Record Nr. UNINA9911026074003321 Autore Malviya Rishabha Titolo Integrating Nanorobotics with Biophysics for Cancer Treatment Pubbl/distr/stampa Bristol:,: Institute of Physics Publishing,, 2024 ©2024 **ISBN** 9780750360197 9780750360203 Edizione [1st ed.] Descrizione fisica 1 online resource (291 pages) Collana Biophysical Society-IOP Series Altri autori (Persone) YadavDeepika SundramSonali **KadrySeifedine** S VirkGurvinder Lingua di pubblicazione Inglese **Formato** Materiale a stampa Livello bibliografico Monografia Nota di contenuto Intro -- Foreword -- Author biographies -- Rishabha Malviya --Deepika Yadav -- Sonali Sundram -- Seifedine Kadry -- Gurvinder Singh Virk -- About the book -- Chapter Nanorobotics: materials, design, and technology -- 1.1 Introduction -- 1.2 Nanorobot design and development -- 1.3 Nanorobots designed for a broad spectrum of healthcare uses -- 1.4 The applications of nanorobots in the field of biomedicine -- 1.4.1 Microbiology -- 1.4.2 Cancer therapy using nanorobots -- 1.4.3 Biologically inspired nanorobots -- 1.4.4 The prospects of nanorobots for use in hematology -- 1.4.5 The neurosurgical prospects of nanorobots -- 1.5 The prospects of nanorobots for use in dentistry -- 1.6 The use of nanorobots in gene therapy -- 1.7 The biocompatibility and toxicity of nanorobots -- 1.8 Conclusions -- References and further reading -- Chapter Robotics and biophysics: technology advances and challenges in organic and inorganic domains -- 2.1 Introduction -- 2.2 An introduction to the use of robots in the field of biophysics -- 2.2.1 The importance of

robots in the field of biophysical research -- 2.2.2 The possible application of robots in areas of biophysical investigation -- 2.2.3 Biophysical applications of robot-based systems -- 2.3 Technology

advances of soft robotics in the organic domain -- 2.3.1 The applications of soft robots in medical and biological settings -- 2.3.2 Biomimetic design -- 2.3.3 The benefits of biomimetic design in biophysics -- 2.3.4 The challenges of applying biomimetic design principles in the field of biophysics -- 2.4 Developments in inorganic measurement technology -- 2.4.1 The integration of advanced prosthetic limbs and biophysics -- 2.4.2 Robotics in diagnostic imaging and laboratory tasks -- 2.5 Challenges in integration -- 2.5.1 Ethical and regulatory issues. 2.5.2 Regulatory challenges in the development of biophysics-based robotic systems -- 2.5.3 Interdisciplinary collaboration -- 2.6 Future prospects -- 2.7 Conclusions -- References -- Chapter Nanorobots: a primer for deciphering the biophysics of cancer -- 3.1 Introduction --3.2 Multiscale cancer biophysics -- 3.3 The biology of cancer cells --3.4 The reason for a biophysical strategy for cancer -- 3.5 Nanorobots -- 3.6 Nanorobots for the detection and treatment of cancer -- 3.7 Conclusions -- References and further reading -- Chapter The biophysics of cancer: management at the nanoscale -- 4.1 Introduction -- 4.2 Important aspects of nanorobots for cancer therapy -- 4.3 Nanorobot propulsion systems for anticancer medicine delivery --4.3.1 Nanorobots propelled by magnets -- 4.3.2 Nanorobots propelled by ultrasound -- 4.3.3 Biologically propelled nanorobots -- 4.3.4 Hybrid-drive nanorobots -- 4.3.5 Nanorobots propelled by other power sources -- 4.4 Precision cancer diagnosis and treatment with nanorobots -- 4.4.1 The identification and assessment of cancerous conditions -- 4.4.2 Gene therapy involving the precise administration of nucleic DNA -- 4.4.3 Vascular infarction in tumors -- 4.5 Nanorobots in cancer therapy: potential and clinical problems -- 4.5.1 The complexity and accuracy of the technology -- 4.5.2 Concerns regarding personal safety -- 4.5.3 Regulatory concerns -- 4.5.4 Scalability -- 4.5.5 Cost -- 4.5.6 Quality control -- 4.5.7 Management of the supply chain and its components -- 4.6 Future perspectives and conclusions -- References -- Chapter Magnetomechanical systems at the micro/nanoscale for cancer management -- 5.1 Introduction -- 5.2 Cancer therapy using magnetomechanical particles -- 5.2.1 Principle -- 5.3 The magnetomechanical identification of telomerase and nuclear acids in cancerous cells. 5.4 The therapeutic applications of telomerase studies in cancer -- 5.5 The clinical applications of telomeres and telomerase in oncology --5.6 Conclusions -- Funding -- Conflict of interest -- References --Chapter The role of micro/nanorobotics in personalized healthcare --6.1 Introduction -- 6.2 Surgical operations -- 6.2.1 Biopsy and sample collection -- 6.2.2 The invasion or penetration of tissues -- 6.2.3 The breakdown of biofilms -- 6.2.4 Deliveries conducted within cells -- 6.3 Diagnosis -- 6.3.1 Biological sensors -- 6.3.2 Isolation -- 6.3.3 Physical sensors -- 6.4 Imaging and diagnostic medicine -- 6.4.1 Optical imaging -- 6.4.2 Imaging using ultrasound -- 6.4.3 Imaging using radionuclides -- 6.5 Prospective view -- 6.6 Regulatory challenges in personalized healthcare -- 6.7 Conclusions -- References and further reading -- Chapter The development of active nanorobots in personalized healthcare -- 7.1 Introduction -- 7.2 Nanorobots --7.3 Nanorobots in healthcare -- 7.3.1 Helices -- 7.3.2 Nanorods --

7.3.3 DNA nanorobots -- 7.4 Applications of nanorobots in personalized healthcare -- 7.4.1 The use of nanorobots in dentistry -- 7.4.2 The use of nanorobots in cancer treatment -- 7.4.3 The application of nanorobots in the treatment and diagnosis of diabetes -- 7.4.4 The application of nanorobots in neurology -- 7.4.5 The application of nanorobots in hematology -- 7.5 Future perspectives --

7.6 Conclusions -- References -- Chapter Nanozyme-based nanorobots for cancer treatment applications -- 8.1 Introduction --8.2 Nanomedicine and nanotheranostics -- 8.3 Targeted tumor vessel infarction with nanomedicine -- 8.4 Targeted tumor drug delivery systems -- 8.4.1 Passively targeted drug delivery systems -- 8.4.2 Actively targeted medication delivery systems -- 8.5 Micro- and nanorobots -- 8.5.1 Chemically powered micro- and nanorobots. 8.5.2 External-field-powered micro- and nanorobots -- 8.5.3 Biohybrid micro- and nanorobots -- 8.6 Difficulties with cancer nanomedicines -- 8.7 Future perspectives -- 8.8 Conclusions --References -- Chapter Progress in the bioelectrochemical and biophysical diagnostic profiling of malignant cancer cells -- 9.1 Introduction -- 9.2 The use of biosensors in clinical assessment -- 9.3 Electrochemical biosensors -- 9.3.1 Various electrochemical measurement methods -- 9.4 Conventional apoptotic and metastatic cell detection methods -- 9.5 Bioelectricity in cancer processes --9.5.1 Cancer and ion channels -- 9.5.2 Calcium channels -- 9.5.3 Sodium channels -- 9.5.4 Intracellular potassium channels -- 9.5.5 Chloride channels -- 9.5.6 Piezoelectric channels -- 9.6 The detection of bioelectric characteristics -- 9.7 Bioelectrical modifications -- 9.8 Electrification and extracellular vesicles -- 9.9 Biosensors for in vitro cancer cell assessment -- 9.10 Conclusions -- References and further reading -- Chapter Wireless microrobots: the next frontier in medical advancements -- 10.1 Introduction -- 10.2 Microrobots and their potential therapeutic applications -- 10.2.1 The imaging of functional capabilities for disorder diagnosis -- 10.2.2 Mobile situational awareness for disease diagnosis and health management -- 10.3 Targeted therapy -- 10.4 The applications of microrobotics in medicine, particularly in the human cardiovascular system and the bloodstream -- 10.5 Biomechanical restrictions that impede microrobots -- 10.6 Current challenges facing miniaturized biomedical robots and their potential future applications -- 10.7 Methods for the actuation and control of therapeutic microrobots -- 10.8 Conclusions -- References and further reading -- Chapter Revolutionizing cancer treatment using micro/nanorobotic devices -- 11.1 Introduction. 11.2 Nano/microrobots for drug delivery -- 11.3 Cancer-targeted drug delivery systems -- 11.3.1 Enhancing treatment precision using passive drug delivery -- 11.3.2 Enhancing treatment precision using active drug targeting -- 11.3.3 Surgical advancements with micro/nanorobotic assistance -- 11.3.4 Robotic biosensing -- 11.3.5 Enhancing drug delivery with micro/nanorobot mobility -- 11.3.6 Field-guided micro/nanorobotics -- 11.4 Conclusions and prospects -- References and further reading -- Chapter Cyborgs and cyberorgans: biosecurity in biorobotics for healthcare-a case study --12.1 Introduction -- 12.2 Biorobotics in healthcare -- 12.3 Cyborgs and cyberorgans in healthcare -- 12.4 Case study -- 12.5 Patent list --12.6 Conclusions -- References.

Sommario/riassunto

This book offers the most recent findings on employing nano/microrobots in biophysics for cancer treatment. Insightful analysis and commentary from the authors complement a comprehensive survey of recent advances and ground-breaking research in the field.