About the Editor

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Dilsat Ozkan-Ariksoysal received her PhD in the field of analytical chemistry from Ege University (Izmir, Turkey) in 2006. She worked as Assistant Professor for 3 years at the Analytical Chemistry Department of the Faculty of Pharmacy in Ege University and since 2012 she has been working as an Associate Professor in the same department. She worked and collaborated with Mehmet Ozsoz for approximately 12 years in his biosensor group. Her areas of interest include the development of enzymatic, electrochemical, optical (surface plasmon resonance) and impedimetric DNA biosensors, nanobiosensors and electrode/surface modifications for the detection of DNA hybridization and DNA damage, compound–DNA interactions, gene mutations, and DNA analysis related to microorganisms.

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Foreword

Biosensors and their application in healthcare: hot topics

Dilsat Ozkan-Ariksoysal

Biosensor development for clinical purposes has attracted scientific interest over the past 15 years owing to the need for rapid, simple hand-held testing devices in medicine. Biological sensors are optical, electrical, piezoelectrical devices that have the ability to detect biological compounds, such as nucleic acids and proteins.

Early diagnosis of inherited disease is important for effective treatment and is sometimes life saving. Current molecular diagnostic methods, for example, enzyme-linked immunosorbent assay and PCR, can require highly skilled personnel, expensive chemicals and be time consuming. In this area, many biosensor schemes have been developed as an alternative to classical methods. Moreover, the pace of research in the 'biosensor' field is extremely fast, and new information (including advancements in nanotechnology and gene technology) is pouring out of the laboratories at a nearly unimaginable rate.

Recent progress in this direction is the development of micro- and nano-array devices that contain biosensor substructure and multiple and parallel detection procedure. In general, DNA is an ideal molecule for microchip devices for the diagnosis of heredity-related diseases due to the recognition specificity, stability and versatile structure.

Although there have been many advancements in the biosensors area, the commercialization of detection methodologies has considerably lagged

behind the research output. In addition, despite many promising applications, there is still a need to develop sensitive, fast and accurate biosensors (microarrays) with picomolar to femtomolar detection limits in the area of diagnosis.

Biosensors and their application in healthcare is a large subject. In this book, we have tried to make it more digestible by organizing the text into clearly separated sections by identifying important and hot-topic applications containing point-of-care tests. The material related to biosensors is presented in nine chapters. **Chapter 1** provides information on antibody-based sensors/arrays for disease detection with emphasis on cancer. In **Chapter 2**, researchers active in the fields of biosensors for implantable visual prostheses discuss current research. **Chapter 3** focuses on enzyme sensors in healthcare, discussing current challenges and emerging trends, and **Chapter 4** describes general principles and applications of label-free whole-cell phenotypic diagnostics. The latest advancements in nanomaterial-based biosensors, peptide nucleic acid-based biosensors for express DNA diagnostics, biosensors for medical mycology, and new diagnostic approaches in optical DNA biosensors are presented in **Chapters 5, 6, 7 and 8**, respectively. Finally, **Chapter 9** discusses the application of biosensors in the diagnosis of heart disease.

We hope that this state-of-the-art book will continue to inform and inspire all levels of researchers' work on biosensors for many years. I would like to thank the scientists around the world who contributed to the book by sharing their valuable studies in the area of biosensors.

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