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UDC 535.3

LIGHT SCATTERING OF HUMAN SKIN AT ELLIPSOIDAL PHOTOMETRY

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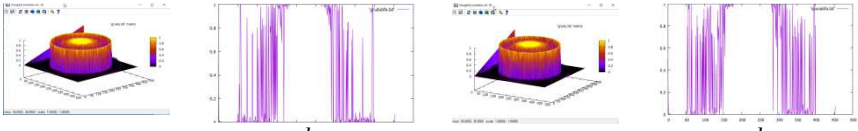
Ellipsoidal photometry as a method of optical diagnostics of scattering biological media [1] can be used to research in reflected and transmitted light. This paper discusses possibility its applicability for making a wide class of diagnostic non-invasive tools for dermatological analysis. Given the applying object – human skin – was selected the technical solution of reflectometer setup with ellipsoidal reflector with truncated orthogonal focal planes [2]. This design provides accurate measurements in backscattered light and satisfies the main task – non-invasive. For evaluation the possibilities of photometric system was carried out simulated of its work in relation to biological object. The numerical experiment was implemented for six samples of human skin: palm, breast, abdomen, back, shoulder and hip. Skin multilayered media was represented by stratum corneum (absorption coefficient 0.1 1/cm and scattering coefficient 100 1/cm fot wavelength 632.8 nm), epidermis (0.15 and 45), dermis (0.073 and 20), fat (0.068 and 15), and muscle tissue (2 and 215).



a *b* *c* *d*

Spatial distribution *a/c* and central cross section *b/d* of forward and backscattered light in breast skin respectively

Muscle tissue is specific model layer in first case was not taken into account, and in second – was set to thickness with impossible for light transmission. Zone analysis of photometric images at ellipsoidal photometry [3] does not given acceptable results. Therefore, was proposed analysis principles of scattered in multilayered media of optical radiation by the central cross section.

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MODELING OF LIGHT SCATTERING IN THICK BIOLOGICAL SAMPLES

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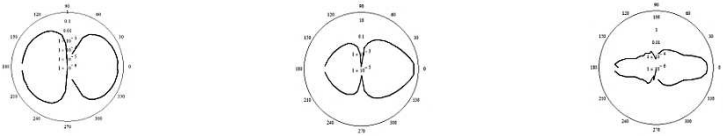
The study of light propagation in biological media (BM) today is an actual topic. Especially, it concerns finding out the character of spatial distribution of scattered light, which the scattering indicatrix is responsible. The modern methods of optical tomography, mammography and biopsy are based on light scattering principles. The experimental indicatrix of scattering in thickness samples lies at the basis of determining the anisotropy factor of single scattering. Since the influence of scattering anisotropy factor to determine the optical parameters of scattered BM radiation is significant enough [1], then for research appropriate to use the spatial photometry [2], which provides for use of the sections method and modified Henyey-Greenstein function [1]. In this paper scattering indicatrix of thickness BM samples were simulated and the influence of thickness on spatial distribution of light scattering was showed. The simulations were obtained by Monte Carlo method. They consisted of 10 numerical experiments on chicken and porcine muscles tissue. Optical properties [1] and thickness of the samples were by the input data for simulation. The modeling was performed for the thickness from 0.0001 to 2 mm. For accuracy of the results for each simulation, 20 million photons were launched. As example the indecatrixes of scattering by porcine muscles of different thickness showed on Figure.



a *b* *c*

Normalized light scattering indicatrix by pig muscle thickness 1 mm (*a*), 0.1 mm (*b*) and 0.001 mm (*c*)