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Comparative study of the provitamin D photoisomerization kinetics in ethanol and liquid crystal

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Kinetics of provitamin D3 (7-dehydrocholesterol, 7-DHC) photoisomerization has been studied by absorption UV spectroscopy with the aim of development of new personal UV biodosimeter on the basis of nematic liquid crystal (LC) with provitamin D3 dopant. Significant difference in spectral kinetics indicative of the increase of trans-isomer accumulation has been observed in the LC as compared with ethanol solution. The results observed are discussed in terms of the microenvironment effect on the previtamin D3 conformational equilibrium and photoconversions.

Кинетика фотоизомеризации провитамина D3 (7-дегидрохолестерин, 7-ДГХ) исследована методом абсорбционной УФ спектроскопии с целью разработки нового персонального УФ биодозиметра на основе нематического жидкого кристалла с примесью провитамина D3. Были обнаружены существенные различия в спектральной кинетике, свидетельствующие об увеличении накопления *транс*-изомера в жидком кристалле по сравнению с этанольным раствором. Наблюдаемый эффект интерпретируется как результат изменения равновесного конформационного распределения превитамина D3 и его фотопревращений вследствие специфического взаимодействия с ЖК матрицей.

Transformation of nematic liquid crystals (LC) into induced cholesteric phase using chiral dopants and control of the LC phases structure and optical properties by means of light are of great importance in the development of molecular devices and optical data storage systems. A possibility to use the nematic LC material doped with provitamin D chiral biomolecules for dosimetry of biologically active solar/artificial UV radiation has been suggested in [1].

The provitamin D photoisomerization is the first basic stage in the vitamin D synthesis (Fig. 1). UV irradiation of provitamin D (Pro) results in the molecule excitation in the singlet excited electronic state and formation of previtamin D (Pre) by hexadiene ring opening. At the second stage, the previtamin D is converted thermochemically into vitamin D by intramolecular hydrogen shift [2]. However, previtamin D itself is unstable under UV irradiation and undergoes a number of re-

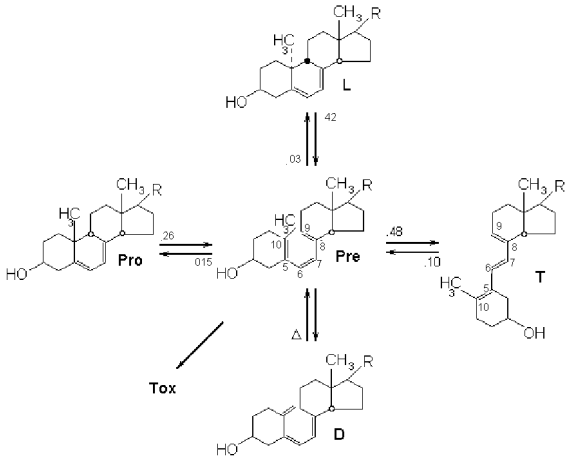

Fig. 1. The reaction scheme of vitamin D synthesis: Pro — provitamin D, Pre — previtamin D, T — tachysterol, L — lumisterol, Tox — toxysterols, D — vitamin D. R = C_8H_{17} — Vitamin D_3 series, R = C_9H_{17} — Vitamin D_2 series. Numbers at arrows represent the photoconversion quantum yields.