

1. Record Nr.	UNINA9910512165003321
Autore	Borse Vivek
Titolo	BioSensing, Theranostics, and Medical Devices : From Laboratory to Point-Of-Care Testing
Pubbl/distr/stampa	Singapore : , : Springer Singapore Pte. Limited, , 2022 ©2022
ISBN	9789811627828 9789811627811
Descrizione fisica	1 online resource (380 pages)
Altri autori (Persone)	ChandraPranjal SrivastavaRohit
Soggetti	Electronic books.
Lingua di pubblicazione	Inglese
Formato	Materiale a stampa
Livello bibliografico	Monografia
Nota di contenuto	Intro -- Contents -- About the Editors -- Chapter 1: Gold Nanoclusters as Emerging Theranostic Interventions for Biomedical Applications -- 1.1 Introduction -- 1.2 Synthesis of AuNCs -- 1.3 Gold Nanoclusters as Biosensors -- 1.4 Gold Nanoclusters as Therapeutics -- 1.5 Conclusions and Future Prospects -- References -- Chapter 2: Advances in Materials, Methods, and Principles of Modern Biosensing Tools -- 2.1 Introduction -- 2.2 Materials for Biosensors -- 2.3 Principles of Biosensing -- 2.3.1 Colorimetric -- 2.3.1.1 Liquid Phase Biosensors -- 2.3.1.2 Paper Biosensors -- 2.3.1.3 Microfluidic Biosensors -- 2.3.1.4 Microfluidic Paper Analytical Devices (PADs) -- 2.3.2 Colorimetric Assays -- 2.3.3 Chemiresistive Biosensors -- 2.3.4 Electrochemical Biosensors -- 2.3.5 Semiconductor Biosensors -- 2.4 Recent Trends of Biosensing and Device Fabrication -- 2.5 Future of Biosensing -- 2.6 Summary -- References -- Chapter 3: Evolution Towards Theranostics: Basic Principles -- 3.1 Introduction -- 3.2 Basic Principle of Theranostics in POC -- 3.2.1 Fundamental Prospects -- 3.2.2 Components -- 3.2.3 Point-of-Care Devices -- 3.3 Biological Factors Involved in Theranostic Applications -- 3.3.1 Administration of Nanoparticles -- 3.3.1.1 Passive Targeting -- 3.3.1.2 Active Targeting -- 3.3.1.3 Physical Targeting -- 3.3.2 The Journey of Nanoparticles to the Target Sites -- 3.4 Recent Advancements in Theranostics -- 3.5

Advantages of Smart Theranostics Agents Over Conventional Therapy -- 3.5.1 Localized Therapy -- 3.5.2 Multimodality -- 3.5.3 Simultaneous Diagnosis and Therapy -- 3.5.4 Multifunctionality -- 3.5.5 Real-Time Monitoring -- 3.5.6 Immune-Evasion -- 3.6 Challenges for Responsible Development -- 3.6.1 Toxicity -- 3.6.2 Stability -- 3.6.3 Commerciality -- 3.7 Future Perspective -- 3.8 Conclusion -- References.

Chapter 4: Biosensor-Based Point-of-Care Devices: Metabolites and Pulse Oximetry -- 4.1 Introduction -- 4.2 Glucose Measurement at the Point-of-Care -- 4.2.1 Methods of Measurement -- 4.2.2 Summary of Devices -- 4.2.2.1 Glucose Meters for At-Home Care -- 4.2.2.2 Glucose Meters for Clinical Care -- 4.3 Creatinine Measurement at the Point-of-Care -- 4.3.1 Methods of Measurement -- 4.3.2 Summary of Devices -- 4.4 Lipid Measurement at the Point-of-Care -- 4.4.1 Mechanisms of Measurement -- 4.4.2 Summary of Devices -- 4.5 Pulse Oximetry Measurements at the Point-of-Care -- 4.5.1 Methods of Measurement -- 4.5.2 Summary of Devices -- 4.6 Conclusion -- References -- Chapter 5: Biosensor-Based Point-of-Care Devices: Detection of Infectious Diseases and Cancer -- 5.1 Introduction -- 5.2 Pathogen Detection at the Point-of-Care -- 5.2.1 Methods of Detection -- 5.2.2 Summary of Devices -- 5.2.2.1 HIV -- 5.2.2.2 Tuberculosis -- 5.2.2.3 Malaria -- 5.2.2.4 Syphilis -- 5.2.2.5 Chlamydia and Gonorrhea -- 5.3 Cancer Detection at the Point-of-Care -- 5.3.1 Methods of Detection -- 5.3.2 Summary of Devices -- 5.3.2.1 Prostate Cancer -- 5.3.2.2 Colorectal Cancer -- 5.3.2.3 Liver Cancer -- 5.3.2.4 Bladder Cancer -- 5.4 Conclusion -- References -- Chapter 6: Non-invasive Cellular Characterization Using Bioimpedance Sensing -- 6.1 Introduction -- 6.2 Principle -- 6.2.1 Cell-Substrate Impedance -- 6.2.2 Design and Simulation of Sensor Configuration -- 6.3 Bioimpedance Sensor and Impedance Measurement -- 6.3.1 Device Fabrication -- 6.3.2 Cleaning and Surface Modification of the Sensor -- 6.3.3 Experimental Setup -- 6.3.4 Cell Culture and Cell Seeding Inside the Chip -- 6.3.5 Bioimpedance Measurement -- 6.4 Theoretical Analysis -- 6.4.1 Electrical Equivalent Model of the System -- 6.4.1.1 Estimation of Equivalent Model Parameters.

6.4.1.2 Fragmental Frequency Analysis Method to Extract the Model Parameters -- 6.4.2 Extracting the Single Cell Property from Measurement of Group of Cells -- 6.4.2.1 Maxwell's Mixture Theory -- 6.4.2.2 Equivalent Electrical Model of Single Cell -- 6.5 Applications -- 6.5.1 Calculation of Equivalent Parameters of HeLa Cells Using Fragmental Frequency Analysis -- 6.5.1.1 Resistance of the PBS Media -- 6.5.1.2 Resistance R_{exp} -- 6.5.1.3 Coating Capacitance -- 6.5.1.4 Double Layer Capacitance -- 6.5.1.5 Equivalent Parameters of the HeLa Cells -- 6.5.2 Extraction of Single Cell Parameters of HeLa Cells -- 6.6 Summary -- References -- Chapter 7: Research Aspects and Strategies for the Development of Biosensors for Renal Disease Diagnosis -- 7.1 Point-of-Care Devices and their Importance in Renal Diseases Diagnosis -- 7.2 Various Biomarkers for Kidney Disease Diagnosis -- 7.3 Point-of-Care Devices for Kidney Injury Diagnosis -- 7.4 New Avenues in Developing POC for Renal Diseases -- 7.5 Conclusion -- References -- Chapter 8: From Natural to Artificial Biorecognition Elements: From Antibodies to Molecularly Imprinted Polymers -- 8.1 Introduction -- 8.2 Development and Production of Recognition Elements -- 8.2.1 Antibodies -- 8.2.2 APTAMERS -- 8.2.3 Molecularly Imprinted Polymers (MIPs) -- 8.3 Conclusions -- References -- Chapter 9: Design and Development of a Bed-Side Cardiac Health Monitoring Device -- 9.1 Introduction -- 9.1.1 Tissue as a Conductor -- 9.2 Evolution of Bio-Impedance: Impedance Cardiography -- 9.3

Significance of Non-Invasive Recording of Cardiac Parameters -- 9.4
Physiological and Clinical Applications of Impedance Cardiography --
9.5 Designing an Electrode - Skin Model for Simulation Studies -- 9.5.1
Current Density -- 9.5.2 Resistive Loss -- 9.5.3 Electric Field
Displacement -- 9.6 ICG Acquisition -- 9.6.1 Frequency and Current
Values.
9.6.2 ICG Measurement Methods -- 9.7 ICG Device Fabrication -- 9.8
Conclusion -- References -- Chapter 10: Tailoring Multi-Functional 1D
or 2D Nanomaterials: An Approach towards Engineering Futuristic
Ultrasensitive Platf... -- 10.1 Introduction -- 10.2 1D or 2D
Nanomaterials and its Sensing Application -- 10.2.1 1D Nanomaterials
-- 10.2.1.1 Nanofibers -- 10.2.1.2 Nanowires -- 10.2.1.3 Nanotubes
-- 10.2.1.4 Nanorods -- 10.2.2 2D Nanomaterials -- 10.2.2.1
Graphene -- 10.2.2.2 Transition Metal Dichalcogenides -- 10.3
Functionalization Routes towards Microbial Detection -- 10.4 1D or 2D
Nanomaterials in Nano/Micro-Gap Based Sensing Devices -- 10.4.1
Planar Gaps -- 10.4.2 Planar Gap Based FET Devices -- 10.4.3 Vertical
Gap -- 10.5 Sample Preparation -- 10.5.1 Cultures -- 10.5.2 Tissues
-- 10.5.3 Blood/Serum/Plasma -- 10.6 Extraction of Biological
Molecules for Molecular Detection -- 10.6.1 Nucleic Acid Extraction --
10.6.2 Protein Extraction -- 10.6.3 Automated Nucleic Acid Extraction
Methods -- 10.7 Fluid Kinetics for Detection Systems -- 10.8 1D or 2D
Material Based Optical Detection of Microbial Strains -- 10.8.1
Fluorescent Biosensor -- 10.8.2 FRET-Based Biosensors -- 10.8.3
Raman Based Sensor -- 10.8.4 DNA Based Sensor -- 10.9 Summary
and Future Work -- References -- Chapter 11: Clinical Validation of the
Medical Devices: A General Prospective -- 11.1 Introduction -- 11.2
What Is Clinical Evaluation? -- 11.2.1 Definition -- 11.2.2 Pre-Clinical
Evaluation -- 11.3 Needs of Clinical Evaluation of Medical Devices --
11.4 Type of Clinical Evaluation -- 11.4.1 Clinical Investigation --
11.4.2 By Literature Way -- 11.5 Clinical Validation According to the
Type of Devices -- 11.5.1 Clinical Validation -- 11.5.2 Process
Validation -- 11.5.3 Revalidation -- 11.5.4 Design Validation -- 11.6
Clinical Validation for each Class of Medical Devices.
11.7 Clinical and Analytical Validations of Biosensors Based IVDs --
11.8 The Regulatory Perspective of the Medical Device in Consideration
with Clinical Validation -- 11.8.1 Medical Device Rules (MDR)-2017,
India -- 11.8.2 Food and Drug Administration USA -- 11.8.3 Medical
Devices Clinical Validation Process in EU -- 11.8.4 Clinical Confirmatory
Process in Australia -- 11.8.5 Medical Devices Clinical Validation in
China -- 11.9 Conclusions -- References -- Chapter 12: Dried Blood
Patterns for Diagnosis of Non-Communicable and Infectious Diseases
-- 12.1 Introduction -- 12.2 Whole Blood and its Physical Properties --
12.3 Physics of Pattern Formation -- 12.4 Factors Affecting the Pattern
Formation -- 12.5 Disease Diagnosis Using the Dried Pattern of Blood
Plasma and Serum -- 12.6 Disease Diagnosis Using the Dried Pattern of
Whole Blood -- 12.7 Challenges and Future Outlook -- References --
Chapter 13: Theranostics: Principles, Materials, and Technical
Advancements -- 13.1 Introduction to Principles of Theranostics --
13.2 Materials for Cancer Theranostics -- 13.2.1 Gold-Based
Nanosystems -- 13.2.2 Iron Oxide-Based Nanosystems -- 13.2.3 Other
Metallic Nanosystems -- 13.2.4 Carbon-Based Nanosystems -- 13.2.5
Silica-Based Nanosystems -- 13.2.6 Quantum Dots-Based
Nanosystems -- 13.2.7 Polymer-Based Nanosystems -- 13.2.8 Lipid-
Based Nanosystems -- 13.3 Advanced Theranostic Nanomedicine
Platforms for Clinical Applications -- 13.3.1 Photodynamic and
Photothermal Therapy -- 13.3.2 Imaging -- 13.3.3 Nanobiosensors --
13.3.4 Magnetic Hyperthermia -- 13.3.5 Multimodal Image Guided

Therapy -- 13.3.6 Treatment of Cardiovascular Diseases -- 13.3.7
Treatment of Central Nervous System Related Diseases -- 13.4
Commercialization and Translational Challenges of Theranostic
Nanosystems -- 13.5 Conclusion -- References.
Chapter 14: Nanotheranostics: Nanoparticles Applications,
Perspectives, and Challenges.
