

INTRODUCTION: SPECIAL ISSUE ON ADVANCES IN BIOPHOTONICS AND BIOMEDICAL OPTICS — PART I

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The 5th Russian-Chinese Workshop on Biophotonics and Biomedical Optics was hosted in Saratov, Russia on 26–28, September, 2012. The bilateral Workshop brought together both Russian and Chinese scientists, engineers and clinical researchers from a variety of disciplines engaged in applying optical science, photonics and imaging technologies to problems in biology and medicine. During the Workshop, 2 plenary lectures, 11 invited presentations, 4 oral presentations and 13 poster reports were presented. A special Internet session with 5 presentations — 1 plenary, 2 invited, and 2 posters — was also organized. This special issue selects some papers from the attendees, and is made up of 12 original research articles and one review. Seven articles will be presented in Vol. 6 No. 1 of JIOHS, while the remaining five articles will be presented in Vol. 6 No. 2.

Optical techniques can be used for diagnosis of tissue characteristic and the pathway, but the photobiomodulation (PBM) may disturb the general optical diagnosis. In addition, the PBM can also be used to diagnose pathways for a dysfunctional function or subfunction to become normal when combining with biochemical and genetic approaches. In this issue, Timon Cheng-Yi Liu *et al.*¹ gave a review about PBM-mediated pathway diagnostics.

Microwave-induced thermoacoustic tomography (TAT) is a noninvasive, nonionizing modality based on the inherent differences in microwave absorption of malignant and normal tissues. Shihua Yang and co-workers² developed a TAT system based on multi-element acquisition and preformed experiments with some mimicked and human tumors to demonstrate the feasibility of detecting and evaluating the early breast tumor. Microwave can also be a common thermotherapy approach.

Working memory refers to a brain system that provides temporary storage and manipulation of the information necessary for complex cognitive tasks. In this issue, a neural ensemble sparse coding method³ is developed to reduce the dimension of neural ensemble during rat working memory task, which makes the description of neural coding more effective with low-dimension.

Heptamethine indocyanine dyes are representative NIR fluorescent contrast agents that have been applied extensively in biotechnology and medicine research. Chunmeng Shi's group⁴ performed preliminary investigation into relationship between the structure and the activity of heptamethine indocyanine dyes, and found several essential requirements of structure for active tumor targeting property.

Multiphoton microscopy (MPM) enables direct noninvasive visualization of tissue architecture and cell morphology without exogenous labeling, and Chen's group has tested different tissues with this technique. In this issue, they focused on the microstructure of the mucosa in fresh intestinal tissue of mouse, and observed the morphology and distribution of main components in mucosa layer such as columnar cells, goblet cells, intestinal glands, and a few collagen fibers.⁵

The reflectance spectrum has been widely adopted to extract diagnosis information with the advantages of noninvasiveness. The external pressure brought by fiber optic probe may influence the accuracy of measurement. Kexin Xu's group⁶ systematically studied the effects of probe pressure on intrinsic changes of water and scattering particles in tissue.

Combining with bronchofiberscope, Dr. Weimin Liu *et al.*⁷ used the microwave therapy method and performed it on 37 patients with severe trachea stenosis diseases 2 to 5 times, and demonstrated that it is an effective method to treat patients with benign trachea stenosis.

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