

adjuvant at some level of intervention in the management of TB. A section on the pathogenesis and treatment guidelines with detailed illustrations is useful even for a common reader. It is known that the reduced immune response, co-infection, latent infection, resistance, etc. increase the mortality rate. An exhaustive list of medicinal plants tested for their antimycobacterial activity is given along with references and bibliography details for further reading. The chapter concludes by highlighting the importance of immune-stimulating and hepatoprotective activity of possible plant products. The authors have also mentioned about the need for BABS (bioprospecting, access and benefit sharing) regulations in South Africa and possible suggestions as a way forward.

The editor and her team are specialists in medicinal plants used in the treatment of superficial skin infections. The eighth chapter deals with issues of superficial skin ailments and methodologies for exploring herbal soap formulations for such ailments. After explaining various types of skin infections, the authors have mentioned the recent statistical data of disease prevalence in South Africa. In case of skin infections, data show that they range from 3.4% to 55% among Nigerians. In recent years resistance to antibiotics is a difficult challenge in treating skin infections. The widespread use of herbals is more advantageous due to their low cost, availability and convenience with less chance of resistance over a period of time when compared to antibiotics. The popular medicinal species used for skin infections are discussed in this chapter with a detailed list of references. Herbal soaps as a medium have many advantages as they are used as emulsifiers, surfactants and germicides with increased permeability. A study on 20 such herbal soaps revealed their activity against many organisms causing skin infections.

The ninth chapter on garlic as medicine is interesting as it starts with its historical importance, origin and its widespread use in many countries. The nutritional values, biological properties and research findings of the biological activities of garlic extract are given in detail with an exhaustive list of references. Emphasis is given to its antibacterial, cardiovascular, immune stimulatory properties and its role in cancer treatment. Even though the clinical signifi-

cance of garlic is well known, it is still debatable because of contradictory reports from different studies. As mentioned by the authors, the role of garlic in health care is promising and it serves as a pioneer medicinal plant in health care.

The final chapter of the book discusses how to maximize the knowledge and resource domain of medicinal plants. The authors are confident that one can improve the underestimated, underappreciated ethnomedicinal practices in South Africa and other countries. To achieve this, the following steps are suggested by them: (i) educate the global population regarding the use of plants in medicine; (ii) the use of medicinal plants stemming from ethnomedicinal origin needs to be fully understood and scientifically validated; (iii) bridge the gap between modern Western medicine and traditional medicine and (iv) develop sustainable strategies for commercialization. Researchers and students of traditional medicine and medicinal plants all over the world will surely benefit from this well-written book.

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Biomedical engineering (BME) is a collaborative field that allows integration of science, technology and engineering to solve major clinical challenges. Due to its diverse nature, it is challenging to summarize and provide an overview of the field in a single book. Hence, the editors of this volume deserve appreciation for having taken up this challenging task and coming out with a collection of reviews that provide the necessary overview of emerging biomedical engineering areas.

This volume consists of 19 articles, each providing an in-depth review of the respective field. These reviews cover several areas such as tissue regeneration, imaging/modelling techniques, cancer, biomechanics, etc. Apart from these, few reviews also focus on individual topics such as glycoaminoglycans, thrombosis, body-powered energy harvesting for medical devices, immunoengineering, etc.

Tissue regeneration is an emerging field that is now starting to make its impact in clinics. Several products in the market are being used to improve the quality of life of patients. This volume contains three articles that review this area. 'Microsphere-based scaffolds in regenerative engineering' describes how microspheres can be used to deliver drugs at a controlled rate and act as a building block for larger scaffolds. Microparticle fabrication methods and their potential applications are discussed. Another article focuses on myocardial and vascular tissue engineering. It reviews approaches with their pros and cons to induce vascularization and focuses on biologically derived scaffolds. Levin *et al.* discuss the role of bioelectricity in developmental pattern formation. This could be the key to understanding mechanisms that control large-scale shape of tissues and organs and has wide implications in clinics for regenerative medicine and for correcting birth defects.

Biomedical imaging and modelling is an area that has been most successful in translating to clinics, with several concepts and products being regularly used to diagnose and treat diseases. So, it is not surprising that four reviews are dedicated to this topic. Shen *et al.* provide an introduction of approaches to deep learning, followed by several applications like detection of anatomical and cellular structures in medical imaging. Hyder *et al.* discuss imaging brain metabolism with major focus on magnetic resonance imaging and magnetic resonance spectroscopy. These techniques allow the user to understand how the brain utilizes nutrients for growth and function and hence can be instrumental in diagnosing and treating brain disorders. Bassett *et al.* discuss the use of network science to predict complex behaviours and links of neural systems that cannot be predicted by treating them as individual elements due to interactions over large spatio-temporal space. Another chapter reviews

multiscale modelling with specific examples of the muscular–skeletal system. It introduces methods for multiscale modelling consisting of quantum simulation, molecular dynamics and continuum theory. Multiscale modelling gives insights into the relationship between the structure and function of a large tissue. The authors have shown the power and utility of multiscale modelling in the biomedical field.

Cancer has been a major disease for the last few decades and even after extensive research, it has seen continuous rise in incidence and mortality. Two reviews on this topic are covered in this volume. One of them delves into the molecular pathways of glutamine that is necessary for cancer cell function. Detailed analysis of glutamine metabolism and its role in tumour growth, epithelial-to-mesenchymal transition and metastasis is provided. Tools to study glutamine uptake and metabolism are also illustrated. Another new emerging area in biomedical engineering is *in vitro* human models. Such models allow researchers to study and test therapeutics in an *in vitro* setting, and give more freedom to perturb and dissect the system compared to animal models. Unlike animal models, *in vitro* models are faster and allow easy customization. However, it is debatable whether such systems are robust enough when compared to *in vivo* animal models due to their simplification. Nonetheless, such *in vitro* models (also sometimes referred to as organ-on-a-chip) have gained a lot of attention. Park *et al.* review hydrogels that mimic cancer microenvironments such as extracellular matrix, stiffness and vascular structures. The engineered microenvironment allows researchers to study tumour invasion, metastasis and screen potential drugs.

Mechanics is an important aspect in biological systems and has garnered the interest of the whole community. This volume dedicates two reviews to biomechanics. Maas *et al.* describe the importance and use of finite element method in biomechanics research. For customization of data analysis and tackling biomechanics challenges the software package, FEBio was developed in the mid-1990s. This review describes the history and advances in FEBio tool. Another chapter is dedicated to techniques for assessing cartilage biomechanical properties such as *ex vivo* measurements of stiffness and lubricity. Non-invasive imaging tech-

niques like X-ray, MRI and CT to assess cartilage mechanical properties are also described.

Despite several efforts of scientists and doctors, surgical interventions are necessary in many cases. A review in this volume deals with surgical data science to ensure that surgeons are well-trained and competent before performing a procedure. The review highlights the need for uniform methods to validate surgical techniques and competency assessment among all surgeons. Post-surgical considerations after Roux-en-Y gastric bypass (RYGB) used in bariatric surgery is covered in another review, which lists important areas such as morphological, hunger, taste and metabolic changes that take place after RYGB. Bioengineering opportunities to replace the surgery with a less invasive procedure are also discussed.

DNA is the information storage and transfer centre in our cells and its engineering remains an attractive target for many diseases. Epigenetic regulation of DNA is described in one of the reviews with emphasis on the cardiovascular system. It covers topics such as DNA methylation, non-coding RNAs, etc. Bioinformatics, systems biology approaches and opportunities for bioengineers are also discussed. In continuation of the role of DNA, another review focuses on one of the fastest emerging areas, i.e. mammalian synthetic biology. Various tools to modify DNA and construct synthetic circuits in mammalian cells are presented, including CRISPR/Cas9. There is a lot of excitement regarding the use of this powerful technology to edit genomes, however, the authors rightly point out the need to assess safety and any off-target effects.

No biomedical engineering book is complete without discussing the immune system as it affects nearly all pathological conditions. A review in this volume describes the use of nanobiomaterials as a platform to engineer and direct the immune response. Several diseases such as cancer, cardiovascular disease, type-I diabetes, arthritis and inflammatory bowel disease are covered in this context. With increasing use and interface of life-saving biomaterials and external devices with the human body, it is essential for the safety of the patients that these devices are always powered and never switched-off. Even after significant improvement in battery life and capacity,

there is a need to power the wearable/implantable devices such that no surgical/medical intervention is needed to recharge/replace the battery. Drawing power from the humans is an attractive source and this nascent field is reviewed here with several examples of such devices both in animals and humans. Choice of materials, designs and operation principles of the devices are discussed. This volume also contains two general reviews giving information on thrombosis and sulphated glycosaminoglycans, and how future biomedical diagnosis and therapies would need to incorporate these pathways for better patient care.

Overall, this volume covers nearly all major areas of biomedical engineering. An area that could have been included is prosthetic devices. A theme-based organization of the reviews could also be beneficial to the readers to navigate through the volume. Nonetheless, all reviews presented here are of excellent quality and have cited several references providing the reader with ample reading material to delve deeper. The authors have included several illustrations and figures making it easy to understand and get a bird's eye view of the respective area. Another good aspect of the volume is that most reviews provide a perspective on future trends and directions of unexplored fields in biomedical engineering, which makes it a fascinating read for anyone working or interested in this area.

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