

PERSONAL UV D-BIODOSIMETER FOR VISUAL DETECTION OF VITAMIN D

Description

Natural exposure to sunlight is responsible for maintaining adequate vitamin D nutrition for most of the population in the world. The UVB portion of sunlight (280 – 315nm) converts provitamin D3 (7-DHC) in skin to previtamin D3 that further undergoes a thermo induced conversion into vitamin D3.

Personal liquid crystalline UV D-biodosimeter has been designed to provide direct visual evaluation of previtamin D accumulated during an UV exposure

The small device (1 x 4 cm²) is based on the cholesteric liquid crystal doped with provitamin D3 molecules that are the primary source of vitamin D synthesis in human skin. Under UV irradiation photoisomerization of provitamin D is accompanied by the cholesteric macrohelix pitch change and, as a result, the LC cell color change. Laboratory tests showed that the reflection band wavelength shift (color change) linearly corresponds to previtamin D accumulation (in vitro).

Innovative Aspect and Main Advantages

Unlike most of UV personal dosimeters that are designed to prevent harmful UV overexposures, personal UV D-biodosimeter can measure beneficial UV effect, namely, the vitamin D synthetic capacity of sunlight or artificial UV sources.

Unlike an in vitro (Holick's) model of vitamin D synthesis (solution of 7-DHC in ethanol) that needs time-consuming HPLC analysis, D-biodosimeter is capable for visual detection of previtamin D synthesis. Quantitative estimation of previtamin D synthesized per 1 cm² is possible using calibrated color strips (like a litmus paper measures pH).

Areas of Application

Nowadays in most cases sun-tanning salons are used for cosmetic purposes.

Personal D-biodosimeter will be helpful for the solarium clients to avoid vitamin D deficiency that is linked rickets, osteoporosis, and many chronic diseases such as cancer (breast, ovarian, colon and prostate), chronic pain, chronic fatigue, autoimmune diseases (multiple sclerosis, rheumatoid arthritis and Type 1 diabetes), high blood pressure, mental illnesses, heart disease, psoriasis and tuberculosis. As a result, such small device will open the doors to sun-tanning salons not only for beauty but for health.

The color change depending on the UV exposure is shown below where each color corresponds to different time of irradiation with the lamp EL-30:

Red section – initial (t = 0 min)

Yellow section – t = 5 min

Green section – t = 10 min

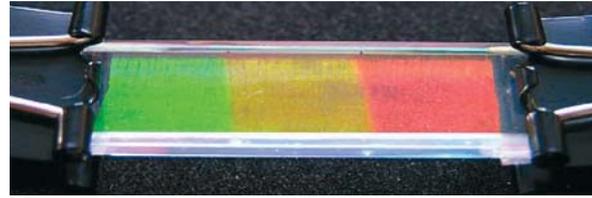


Fig.1. Photography of personal UV D-biodosimeter with three sections of different UV exposures

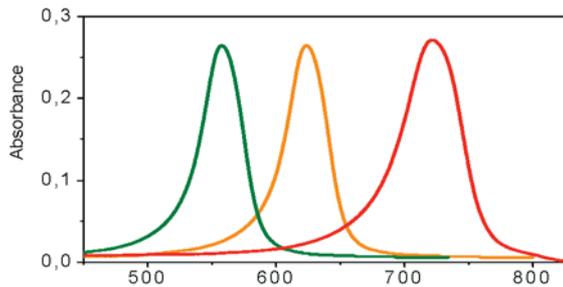


Fig.2. Corresponding absorption spectra of each section presented at Fig.1

Stage of Development

Tested, available for demonstration

Contact Details

Institute of Physics of the National Academy of Sciences of Ukraine

Contact person: Irina Terenetskaya

Address: 46, Prospekt Nauki, Kiev, 03028, Ukraine

Tel.: 380 44 525 0813

Fax: 380 44 525 1589

e-mail: teren@iop.kiev.ua