of 35345 personal workday measurements of mainly construction workers, farmers, seamen, teachers, expeditioners, and athletes were included. They covered all year, 6 am - 6 pm work hours, latitudes from 20-75° north and 10-68° south, and altitudes in the 0-8000 m range. 76.2% of the studies included repeated measurements. Eleven different polysulphone film, UV-sensitive spore, or electronic irradiance sensors placed on head, neck, shoulder, chest, back, arm, or wrist were used. Exposure levels varied between 0.4 SED for laboratory workers and 28.6 SED for construction workers.

Conclusion: The established measurement database will be used for the establishment of a general population quantitative job exposure matrix (JEM) as part of the European Exposome Project for Health and Occupational Research (EPHOR). The UV-JEM will be applied in multi-centre European occupational cohort studies of adverse and gainful effects of exposure to UVR.