3D model of bladder cross-section tissue for visualisation of optical properties

K. Litvinova[1], I. Rafailov[2], V. V. Dremin[3], A.V. Dunaev[3], S. G. Sokolovski[1] and E. Rafailov[1]

[1] *Optoelectronics and Biomedical Photonics Group, Aston Institute of Photonic Technologies, Aston University, Aston Triangle, Birmingham, B4 7ET, UK*

[2] *Department of Imaging and Technology, School of Medicine, University of Dundee, Dundee, DD1 9SY, UK*

[3] *Biomedical Photonics Instrumentation Group, Scientific-Educational Centre of "Biomedical Engineering", State University – Education-Science-Production Complex, Oryol, 302020, Russia*

e-mail: k.litvinova@aston.ac.uk

Bladder cancer (BC) is the fourth most common malignant disease worldwide, accounting for 4 % of all cancer cases [1]. As such, early diagnosis of the disease can improve both the outlook of treatment for patients as well as reduce the costs associated with the disease [2]. Many current photonics based devises are available for potential application in BC detection, but their effectiveness remains unproven [3]. The purpose of the study is to create an optical cross-section model of a bladder, capable of visually representing the passage of photons through the tissue layers [4]. Fresh pig bladders were dissected into 2 cm^2 sections and subjected to spectrophotometric analysis. The absorption, transmission and reflectance data, along with the dimensions of the analysed sections and complimentary literature data were used in the creation of a "generic" cross-section optical property model simulating the passage of thousands of photons through the tissue at different wavelengths. Fluorescence data gathered by the multifunctional laser non-invasive diagnostic system "LAKK-M" (SPE "LAZMA" Ltd, Russia) from pig bladders was further applied to the model for a specific representation of the photon passage through the tissues [5]. Ultimately, this model can be employed to simulate the effects of different laser wavelength and energy inputs to bladder tissue and to determine the effectiveness of potential photonics based devices for BC diagnosis.

REFERENCES

[1] A. Jemal et al., CA: a cancer journal for clinicians 59, 225 (2009).
[2] N. Ramanujam, Neoplasia (New York, N.Y.) 2, 89 (2000).
[3] S. Palmer et al., Clinical genitourinary cancer 11, 390 (2013).
[4] I. Rafailov et al., Proc. SPIE 9303, Photonic Therapeutics and Diagnostics XI, 93030W (2015).
[5] D. A. Rogatkin et al., Proc. SPIE 78901H1 (2011).