



ICEPURE: The impact of climatic and environmental factors on personal ultraviolet radiation exposure and human health

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The European Commission (EC) 7th Framework ICEPURE project (www.icepure.eu) addresses the adverse (DNA damage and immunosuppression) and beneficial effects (vitamin D synthesis) of solar UV radiation (UVR) during work and leisure activities in Europe. Outcome is correlated with personal UVR exposure, measured as standard erythema doses (SED) recorded by time-stamped electronic dosimeters worn on the wrist. These consist of small detectors with a spectral response to the CIE erythema action spectrum. The dosimeters have been thoroughly characterised, tested and calibrated. In a few case studies, the dosimeters were mounted on other body sites for comparison of exposure.

Ambient UVR exposure at the sites of the population studies measured with a similar dosimeter acting as a “ground station” is an important control measurement.

The personal exposure was modelled with a radiative transfer model that takes its input from time, location and environmental parameters such as, ozone layer thickness, albedo aerosol and cloudiness. The radiative transfer model in conjunction to 3d body models of humans leads to the body distribution of UVR exposure.

Furthermore, factors such as behaviour and clothing are recorded in diaries. Measures of erythema and pigmentation are spectrally monitored by skin colour measurements.

Farming was chosen as an outdoor work activity, and farmers and their families from Denmark, Poland, Spain and Austria have been studied from spring to autumn for one year. These countries cover a wide latitudinal range within Europe. Additionally children at a summer camp in Poland have participated. In winter, Austrian and Danish holidaymakers were studied at an Austrian ski resort. Information about summer holidays was collected by observing sun-seeking Danish, Polish and Spanish holidaymakers in the Canary Islands. Field work for the above studies has been completed and data analyses and interpretation are in progress. Laboratory studies on healthy volunteers are investigating the relationship between the action spectrum for erythema, vitamin D synthesis and the suppression of the sensitization phase of the contact hypersensitivity response. This information can be used in conjunction with the field data, for risk/benefit evaluation. Objectively measured UVR can be used to validate UVR estimates based on exposure surrogates. A simulation study in six European cities has been done to determine the impact of surrogate UVR exposure measurement error in epidemiological studies.