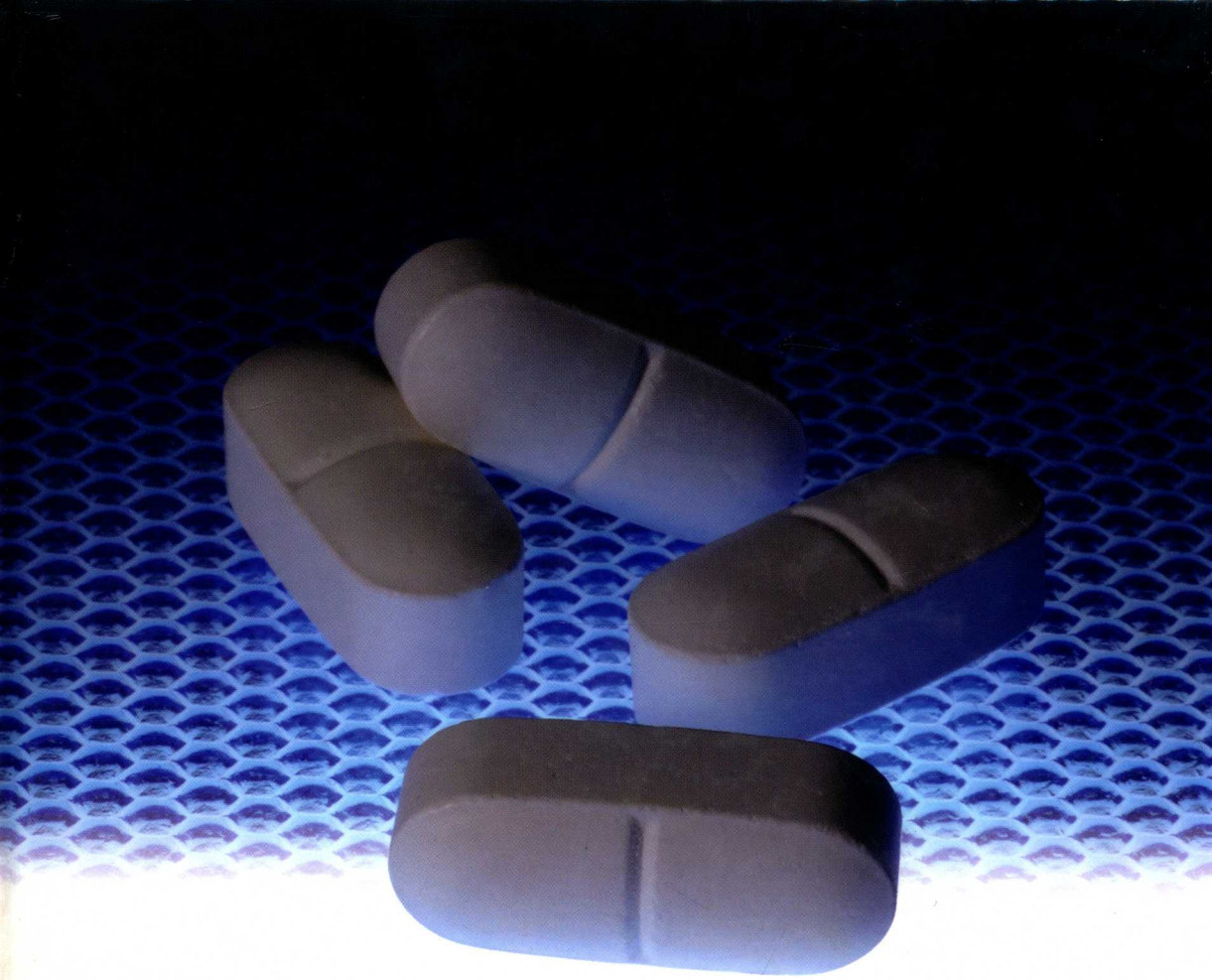
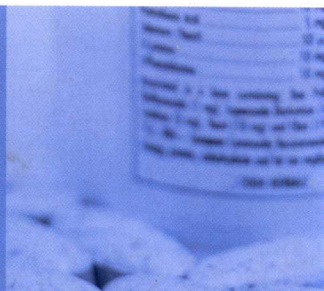


PHARMACOLOGY

for the Health Care Professions

CHRISTINE M. THORP



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Pharmacology for the Health Care Professions

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Pharmacology for the Health Care Professions

This book is dedicated to
the memory of my mother

Foreword

Students of pharmacology are well served by a number of academic textbooks on their subject but the majority are written from a traditional academic viewpoint. This new book is different in that it is written specifically for the audience of the Health Care Professions and the author Dr Christine Thorp is particularly well qualified in this respect.

Dr Thorp graduated from the School of Pharmacy and Pharmacology at the University of Bath, first with a BSc in 1975 and then with a PhD in 1979 providing her with a traditional academic view of pharmacology and experience of research. Since then she has undertaken a number of roles, most recently in the Faculty of Health and Social Care at the University of Salford, with responsibility for teaching pharmacology to students in a variety of Health Care Profession disciplines.

Dr Stephen Moss BPharm, MSc, PhD, FRPharmS
Department of Pharmacy and Pharmacology
University of Bath
July 2008

Preface

The need for a book such as this one has arisen as a result of recent changes in legislation and expansion in the numbers of health care professionals involved in administration and/or prescription of medicines.

The book is an introduction to pharmacology for health care professionals. Although anyone involved in the care of patients is a health care professional, this book has been specifically written for physiotherapists, podiatrists and radiographers (otherwise known as *allied health professionals*). However, the book may be of interest to other health care professionals.

The book aims to provide the knowledge of pharmacology necessary for undergraduates of all three professions and practitioners on post graduate programmes for accreditation of supplementary prescribing or access and supply of prescription-only medicines. It may also be of more general use to any health care professional involved in patient care, especially those who administer medicines under patient group directions.

The book is arranged into three parts. In the first part, Principles of Pharmacology, two chapters cover administration, absorption, distribution, metabolism and excretion of drugs (Chapter 2) and adverse drug reactions, drug–drug interactions, individual response to drugs and targets for drug action (Chapter 3).

The second part is Systemic Pharmacology, which covers common disorders of the major body systems and their treatment. The cardiovascular, respiratory, endocrine, musculoskeletal, skin and central nervous systems are considered. An outline of normal physiology of the systems is included where appropriate and relevant diseases described briefly. This is not intended to be a physiology book or a pathophysiology book. Should the reader need to consult such books, suggestions are given in the bibliography. Major groups of drugs are discussed, with emphasis on areas of relevance to the three professions for whom the book is intended.

In addition to drugs used to treat diseases of the major systems, the treatment of infections and parasites, the use of cancer chemotherapy, the use of anaesthetics and analgesics and the use of contrast agents and adjuncts to radiotherapy are included in Part 2.

The final part has two chapters. The first of the two (Chapter 14) is about legislation around the use of medicines with discussion of salient points from the Medicines Act 1968 and the Misuse of Drugs Act 1971. Specific exemptions for podiatrists, the use of patient group directions, supplementary prescribing and independent prescribing and a brief history of non-medical prescribing are considered.

The final chapter (Chapter 15) 'Prescribing in Practice' consists of contributions from podiatry, radiography and physiotherapy colleagues. They have described the use of

various forms of access, supply, administration and prescription of medicines in their professions today and considered future developments in the light of the recent legislation allowing pharmacists and nurses to train as independent prescribers. Hopefully this will give the reader a realistic view of what is currently happening and what might happen in non-medical prescribing.

Useful web sites are listed at the end of each chapter, to encourage the reader to use the Internet for sources of reliable and respectable up-to-date information about disease, medicines and therapeutics. Although all websites were accessible at the time of writing, their existence cannot be guaranteed in the future.

Each chapter is followed by one or more case studies to illustrate the clinical use of drugs and problems that may arise from drug–drug interactions and adverse reactions. The situations are not based on any particular individuals; rather information has been gathered from many sources including my colleagues in physiotherapy and podiatry and used to construct the cases.

Finally, the chapters are finished off with review questions to test the reader's understanding of key concepts.

In the appendices, a list of drug names with their main therapeutic uses and a glossary of key terms used in the text are provided.

Drugs in current use are not all covered in this text; neither is this work intended as a recommendation for any drug use. Professionals should always consult the latest edition of the *British National Formulary* for definitive information about medicines.

Acknowledgements

I would like to thank friends and colleagues who encouraged and supported me in the writing of this book from its early inception through to final completion. I especially want to thank Leah Greene for her technical expertise and unfailing assistance with computer applications. I am grateful to Alison Barlow and Peter Bowden for their helpful ideas with matters relating to podiatry and Louise Stuart, MBE (Consultant Podiatrist) for an insight into supplementary prescribing; to Jan Dodgeon for help with topics relevant to radiography and Chris Frames and Chris O'Neal for their help with devising physiotherapy case studies.

Special thanks are due to those who contributed to Chapter 15, namely Professor Peter Hogg (Nuclear Medicine) and his co-authors, and Anthony Waddington (Podiatric Surgeon). Without their experience in practice this book would have had far less relevance to the health care professionals for whom it was written.

I have to thank students past and present for their inspiration, comments and suggestions over the years and I hope future students and practitioners will benefit from this.

Thanks to staff at Wiley (in particular Rachael Ballard, Fiona Woods and Jon Peacock), to Neil Manley for creating the index, and to Wendy Mould, who copyedited the book.

Finally, thanks to Alex for his understanding and patience.

Contents

1

Introduction

Pharmacology is the science of drugs and their effects on biological systems. A drug can be defined as a chemical that can cause a change in a biological system; the important biological system to be considered in this book is the human body. A drug is the active ingredient in a medicine; a medicine is the formulation of a drug into a tablet, capsule or other delivery system. The Medicines Act 1968 refers to drugs as medicinal products.

Drugs can be naturally occurring substances, for example hormones; everyday substances, for example caffeine and alcohol; synthetic chemicals marketed for therapeutic activity, for example aspirin; or substances used for recreation.

Pharmacology as a science encompasses the following:

- the action of natural chemicals in the body;
- the origins and sources of drugs;
- their chemical structure and physical characteristics;
- their mechanisms of action;
- their metabolism and excretion;
- studies of their action on whole animals, isolated organs, tissues and cells, enzymes, DNA and other components of cells;
- ultimately studies of their actions in humans and their therapeutic uses.

Pharmacology is also the study of the toxic effects of drugs and chemicals in the environment. All drugs are capable of being toxic and all drugs can produce unwanted effects at high doses, or if used incorrectly. The difference between a medicine and a poison is often merely a matter of concentration. In therapeutics, the treatment of disease is intended to have a beneficial effect with adverse effects kept to an acceptable minimum. The science of modern pharmacology is a relatively recent development. Prior to the 1930s, there were very few medicines available, and those that were available came from natural sources. Examples of drugs originally from natural sources and still in use today are quinine (from the bark of the cinchona tree and used to treat malaria), digitalis (from the foxglove and used for heart failure) and aspirin (extracted from the bark of willow tree and originally used to treat fever).

Development of new drugs can happen in many ways. Drugs have been developed following observation of side effects when being used for other purposes. It is now known

Pharmacology for the Health Care Professions Christine M. Thorp

that the site of action of many drugs is a cellular receptor. As knowledge of receptor structures has developed, this has allowed drugs to be designed to fit with receptors. The human genome project and mapping of genes has led to work on the development of drugs to alter genes.

1.1 Pharmacology and health care professionals

The importance of pharmacology to health care professionals cannot be overestimated. Members of the three professions, physiotherapy, podiatry and radiography, encounter patients on a daily basis, many of whom will be on drug therapy. Patients are increasingly likely to be receiving at least one drug; many older patients are likely to be on more than one drug, and prescription of eight or nine drugs at the same time is not uncommon. This is known as *polypharmacy* and it increases the chance of patients experiencing adverse effects or the effects of drug–drug interactions.

Depending on the nature of their work, health care professionals may spend some considerable time with individual patients who might have questions about their drug therapy. Some health care professionals may be treating mainly older patients, or younger patients or high-risk patients, and will become experienced and familiar with drugs in their areas of expertise.

Health care professionals can be ideally placed to spot adverse drug reactions and to play an important role in the long-term monitoring of commonly prescribed drugs. As professionals, they should be able to advise patients or know when to refer them to other experts in the health care team. Drug therapy of disease is ever expanding; new drugs exist for effective treatment or cure of more diseases than ever before. Correct use of drugs is paramount. It is therefore important for health care professionals to have an understanding of therapeutic uses of medicines, normal doses, adverse effects, interactions with other drugs, precautions and contraindications. It is equally important to be able to judge whether a change in a patient's condition is caused by drug therapy, or a change in the disease process. Medication can lead to symptoms such as dizziness, fatigue, dry mouth, constipation and patients may or may not associate new symptoms with drug use.

Health care professionals are increasingly involved in the administration of drugs to patients, either as an exemption to the Medicines Act 1968, under patient group directions, or as supplementary prescribers. The Medicines Act 1968, and additional secondary legislation since then, provides a legal framework for the manufacture, licensing, prescription, dispensing and administration of medicines. An exemption to the Medicines Act allows certain professionals, including podiatrists, access to specified prescription-only medicines, providing they are appropriately registered with the Health Professions Council. The use of patient group directions allows many health care professionals to administer prescription-only medicines to specific groups of patients without a normal prescription. Podiatrists, radiographers and physiotherapists are now included in the list of health care professionals who can train to prescribe medicines alongside doctors (and dentists) as supplementary prescribers.

Prior to 1994, only doctors, dentists and veterinary practitioners were allowed to prescribe medicinal products in the United Kingdom. That year the law was changed to enable district nurses, midwives and health visitors to prescribe from a limited formulary of dressings, appliances and some medicines. This formulary of medicines was extended in 2002.

A review of prescribing, supply and administration of medicines for the Department of Health (1999) (Crown Report 2) recommended two types of prescriber: independent and supplementary.

Over the next few years, supplementary prescribing by nurses and pharmacists was introduced and legislation to allow this was changed in April 2003.

A similar process occurred with podiatry, physiotherapy and radiography and led to extension of supplementary prescribing to these professions in April 2005. In a further development in 2006, nurses and pharmacists became eligible to train as independent prescribers.

Non-medical prescribing is now the term applied to prescribing by members of the health care professions who are not 'medically' qualified.

Prescribing can be described in the following three ways:

1. to order in writing the supply of prescription-only medicine for a named patient;
2. to authorize by means of an NHS (National Health Service) prescription the supply of any medicine (prescription-only, pharmacy or general sales list item) at public expense;
3. to advise a patient on suitable care or medication, including over-the-counter drugs, and therefore with no written prescription.

All health care professionals who are involved in prescribing, and/or administration of medicines have to abide by standards set out by their respective professional bodies. For podiatrists, radiographers and physiotherapists, this is the Health Professions Council. Health care professionals have a responsibility to consult documentation produced by the professional bodies and be accountable for prescribing and administering drugs. All members of health care professions have a responsibility to reduce the risk of errors in prescribing, must assess and appraise their own practice and show a commitment to continuing professional development. This is essential not least because information about drugs and associated legislation is constantly changing. New drugs come on the market, and others are withdrawn or reclassified. Reliable sources of information are the *British National Formulary* (*BNF*), the *Monthly Index of Medical Specialities* (*MIMS*), the *British Pharmacopoeia* (*BP*), patient information leaflets (PILs) and summaries of product characteristics (SPCs) supplied by medicines manufacturers. Official bodies concerned with the use, quality and safety of medicines are the Commission on Human Medicines (CHS, formerly the Committee on the Safety of Medicines), the Medicines and Healthcare Products Regulatory Agency (MHRA) and the National Institute for Health and Clinical Excellence (NICE).