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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 - 6

Herbal Formulation Development

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6.1. Introduction

Herbal formulation development involves the systematic integration of botanical materials into delivery systems suitable for human administration. The process requires adapting traditional medicinal knowledge to modern pharmaceutical engineering principles. Unlike conventional allopathic medications, which typically contain a single synthetic chemical entity, herbal formulations comprise complex mixtures of secondary metabolites. These metabolites interact with multiple biological targets simultaneously. This polyvalent pharmacology requires specialized approaches in formulation science to ensure therapeutic efficacy, physical stability, and patient safety.

The primary objective of formulating herbal medicines is to convert raw, often unpalatable plant materials into standardized, convenient, and stable dosage forms. Crude plant materials possess inherent variabilities derived from genetic, environmental, and post-harvesting factors. Developing a consistent pharmaceutical product from inconsistent raw materials constitutes the core challenge of this discipline. Formulators must apply principles of physical pharmacy, analytical chemistry, and chemical engineering to mitigate this variability.