EMS Annual Meeting Abstracts
Vol. 9, EMS2012-195, 2012
12th EMS / 9th ECAC

Relationships between visible radiation spectrum and daily melatonin secretion in man

J.M Wieczorek (1,2)

(1) University of Warsaw, Interfaculty Individual Doctoral Studies in Mathematics and Natural Sciences, Warsaw, Poland, (2) University of Warsaw, Faculty of Geography and Regional Studies, Warsaw, Poland

Melatonin (MEL) is a hormone produced by the pineal gland which is located in a central part of the human brain. Melatonin stimulates and regulate working of endogenous biological clock. Melatonin is well known as a "darkness hormone", because its secretion occurred mainly in a nocturnal hours. However, some studies show that daylight generates changes in MEL cycle. It was found that not only the occurrence or absence of light stimuli resulting from a photoperiod affects MEL production. Large individual and regional differentiations of MEL concentration found in humans suggests that the type and characteristic of this stimulus as well as a time of its occurrence are more important (Morita et all, 1998, 2002).

To investigate the impact of visible radiation stimuli on melatonin secretion the field experiment was carried out in two different lighting and climate zones. It was attended by eight volunteers, permanently residing in Poland (Warsaw), which were transferred (without changing the time zone) to the polar lighting zone in Norway (Tromso) and stayed there twice: during the summer and winter solstices. Three types of measurements were carried out: 1) meteorological and spectroradiometer outdoor surveys, 2) individual radiation characteristics of subject surroundings, 3) melatonin concentration in saliva samples.

Maximum intensity of visible solar radiation falls on the wavelengths of 520 nm (green light). The ganglion cells (in retina) of the human eye show the greatest sensitivity to the wavelength of 480 nm (blue). Most commonly used artificial lighting sources represent a maximum at a wavelength of 600-650 nm (orange). Studies on plants have shown that chlorophyll production is closely related to specific wavelengths of light (PAR – with maximum at 430-450 nm and 640-660 nm). The question is, if the production of melatonin also shows similar dependencies? The purpose of the paper is to present spectral characteristics of radiation recorded during measurements conducted in polar and moderate lighting zone and their impact diurnal MEL profiles at participants exposed to different lighting conditions.