

# Drug Discovery in Africa

Impacts of Genomics, Natural Products, Traditional Medicines, Insights into Medicinal Chemistry, and  
Technology Platforms in Pursuit of New Drugs

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# Preface

It is vital for African scientists to enhance the drug discovery capability of the continent to address African health needs. This book highlights the status of early stage drug discovery activities in Africa with a view to capturing strengths, weaknesses and opportunities within this field. The book demonstrates that at present, drug discovery expertise in Africa exists in part, yet has huge potential to build capacity and competency in the relevant areas of drug discovery including target identification, hit discovery, medicinal chemistry, preclinical pharmacology as well as drug metabolism and pharmacokinetic studies.

The following 17 chapters cover diverse topics from target identification and validation, hit identification and hit to lead medicinal chemistry progression, through to drug delivery systems. Some chapters offer a historical overview of Africa's efforts at drug discovery from traditional medicines through to natural product-driven search for hits against infectious and non-communicable diseases. While the sources of the contributions clearly indicate that only a few places in Africa have established the competencies to champion modern drug discovery, network-based initiatives such as the African Network for Drugs and Diagnostics Innovation, ANDI, demonstrate an emerging strategy to build capacity for drug discovery research across Africa. Some chapter contributions have been made by international researchers who have committed their research efforts to finding healthcare solutions for Africa. These colleagues are a vital link for African researchers to the international community.

To the best of our knowledge, this is the first book dedicated to contemporary drug discovery approaches in Africa. Although traditional medicines' research has often characterised research agendas at many African institutions, they have rarely yielded verifiable results with respect to the treatment or control of infectious and non-communicable diseases responsible for the high morbidity and mortality in Africa. Reasons for this lack of participation in drug discovery by African institutions and scientists are varied and include a lack of a common culture of research and innovation, limited government and/or private sector financial support for drug discovery research, and poor access to technological platforms and pharmaceutical industry expertise. Contributions in this book seek to break the myth

that it is not possible to do good science in Africa, as they demonstrate emerging world class scientific work by researchers on the African continent. The book therefore hopes to inspire a new generation of African scientists to courageously build on the cases presented in this book, to witness African scientists contributing significantly to the discovery of medicines for diseases that are partly responsible for the stagnation of Africa's social and economic progress.

The drug discovery process is a multidisciplinary undertaking requiring teams composed of biochemists, medicinal chemists, pharmacologists, molecular biologists, computational chemists and many others. In putting together this book, we have tried to bring to bear the contributions of these various experts towards the one objective of drug discovery. In a conventional pharmaceutical industry setting, experts work in integrated teams with a shared project vision and committed resources to meet set targets and deliverables. Chapters presented here, however, reflect scattered efforts by individuals in time and space, involving isolated aspects of the drug discovery process. This suggests that presently little will change in the emergence (or lack thereof) of drugs from Africa. This book, however, aims to highlight identified areas of expertise which we hope can be forged into an effective drug discovery pipeline.

The book covers current sciences and technology for drug discovery: crystallography in discerning ligand–enzyme interactions in the design of angiotensin-converting enzyme (ACE) inhibitors, harvesting the chemical diversity of the plant and marine biodiversity of Africa; novel approaches in target discovery against *Mycobacterium tuberculosis*; application of in silico, in vitro and in vivo Drug Metabolism and Pharmacokinetics (DMPK) in the whole drug discovery value chain; exploration of nanotechnology as a drug delivery vehicle to rescue old drugs by addressing their PK and safety limitations; and repositioning of some drugs for the treatment of infectious diseases. The authors address new ideas emerging on how to increase chances of identifying lead compounds from natural products, given the clear need for a paradigm shift from the traditional approaches that generally resulted in either reports of medicinal plant extracts having activity in a standard microorganism-based assay, or the purification and structural elucidation of natural products, publishing a paper and storing the pure compounds in a laboratory cupboard. The book also takes stock of some important initiatives towards drug discovery across the continent, and highlights the failure of most governments to honour their promise to fund science, technology and innovation.

This book targets African life sciences institutions and their leaders to inspire them to give high priority to science and technology that supports the drug discovery process. It also targets young scientists, and encourages them to see the exciting opportunities in the field of drug discovery and development. Above all, the book targets the policy makers on the need to have budget lines for drug discovery initiatives, because we believe that results from such investments can have positive national and continental implications. The book ultimately aims to demonstrate to the international community the seriousness with which Africa is taking the need to engage in drug discovery research.

As editors of this book, we are grateful to all the leading researchers who have given up their time to write the chapters in this book. They have demonstrated the team spirit that is required for a successful drug discovery campaign. We would also like to thank the scientists who reviewed these chapters, ensuring they meet international standards. We are grateful to Dr. Aloysius T. Nchinda for coordinating the writers and reviewers, completed with exceptional levels of professionalism, and wish to thank Dr. Heather Davies-Coleman for proofreading the chapters and ensuring consistency in the presentations.

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