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Foundations and Advances in Pharmaceutical Sciences

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PREFACE

Pharmaceutical sciences continue to evolve through the integration of natural product research, drug design, formulation development, and pharmacological evaluation. The increasing complexity of healthcare demands a multidisciplinary understanding of medicines, from their origin and development to their therapeutic application and regulatory evaluation. This book, *Integrated Pharmaceutical Sciences: From Natural Sources to Therapeutic Applications*, was prepared to provide a concise and structured overview of major domains within pharmaceutical sciences.

The book presents fundamental and applied concepts related to pharmacognosy, pharmaceutics, pharmaceutical chemistry, and pharmacology in an integrated manner. Each chapter has been designed to provide clear academic content with emphasis on practical relevance, recent developments, and current pharmaceutical approaches. Topics included range from natural drug sources and phytochemicals to novel drug delivery systems, toxicological screening, regulatory aspects, nanotechnology, and personalized medicine.

This book is intended for undergraduate and postgraduate students, researchers, and academic professionals seeking a compact interdisciplinary resource in pharmaceutical sciences. The contributors have aimed to maintain scientific accuracy while presenting the material in a concise and accessible format.

We hope this book will contribute to academic learning and encourage further exploration in the field of pharmaceutical sciences.

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Chapter – 15

Future Trends in Pharmaceutical Sciences

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15.1. Introduction

The discipline of pharmaceutical sciences is undergoing a transition driven by the integration of computational technology, advanced biotechnology, and materials science. The traditional paradigm of drug discovery relied heavily on the mass screening of chemical libraries to identify active molecules for broad patient populations. This approach is giving way to highly targeted, data-driven methodologies. Researchers now utilize predictive algorithms to design specific molecules for defined biological targets. The focus is shifting from treating acute symptoms to modifying underlying disease mechanisms and providing potential cures for chronic or genetic conditions.

The complexity of therapeutic agents is increasing. Historically, the pharmaceutical industry focused on small organic molecules with low molecular weights. These molecules are easily synthesized and generally suitable for oral administration. Modern research emphasizes complex biological macromolecules, including monoclonal antibodies, therapeutic proteins, and nucleic acids. These large molecules offer high specificity for their targets. They also present significant challenges regarding physical stability, manufacturing scale-up, and systemic delivery.