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Light-Based Diagnosis and Treatment of Infectious Diseases

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Introduction

Infectious diseases continue to rank high among global mortality factors and inflammations have been identified as a root case of many chronic disorders. Over 95% of the mortality caused by infections and inflammatory diseases is due to the lack of proper diagnosis and treatment. The inability of physicians to characterize infections at the point of care has led to broad overuse of broad-spectrum antibiotics due to the risk of missed diagnosis. Furthermore, the rise of antibiotic-resistant pathogens has complicated the choice of the treatment. It is now indisputable that antibiotic resistance is life-threatening in the same sense as cancer, both in the number of cases and the likely outcome. In 2015, the White House announced the "National Action Plan for Combating Antibiotic-Resistant Bacteria". It is noted in the National Action Plan that "New therapeutics, vaccines, and diagnostics are urgently needed to combat emerging and reemerging antibiotic-resistant pathogens".

Rapid, optically based diagnosis could play an important role by informing treatment during this critical initial window. In addition, light-based antimicrobial therapies have attracted increasing attention due to their ability to eradicate pathogens regardless of antibiotic resistance and the fundamental improbability of the pathogens themselves to develop resistance to these light-based therapies due to the rather non-specific nature of the targets.

To communicate and disseminate new findings in the area of light-based diagnosis and treatment of infections and inflammatory diseases, to increase collaborations between research groups, and to supplement and enhance the training of early-stage researchers, we founded a new conference of "Photonic Diagnosis and Treatment of Infections and Inflammatory Diseases (Conference 10479)" at the SPIE Photonics West BioS in 2018. Technical and scientific papers related to advanced light-based diagnostic and therapeutic technologies that push beyond the scope of the state-of-the-art in basic science and clinical practice are solicited by this conference. The topics covered in the conference include photonic diagnosis of infections using Raman spectroscopy, intrinsic phase-shift Spectroscopy, interferometric imaging, elastic light scattering, label-free multiphoton imaging, reflectance spectrometry, confocal fluorescence imaging, etc.; and phototherapy for infections using antimicrobial photodynamic therapy, antimicrobial blue light therapy, ultraviolet C irradiation, water filtered infrared A irradiation, photodynamic vaccination, etc.

The present volume contains selected papers of the new conference at the SPIE Photonics West BioS 2018, held on January 29-31, 2018 in San Francisco, California. This conference received 61 papers. After an initial review, 49 papers were selected as oral presentations and 8 as poster presentations. Each paper received 2-6 reviews. Paper 10479-26 entitled "Drug-free annihilation of

methicillin-resistant staphylococcus aureus via staphyloxanthin photobleaching" and authored by Ms. Puting Dong and her colleagues from the Boston University was selected from over 300 papers from different conferences for the Translational Research Best Paper Award of SPIE Photonics West 2018. Finally, 23 papers were included for publication in the Conference Proceedings.

As Conference Chair, I have many people to thank.

First, I would like to extend my special thanks to Drs. Rox Anderson and Tayyaba Hasan from the Wellman Center of Photomedicine for their endorsements on my proposal. I thank all the authors who submitted their papers to the conference. I thank Conference Committee Members Dr. Kristen C. Maitland, Dr. Alessandro M. Deana, Dr. Akilan Palanisami, and Dr. Ying Wang for their valuable time devoted to reviewing the papers. I also thank all Session Chairs. The largest burden fell upon their experienced shoulders. This conference would not have had such a good start without their contributions. It is my pleasant duty to acknowledge the finical support from Ondine Biomedical Inc., Ushio Inc., and Gel4Med, Inc.

Finally, I would like to give my gratitude to the SPIE staff for the conference and for assembling the Proceedings. We are looking forward to SPIE Photonics West 2019 that will be held at the same time and location next year.

Tianhong Dai