MARTINDALE

The Extra Pharmacopoeia

Incorporating Squire's Companion

Twenty-seventh Edition

EDITED BY AINLEY WADE

ASSISTANT EDITOR
JAMES E. F. REYNOLDS

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Preface

The aim of Martindale—The Extra Pharmacopoeia—since it was first published by William Martindale in 1883 has been to provide a concise summary of the properties, actions, and uses of drugs and medicines for the practising pharmacist and medical practitioner. With each succeeding edition the task of condensing the accumulated knowledge on drugs becomes more difficult. By increasing the page size and improving the typography it has been possible to include many more drugs and preparations in this edition and yet keep the book within a single volume. The increase in the amount of information required by the medical and pharmaceutical professions makes this edition more than thirty times the size of the first volume and the amount of information has been increased by about fifteen per cent since the twenty-sixth edition. While we have aimed at supplying the needs of the professions in the United Kingdom we have also kept in mind the numerous readers who are overseas and who are working in various related professions and industries, in libraries of all types, and in schools of pharmacy and medicine.

The trends noted in the last edition to a decrease in the rate of introduction of new drugs and an increase in the number and depth of published studies on both new and existing drugs have continued. Old drugs only slowly fade away and few deletions have been possible. Information on old drugs not included in this edition should be sought in the earlier editions of the Extra Pharmacopoeia.

The organisation of clinical trials and surveys on a worldwide or cooperative basis has led to more definitive answers being available on such problems as treatment regimens for leukaemia, the prevention and treatment of cardiovascular disease, treatment regimens for tuberculosis, the association of toxic effects with particular forms of treatment, and the quantification of the risks involved in various forms of drug use.

As with previous editions, the revision process has continued on the printer's proofs and new material has been added up to the beginning of 1977.

The last five years have seen a sustained growth of interest in drug information. It has long been held that all pharmacists should be able to provide information on the drugs they handle but with the increasing thirst for information on drugs this approach has been found inadequate and drug information specialists have been established at several levels. They provide a focus for the active dissemination of drug information to the health professions and collect and collate information from a variety of sources to answer specific questions. The information most frequently asked for by the medical profession, pharmacists, nurses, and other health professionals can be summarised as the identity, availability, therapeutic use, and administration of medicines; side effects and toxic effects; suitability for the patient; and dose. The contents of Martindale can answer most such questions through the basic information provided on the properties and uses of the great majority of drugs in use throughout the world.

In this edition, the style of recent editions has been followed closely but several features have been covered in more detail than before. Proprietary names for single drugs in use overseas have been added in greater numbers. Special attention has been given to names used in Australia, Canada, France, Germany, Japan, South Africa, Sweden, and the United States of America. Monographs on more than 900 new drugs have been added. Many of these drugs are from overseas and though not familiar in Britain are similar in properties to well-known drugs; some are making their first appearance in Martindale in spite of their having been available for a number of years. This wide coverage of the world's medicines should make it possible to confirm the identity of most preparations or to suggest a suitable substitute.

Because pharmacists are now more interested in clinical pharmacy and because more pharmacy students are undergoing clinically orientated studies Martindale is increasingly being used as a textbook as well as in its traditional role of reference book or source of passive information. The range of information sources used in the revision has therefore tended towards the clinical rather than the pharmaceutical.

Some regrouping of monographs into chapters which reflect therapeutic use has again been necessary and new chapters have been added on Levodopa and some other Antiparkinsonian Agents, Propranolol and other Beta-adrenergic Blocking Agents, Prostaglandins, and Vasodilators.

Several major therapeutic developments have occurred in the last five years: more beta-adrenergic blocking agents have been introduced, though so far no satisfactory replacement for practolol has been found; the discovery of hypothalamic releasing factors for pituitary hormones and the development of inhibitors such as bromocriptine has opened up new areas for study, as has the discovery of the hormonal action of vitamin-D metabolites; dopamine has come into therapeutic use and interest in dopaminergic agents and their links with tranquillisers, hypothalamic releasing factors, and enkephalins is providing an underlying rationale for the use of what were until recently treated as distinct groups of drugs; the histamine H_2-receptor antagonist cimetidine has recently been introduced; and there have been further increases in the number of analgesic phenylalkanoic acids and of benzodiazepines. The pharmaceutical industry and academic medicine in Britain have made significant contributions in these areas.

One development that should be recorded is the imminent eradication of smallpox from the world following a sustained programme by the World Health Organization. It is hoped that by the next edition of Martindale the use of smallpox vaccine will be of historical interest only.

In 1969 the metric system of weights and measures was officially brought into use in British medicine and pharmacy: in this edition, Imperial weights and measures have been omitted for the first time. The official introduction of the Système International d'Unités (SI units) has led to further changes in weights and measures and for this reason fuller lists of SI units and their equivalents in the metric and Imperial systems are given on pages xxiii–xxvi.

Arrangement

PART 1 (pages 1–1714) contains monographs on some 3130 substances arranged in 112 chapters. The substances are generally grouped so as to bring together drugs which have similar uses or which have similar actions. Any such classification brings problems in accommodating drugs with several actions. Occasionally, totally new and different uses for an established drug are discovered or a drug may be employed for different uses in different parts of the world. Some groups, such as the sulphonamides, have chemical structures which are as closely related as their uses. Other chemically related groups, such as the benzodiazepines, have had to be separated and grouped with drugs with a similar action in the chapters on hypnotics, anticonvulsants, and tranquillisers. In such cases, cross-references to related drugs are provided in the text.

At the start of some chapters there is an introductory section with a therapeutic or pharmacological classification of the drugs; other chapters begin with brief summaries and abstracts describing the general uses and toxic effects of the group. Monographs on the drugs then follow in alphabetical order of their main titles, except that the monograph on a substance which forms the title of a chapter is usually placed first.

PART 2 (pages 1715–1834) consists of a series of short monographs on some 1040 drugs and ancillary substances arranged in the alphabetical order of their main titles. It includes monographs on obsolescent drugs and on new drugs of insufficient importance or too recently introduced for classification. This section has more than doubled in size since the previous edition,

the increase being mainly in the number of drugs used in proprietary preparations in countries outside the United Kingdom and the United States of America. A Supplementary List of Proprietary Products which are less readily classified is included, together with details of some preparations received too late for inclusion in the main text.

PART 3 (pages 1835–1869) gives the composition of more than 1450 proprietary medicines which are advertised to the public in the United Kingdom and which are usually supplied on demand. The formulas are generally expressed in the terms used by the manufacturers or as described on the labels on the containers. As in earlier editions of Martindale, the claims made for these products and their recommended doses are not included as they are often not supported by the known therapeutic effects of the ingredients in the doses employed. Recent legislation in the United Kingdom and the review of product licences may effect a further reduction in the number of these preparations or affect their composition and indications during the currency of this edition.

Information has not been provided on the provisions of the Medicines Act, the Misuse of Drugs Act, or the Poisons Act, which are subject to frequent revision. Details of current British legal requirements may be found in 'Restricted Medicines and Poisons', published by The Pharmaceutical Press and amended monthly in *The Pharmaceutical Journal.*

Indexes

DIRECTORY OF MANUFACTURERS. Throughout the text the names of manufacturers and distributors are abbreviated. Their full names and addresses are given in this directory. Because of the increased number of proprietary names from many countries included in this edition, the directory has increased from about 900 entries to over 1430, of which about 700 are from overseas.

INDEX TO CLINICAL USES. This index is a guide to the uses described in the text and is not a comprehensive therapeutic index. It refers the reader to the chapters and monographs where the listed diseases are mentioned. Entries have been limited to those diseases where the treatment appears to be effective or widely used. The drugs under each disease heading are listed in order of page number and not of preference.

GENERAL INDEX. To make fullest use of the contents of Martindale the general index should always be consulted. The exhaustive index to the drugs, preparations, compounds, and pharmacological and therapeutic groups in the book has been compiled to exacting standards and this has resulted in an index of about 43000 entries. As in previous editions, the index is arranged alphabetically 'word-by-word' rather than 'letter-by-letter'. A significant change has been made by considering all code-letter combinations as if they were words, regardless of whether capital letters are used. Many cross-references have been added to the text and abstracts to direct the reader to complementary information which may not be easily accessible through the index.

Nomenclature

TITLES. The title of each monograph is in English, with preference being given to British Approved Names, United States Adopted Names, International Nonproprietary Names, and names used in the *European Pharmacopoeia.* Other names given as synonyms include abbreviated English or Latin names of substances included in current or past editions of the *British Pharmacopoeia*, the *British Pharmaceutical Codex*, and the *British National Formulary*; English, American, and Latin synonyms; French, German, Scandinavian, Spanish, Portuguese, Italian, and other foreign names from the relevant pharmacopoeias when these may not be readily

identifiable; manufacturers' code numbers; and trivial chemical names. In new Approved Names it is now general policy to use 'f' for 'ph' in sulpha, 't' for 'th', and 'i' for 'y'. For this reason entries in alphabetical lists and indexes should be sought in alternative spellings if the expected spellings are not found. A table of abbreviated names for radicals and groups used in approved names and titles is given on page xxii.

BOTANICAL NAMES. The nomenclature follows the International Rules of Botanical Nomenclature.

CHEMICAL NAMES. The nomenclature generally follows the definitive rules issued by the International Union of Pure and Applied Chemistry, 1957–75, as accepted by The Chemical Society, London.

NAMES OF MICRO-ORGANISMS. The nomenclature used is principally that of the *Catalogue of the National Collection of Type Cultures – 1972* (Public Health Laboratory Service Board, London, HM Stationery Office, 1972), *Nomenclature of Fungi Pathogenic to Man and Animals* (Medical Research Council Memorandum No. 23, 3rd Edn, HM Stationery Office, 1967), *The National Collection of Industrial Bacteria: Catalogue of Strains* (2nd Edn, Edinburgh, HM Stationery Office, 1964 and supplements), and *Index Bergeyana* (London, E. & S. Livingstone, 1966).

Pharmacopoeias

The titles of substances included in the *British Pharmacopoeia* or the *British Pharmaceutical Codex* are followed in parentheses by the initials *B.P.* or *B.P.C.* Substances which are the subject of monographs in the *European Pharmacopoeia*, Volumes 1 to 3, or the International Pharmacopoeia are similarly indicated by the abbreviations *Eur.P.* or *I.P.* after the main title or synonyms.

The pharmacopoeias in which each substance appears are listed and differences of chemical, pharmaceutical, or therapeutic significance are indicated. The pharmacopoeias should be consulted for confirmation and for details of standards.

The following foreign pharmacopoeias and related publications have been examined for this edition:

Austrian suppl. 1
French
Italian
Japanese
Jugoslav
Netherland
Nordic addenda to 1974
Russian
Swiss and suppl. 1
United States and suppl. 1
Australian Pharmaceutical Formulary
Danish Dispensatory amendments to 1973
United States National Formulary and suppl. 1

Atomic and Molecular Weights

Atomic weights are based on the table of Atomic Weights as revised in 1971 by the Commission on Atomic Weights, XXVI International Union of Pure and Applied Chemistry Conference and based on the ^{12}C scale (see page xxxii). Molecular weights are given corrected to one place of decimals or to four significant figures for relative weights of less than 100.

Doses

The doses given in the statements under the heading 'Dose' are usually those in the *B.P.* or *B.P.C.* if the drug is described in either of these publications. In other instances, the doses quoted are generally those of another pharmacopoeia or standard reference book. For some drugs the stated doses represent the range found to be effective in clinical reports or known to be used and suggested by the manufacturers or licensing authorities. Unless otherwise stated, the

doses represent the average range of quantities which are generally regarded as suitable for adults when administered by mouth and may usually be repeated three or four times in twenty-four hours; if it is usual to administer a drug by a method other than by mouth, the dose suitable for that method of administration is stated. More detailed information on doses and drug administration is usually given in the text under 'Uses' and in the abstracts. Because the strength, dose, route, and frequency should be stated on all prescriptions, strengths to be supplied when none is specified on the prescription or order have not been included in this edition. Unless otherwise specified, Dextrose Injection is 5% w/v, Sodium Chloride Injection is 0.9% w/v, and water is purified water.

When doses for children are expressed as a range of quantities within specified age limits, the lower dose applies at the lower age and the higher dose at the higher age.

Doses are given in the metric system, as was the wish expressed by William Martindale in the Preface to his first edition in 1883. The present edition is the first in which the Imperial system has not been included. However, the simple metric system envisaged by William Martindale is already being superseded by the more coherent International System (SI) for pharmacy and medicine, and for general use in trade and commerce.

While every attempt has been made to check all the statements made, the publisher cannot accept any responsibility for errors or omissions.

Equivalents for units of weights and measures in the Imperial, metric, and international systems are given on pages xxiv–xxvi.

Pharmaceutical Information

Chemical and physical properties likely to be of use or interest are given for each drug. Special attention has been paid to the collection of data on the stability of drugs and on incompatibilities with drugs and preparations of drugs, particularly those likely to occur in solutions for intravenous administration. Compared with publications on uses and toxic effects, there is a relative dearth of useful publications on the properties of drugs.

ISO-OSMOTIC SOLUTIONS. The term iso-osmotic is used for solutions which exert the same osmotic pressure as serum and does not necessarily indicate that such solutions would be in osmotic equilibrium with red blood-cells. It is used in preference to the more generally employed term 'isotonic' which in pharmaceutical practice has not always been correctly used to indicate osmotic equilibrium with red blood-cells. Care is necessary if solutions not in osmotic equilibrium with red blood-cells are administered by rapid intravenous infusion. The osmotic activity of the blood or its components is sometimes expressed in milliosmoles (mosmol). An osmole has the molal concentration in moles per 1000 g of solvent [molar concentration is in moles per 1000 g of solution] of an ideal solution of a non-dissociating substance which exerts the same osmotic pressure as the solution under consideration; it is calculated as the weight of any solute that depresses the freezing point of water by 1.86°. For real solutions correction factors have to be applied.

PERCENTAGE STRENGTHS. Unless otherwise stated, solutions of solids in liquids are expressed as percentage w/v, of liquids in liquids as percentage v/v, and of gases in liquids as percentage w/w.

SOLUBILITY. The figures given for solubility in each monograph have generally been obtained from the major pharmacopoeias in which the drug is described or from the manufacturers. These sources have not always used comparable materials or methods of determination and the figures should not be considered absolute. Unless otherwise indicated in the text, the figures are for solubility at 'ordinary room temperature'. At one time this was considered to be in the range

15° to 20° but 20° to 25° is the probable range in most laboratories today. In this edition, the solubility terms used by most of the world's pharmacopoeias have been adopted:

solubility		*solubility*	
very soluble	1 in less than 1	slightly soluble	1 in 100 to 1 in 1000
freely soluble	1 in 1 to 1 in 10	very slightly soluble	1 in 1000 to 1 in 10000
soluble	1 in 10 to 1 in 30	practically insoluble	1 in more than 10000
sparingly soluble	1 in 30 to 1 in 100	insoluble	

STORAGE. Substances and preparations should be stored under conditions which prevent contamination and diminish deterioration, and the conditions of storage given in the text indicate the precautions which should be taken in specific cases. The term 'a cool place' is generally used to describe a place in which the temperature does not exceed 15°. Unless otherwise specified, all injections should be stored in alkali-free containers.

TEMPERATURE. Temperatures are expressed in degrees Celsius (centigrade) unless otherwise indicated.

Pharmacological and Therapeutic Information

Information on the toxic effects, treatment of toxic effects, precautions, absorption and fate, and uses of each substance is provided by concise statements under these headings and these are elaborated and expanded by abstracts from published papers and reviews. In compiling these statements the intention has been to present unbiased summaries and, where views are conflicting, to represent these as fairly as possible by a suitable selection of abstracts.

The abstracts of medical and pharmaceutical literature have been a characteristic and valuable feature of Martindale since the book was first published. During revision for this edition a wider selection of journals and abstract journals was used than for any previous edition and at least 65000 abstracts and references from about 1100 journals were considered. Of these about 33000 have been included and data from some of the others have been used. When far too many abstracts were available, as was the case with some drugs such as corticosteroids, benzylpenicillin, and diazepam, a more restricted selection has had to be made to cover the wide variety of doses, uses, and toxic effects reported. Where practicable, abstracts reporting work published in readily available English language journals have been selected. Under some drugs, e.g. digoxin, halothane, and phenytoin, the abstracts have been condensed in a review form.

Much information has been found in sources such as World Health Organization publications, government reports and legislation, British Standards, and other official and standard publications.

The risks of administering drugs in pregnancy are well known and the general principle is to give a drug only when the benefit to the individual mother outweighs the risk to the foetus. Where there is a clear risk it is noted under the Precautions or Toxic Effects heading but safety should not be inferred from the absence of a statement for any drug.

Clinically significant interactions between drugs are stated under the Precautions heading. Surveys show that they are more often due to the similar therapeutic or toxic effects of the drugs than to complicated interactions.

Formulas

Formulas are given for preparations in current editions of the *British Pharmacopoeia*, the *British Pharmaceutical Codex*, and the *British National Formulary*, and for those preparations in earlier editions of these publications which enquiries have indicated are still required. Similarly, formulas are given for preparations in the *United States Pharmacopoeia* and *National Formu-*

lary, and formulas from other pharmacopoeias are also included if they are considered to be of special interest. Selected formulas from hospital and Commonwealth formularies and from the medical and pharmaceutical literature are included for their special interest to those pharmacists required to formulate comparable preparations.

Preparations of the *British National Formulary*, and its predecessors the *National War Formulary* and the *National Formulary*, which were not formulated in the metric system have been converted to the metric system according to the procedure based on the Weights and Measures (Equivalents for dealing with drugs) Regulations 1970 (SI 1970: No. 1897) and the instructions issued by the Department of Health and Social Security. Preparations from editions of the *British Pharmaceutical Codex* prior to 1968 are formulated in the metric quantities indicated in the appropriate edition, where these are given, or in accordance with the above procedure. Dose volumes have been converted to the approximately equivalent metric volumes of 4 or 15 ml; pharmacists in the United Kingdom are required by the Regulations to dispense dose volumes of 5 or 10 ml, or multiples of these amounts, and they should satisfy themselves that the adjustment may be made without the properties of the preparation being affected. However, the Regulations also state that for a prescription for a preparation in any edition of the *British Pharmaceutical Codex* or *National Formulary* prior to 1968 whose formula is expressed in Imperial units there shall be dispensed the formula in metric units given in the *Compendium of Past Formulae 1933 to 1966* (London, The National Pharmaceutical Union, 1969). Where the formulas of the *Compendium* differ from the formulas revised according to the above procedure, they are given also as amended formulas.

Ingredients of preparations are named according to the title under which they are described in Martindale; in the preparation of medicaments to formulas originating outside the United Kingdom it is necessary to ensure that ingredients of suitable quality are employed if it is intended that the product should comply with the standards specified by the appropriate authority.

The term 'freshly prepared' is used to indicate that a preparation must be made not more than twenty-four hours before issue for use, and the term 'recently prepared' indicates that deterioration is likely if the preparation is stored for more than a few weeks at temperate room conditions.

Proprietary Preparations

In Parts 1 and 2, the information on proprietary preparations available in the United Kingdom is presented in the same manner as in the last edition, each product being described at the end of the monograph on its principal ingredient. The proprietary names of single-ingredient preparations have been included for Australia, Canada, France, Germany, South Africa, Sweden, the United States of America, and for some other countries. It is hoped that the inclusion of this increased number of proprietary names will assist pharmacists and physicians in identifying the active ingredients used; the route of administration and dose may not be comparable.

The proprietary preparations described in Parts 1 and 2 are mostly those intended for supply on prescription. Most proprietary medicines which are advertised to the public and supplied on demand are described in Part 3.

The information on composition, dosage, and uses of proprietary preparations is mainly taken from the literature issued by the manufacturers or their distributing agents and has been confirmed by them, but no responsibility can be accepted for the accuracy of this information.

Information on diluents suggested for liquid proprietary preparations for oral administration has been provided by the manufacturers or taken from the *Diluent Directory* issued by the National Pharmaceutical Association (formerly National Pharmaceutical Union).

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In preparing Martindale many skills and areas of knowledge are used and the Editor would like to record his thanks to the staff listed on page v who have ably contributed their talents and experience in the preparation of this edition, particularly to the senior staff J. E. F. Reynolds, MPS, M I INF SC, G. E. Diaper, MPS, and Anne B. Prasad, MPS. Thanks are due to Kathleen M. Parfitt, B SC, MPS, Linda Hanrahan, and Maureen Dempsey who also helped with editorial work and proof reading, and to Anne Gatland, BA, and Cathleen Wrightson who accomplished the formidable task of typing the manuscript and index of the whole of this edition.

Finally, the removal of the Pharmaceutical Society to its new headquarters at 1 Lambeth High Street during the preparation of this edition breaks the long and happy association with 17 Bloomsbury Square, for 135 years the home of the Society and for over 40 years since the death of William Harrison Martindale the home of the Extra Pharmacopoeia.

London SE1
February 1977

Abbreviations

The titles of journals are abbreviated according to the general style of *World List of Scientific Periodicals* (London, Butterworths, 1963–75).

For abbreviations of the names of manufacturers or their distributors, see Directory of Manufacturers, p. 1871.

~—about, approximately.
α—alpha. Also used in radiation data for alpha particles (see p. 1351).
A—ampere.
Å—ångström.
aa—*ana*, 'of each'.
Aberdeen Roy. Infirm.—Aberdeen Royal Infirmary.
ABPI—Association of the British Pharmaceutical Industry.
ACO Prep.: Sweden—ACO Preparat 1960–1961, Stockholm, Sweden.
Addenbrooke's Hosp., Cambridge—Addenbrooke's Hospital, Cambridge.
Adelaide Child. Hosp.—Adelaide Children's Hospital, Australia.
ADI—acceptable daily intake.
A.D.T.—Accepted Dental Therapeutics, published by the American Dental Association.
agg.—aggregate (in botanical names), including 2 or more species which resemble each other closely.
Ala—alanine.
a.m.—*ante meridiem*, 'before noon'.
AMA—American Medical Association.
A.P.F.—Australian Pharmaceutical Formulary and Handbook, 1974.
Arg—arginine.
Arg.—Argentine or Argentinian.
Arg.P.—Argentinian Pharmacopoeia 1966 (Farmacopea Nacional Argentina, Quinta Edicion).
Asn—asparagine.
Asp—aspartic acid.
ATCC—American Type Culture Collection, 12301 Parklawn Drive, Rockville, MD 20852, USA.
Aust.—Austria *or* Austrian.
Aust. P.—Austrian Pharmacopoeia 1960 (Österreichisches Arzneibuch, 9 Ausgabe) and Supplement I (1966).
Austral.—Australia *or* Australian.
β^+—beta particles: positions (see p. 1351).
β^-—beta particles: electrons (see p. 1351).
B.—*Bacillus*.
BAN—British Approved Name.
Beaumont Hosp., Lancaster—Beaumont Hospital, Lancaster.
Belg.—Belgium *or* Belgian.
Belg.P.—Belgian Pharmacopoeia 1962 (Pharmacopée Belge, Cinquième Édition).
Birmingham Child. Hosp.—Birmingham Children's Hospital.
B.N.F.—British National Formulary. Refers to 1976 Edn unless otherwise specified.
B.P.—British Pharmacopoeia. Unless otherwise specified in the text, *B.P.* references are to the 1973 Edn, including the addendum 1975.
b.p.—boiling point.
B.P.C.—British Pharmaceutical Codex. Unless otherwise specified in the text, *B.P.C.* references are to the 1973 Edn, including the supplement 1976.
Bq—becquerel (see p. 1354).
Br.—*Brucella*.
Braz.—Brazil *or* Brazilian.
Braz.P.—Brazilian Pharmacopoeia 1959 (Farmacopéia dos Estados Unidos do Brasil, 2ª Edição).
Bristol Roy. Infirm.—Bristol Royal Infirmary.
Brompton Hosp.—Brompton Hospital, London.
BS—British Standard (specification).
Bulg.—Bulgaria *or* Bulgarian.
BUN—blood-urea-nitrogen.
B.Vet.C.—British Veterinary Codex. Unless otherwise specified in the text, *B.Vet.C.* references are to the 1965 Edn, including amendments (1966 and 1968) and supplement (1970).
C—Celsius (centigrade). Unless otherwise indicated in the text, temperatures are expressed in this thermometric scale.
C.—*Corynebacterium*.
Canad.—Canada *or* Canadian.
Canad.F.—The Canadian Formulary 1949.
Cape Hosp.—Cape Provincial Administration, Groote Schuur Hospital, Observatory, Cape 7925, South Africa.
Charing Cross Hosp.—Charing Cross Hospital, London.
Chil.P.—Chilean Pharmacopoeia 1941 (Farmacopea Chilena, Tercera Edicion) and amendments 1951.
Chin.P.—Chinese Pharmacopoeia.
CI—Colour Index. (Colour Index, 3rd Edn 1971 and supplements.)
Ci—curie(s) (see p. 1354).
Cl.—*Clostridium*.
CM—Chick-Martin (coefficient) (see p. 535).
cm—centimetre(s).
cm^2—square centimetre(s).
cm^3—cubic centimetre(s).
CNS—central nervous system.
cP—centipoise(s).
CSF—cerebrospinal fluid.
cSt—centistokes.
Cys—cysteine.
Cz.—Czechoslovakia *or* Czechoslovak.
Cz.P.—Czechoslovak Pharmacopoeia 1970 (Československý Lékopis, Vydání třeti; Pharmacopoea Bohemoslovenica, Editio tertia).
D & C—designation applied in USA to dyes permitted for use in drugs and cosmetics.
Dan.—Danish.
Dan.Disp.—Danish Dispensatory 1963 (Dispensatorium Danicum) including all amendments to 1973.

DC—direct current.
Denm.—Denmark.
D.P.F.—Dental Practitioners' Formulary. Unless otherwise specified in the text, *D.P.F.* references are to the 1976 Edn.
D.T.F.—Drug Tariff Formulary: Drug Tariff, 1976 (National Health Service, Department of Health and Social Security).
E.—*Escherichia.*
EC—electron capture (see p. 1354).
ECG—electrocardiogram.
ECT—electroconvulsive therapy.
Ed.—editor(s) *or* edited by.
Edn—edition.
EEG—electro-encephalogram.
e.g.—*exempli gratia*, 'for example'.
EID50—egg-infective dose 50 (the dose of the micro-organism which infects 50% of the eggs inoculated).
ENT—ear, nose. and throat.
ESR—erythrocyte sedimentation-rate.
et al.—*et alii*, 'and others': for three or more co-authors or co-workers.
Eur.P.—European Pharmacopoeia vol. I 1969, vol. II 1971, vol. III 1975, and Supplement 1973.
eV—electronvolt(s).
Ext. D & C—designation applied in USA to dyes permitted for use in external drug and cosmetic preparations.
F—Fahrenheit.
FAO—Food and Agriculture Organization of the United Nations.
FAO/WHO—Food and Agriculture Organization of the United Nations *and the* World Health Organization.
FDA—Food and Drug Administration of USA.
F D & C—designation applied in USA to dyes permitted for use in foods, drugs, and cosmetics.
FDD—Food and Drug Directorate of Canada.
FEV_1—forced expiratory volume in 1 second.
FIGLU—formiminoglutamic acid.
Fin.—Finland *or* Finnish.
fl oz—fluid ounce.
F.N.Belge—The Belgian 'Formulaire Nationale'.
F.N.Fr.—The National Formulary of France 1974 (Formulaire National, I^re Édition).
Formulaire F.N.P.—Formulaire de la Fédération Nationale Pharmaceutique, Paris.
f.p.—freezing point.
Fr.—France *or* French.
Fr.P.—French Pharmacopoeia 1972 (Pharmacopée Française, IX^e Édition) and amendments 1974.
FSC—Food Standards Committee of the Ministry of Agriculture, Fisheries and Food.
ft—foot (feet).
ft^2—square foot (feet).
γ—gamma. Also used in radiation data for gamma-radiation (see p. 1351).
g—gram(s).
gal—gallon(s).
Ger.—Germany *or* German.
Ger.P.—West German Pharmacopoeia 1968 (Deutsches Arzneibuch, 7 Ausgabe).
GFR—glomerular filtration-rate.
Gln—glutamine.
Glu—glutamic acid.
Gly—glycine.
GOT—glutamic oxaloacetic transaminase (aspartate aminotransferase).
GPT—glutamic pyruvic transaminase (alanine aminotransferase).
GRAS—generally recognised as safe. A designation applied to food additives.
Gt Ormond St Child. Hosp.—The Hospital for Sick Children, Great Ormond Street, London.
Guy's Hosp.—Guy's Hospital, London.
Gy—Gray (see p. 1354).
H.—*Haemophilus.*
HA unit(s)—haemagglutination unit(s).
Hadassah Univ. Hosp.—Hadassah University Hospital, Jerusalem, Israel.
Hb—haemoglobin.
HDL—high-density lipoproteins (see p. 362).
His—histidine.
HLB—hydrophilic-lipophilic balance (see p. 319).
Hung.—Hungary *or* Hungarian.
Hung.P.—VIth Hungarian Pharmacopoeia 1967 (Magyar Gyógyszerkönyv).
Hz—hertz.
IAEA—International Atomic Energy Agency.
ibid.—*ibidem*, 'in the same place (journal or book)'.
ICRP—International Commission on Radiological Protection.
ICRU—International Commission on Radiation Units and Measurements.
idem—'the same': used for the same authors and titles.
i.e.—*id est*, 'that is'.
Ig—immunoglobulin.
Ile—isoleucine.
in—inch(es).
in^2—square inch(es).
Ind.—India *or* Indian.
Ind.N.F.—National Formulary of India, 2nd Edn, 1966.
Ind.P.—Pharmacopoeia of India, 2nd Edn, 1966.
Ind.P.C.—The Indian Pharmaceutical Codex 1953.
I.P.—International Pharmacopoeia 1967 (Specifications for the Quality Control of Pharmaceutical Preparations, 2nd Edn) and Supplement 1971.
IQ—intelligence quotient.
i.r.—infra-red.
ISO—International Organization for Standardization.
IT—isomeric transition (see p. 1354).
It.P.—Italian Pharmacopoeia 1972 (Farmacopea Ufficiale della Repubblica Italiana, Ottava Edizione).
Ital.—Italy *or* Italian.
iu—international unit(s).
IUD—intra-uterine device.
J—joule(s).
Jap.—Japan *or* Japanese.
Jap.P.—The Pharmacopoeia of Japan, 8th Edn, 1971.
Jug.P.—Jugoslav Pharmacopoeia 1972 (Farmakopeja SFRJ; Pharmacopoea Jugoslavica, Editio Tertia).
K—kelvin
KA units—King-Armstrong units of serum alkaline phosphatase.
kcal—kilocalorie(s).
keV—kiloelectronvolt(s).
kg—kilogram(s).
King's Coll. Hosp.—King's College Hospital, London.
kJ—kilojoule(s).
Kleb.—*Klebsiella.*
kPa—kilopascal(s).

L.—*Listeria.*
lb—pound(s) avoirdupois.
LD50—a dose lethal to 50% of the specified animals or micro-organisms.
LDL—low-density lipoproteins (see p. 362).
LE—lupus erythematosus.
Leeds Gen. Infirm.—The General Infirmary at Leeds, West Yorkshire.
Leu—leucine.
Lf—flocculation equivalents.
loc. cit.—*loco citato*, 'in the place cited'.
Lys—lysine.
m—metre(s).
m^2—square metre(s).
m^3—cubic metre(s).
M—molar.
M.—*Mycobacterium.*
mA—milliampere(s).
Manchester Roy. Infirm.—Manchester Royal Infirmary.
MAOI—monoamine oxidase inhibitor.
max.—maximum.
MB 1959: Sweden—MB Formulary 1959 (Apotekarsocietetens Förlag, Stockholm).
mCi—millicurie(s).
mEq—milliequivalent(s).
Met—methionine.
MeV—megaelectronvolt(s).
Mex.P.—Mexican Pharmacopoeia 1952 (Farmacopea Nacional de los Estados Unidos Mexicanos, Segunda Edicion).
mg—milligram(s).
MIC—minimum inhibitory concentration.
Middlesex Hosp.—Middlesex Hospital, London.
min—minute.
min.—minimum.
MJ—megajoule(s).
ml—millilitre(s).
mm—millimetre(s).
mm^3—cubic millimetre(s).
mmHg—millimetre(s) of mercury.
mmol—millimole.
mol—mole.
mol. wt—molecular weight.
Moorfields Eye Hosp.—Moorfields Eye Hospital, London.
mosmol—milliosmole.
m.p.—melting point.
Mrad—megarad.
MRC—Medical Research Council.
mrem—millirŏntgen-equivalent-man.
μCi—microcurie(s).
μg—microgram(s).
μl—microlitre(s).
μm—micrometre(s).
N—normal.
N.—*Neisseria.*
nCi—nanocurie(s).
NCIB—The National Collection of Industrial Bacteria (maintained at the Torry Research Station, PO Box 31, 135 Abbey Road, Aberdeen, AB9 8DG, Scotland).
NCTC—National Collection of Type Cultures (Central Public Health Laboratory, Colindale Avenue, London, NW9 5HT).
Neth.—The Netherlands.
Neth.P.—Netherlands Pharmacopoeia (Nederlandse Farmacopee) 6th Edn 1966, 7th Edn vol. 1 (1971) and vol. 2 (1973).
N.F.—National Formulary (now replaced by the British National Formulary).
N.F. units—units defined in the United States National Formulary.
ng—nanogram(s).
NIH—National Institutes of Health.
nm—nanometre(s).
Nord.P.—Nordic Pharmacopoeia 1963 (Pharmacopoea Nordica) including all addenda published up to 1974. This pharmacopoeia is official in Denmark, Finland, Iceland, Norway, and Sweden.
Norw.—Norway *or* Norwegian.
NPU—National Pharmaceutical Union, now the National Pharmaceutical Association (NPA).
NRPB—National Radiological Protection Board.
NRRL—Northern Utilization Research and Development Division, US Department of Agriculture, Peoria, IL, USA (formerly Northern Regional Research Laboratory).
N.W.F.—National War Formulary.
NZ—New Zealand.
N.Z.F.—New Zealand Formulary and amendments.
OP—over proof.
Orsett Hosp.—Orsett Hospital, Essex.
o/w—oil in water.
oz—ounce(s).
P—probability.
PBI—protein-bound iodine.
pCO_2—plasma concentration of carbon dioxide.
p_aCO_2—arterial plasma concentration of carbon dioxide.
per—'through'.
pg—picogram(s).
pH—the negative logarithm of the hydrogen ion concentration.
Phe—phenylalanine.
Pharm. Soc. Lab. Rep.—Pharmaceutical Society's Laboratory Report.
pK_a—the negative logarithm of the dissociation constant.
p.m.—*post meridiem*, 'after noon'.
pO_2—plasma concentration of oxygen.
p_aO_2—arterial plasma concentration of oxygen.
Pol.—Poland *or* Polish.
Pol.P.—Polish Pharmacopoeia 1965 (Farmakopea Polska IV).
Port.—Portugal *or* Portuguese.
Port.P.—Portuguese Pharmacopoeia 1946 (Farmacopeia Portuguesa IV) and Supplements 1961 and 1967.
ppm—parts per million.
Pr.—*Proteus.*
Pro—proline.
Ps.—*Pseudomonas.*
q.s.—*quantum sufficit*, 'as much as suffices'.
Queen Eliz. Hosp. for Child.—Queen Elizabeth Hospital for Children, London.
Queen Eliz. Hosp., S. Australia—Queen Elizabeth Hospital, South Australia.
q.v.—*quod vide*, 'which see'.
R—röntgen (see p. 1355).
rad—radiation absorbed dose (see p. 1355).
REM sleep—rapid-eye-movement sleep.
rem—röntgen-equivalent-man (see p. 1355).
Rochester Methodist Hosp. MN.—Rochester Methodist Hospital, Rochester, MN, USA.

Roum.P.—Roumanian Pharmacopoeia 1965 (Farmacopeea Română. Ediția A. VIII-A) and Supplements I (1968) and II (1970).
Roy. Child. Hosp., Melbourne—Royal Children's Hospital, Melbourne, Australia.
Roy. Free Hosp.—Royal Free Hospital, London.
Roy. Marsden Hosp.—Royal Marsden Hospital, London.
Roy. Melb. Hosp.—Royal Melbourne Hospital, Melbourne, Australia.
Roy. Nat. Orthopaedic Hosp.—Royal National Orthopaedic Hospital, Stanmore, Middx.
Roy. Nat. T. N. and E. Hosp.—Royal National Throat, Nose and Ear Hospital, London.
Roy. Sussex County Hosp.—Royal Sussex County Hospital, Brighton.
Roy. Victoria Hosp., Belfast—Royal Victoria Hospital, Belfast.
Roy. Victoria Infirm., Newcastle—Royal Victoria Infirmary, Newcastle upon Tyne.
Rus.—Russia *or* Russian.
Rus.P.—Russian Pharmacopoeia (State Pharmacopoeia of the USSR, Tenth Edition).
RW—Rideal-Walker (coefficient) (see p. 535).
S.—*Salmonella*.
S. Afr.—South Africa.
St. Andrew's Hosp., Billericay—St. Andrew's Hospital, Billericay, Essex.
St. Bart.'s Hosp.—St. Bartholomew's Hospital, London.
St. John's Hosp.—St. John's Hospital for Diseases of the Skin, London.
St. Mark's Hosp.—St. Mark's Hospital, London.
St. Mary's Hosp.—St. Mary's Hospital, London.
St. Thomas' Hosp.—St. Thomas' Hospital, London.
Scand.—Scandinavian.
SCI—Society of Chemical Industry.
Ser—serine.
SGOT—serum glutamic oxaloacetic transaminase (serum aspartate aminotransferase).
SGPT—serum glutamic pyruvic transaminase (serum alanine aminotransferase).
Sh.—*Shigella*.
Sheffield Roy. Infirm.—Sheffield Royal Infirmary, South Yorkshire.
SLE—systemic lupus erythematosus.
sp. gr.—specific gravity.
Span.—Spain *or* Spanish.
Span.P.—Spanish Pharmacopoeia 1954 (Farmacopea Oficial Española, Novena Edicion).
spp.—species.
St—stokes.
Staph.—*Staphylococcus*.
Stoke Mandeville Hosp.—Stoke Mandeville Hospital, Aylesbury.
Str.—*Streptococcus*.
Suppl.—supplement(s).
Swed.—Sweden *or* Swedish.
Swiss P.—Swiss Pharmacopoeia 1971 (Pharmacopoea Helvetica. Editio Sexta. Édition Française) and Supplement I (1973).
Switz.—Switzerland.
TCID—tissue-culture-infective dose.
TCID50—tissue-culture-infective dose 50 (the dose of the micro-organism which infects 50% of tissue cultures inoculated).
Thr—threonine.
Trp—tryptophan.
Tyr—tyrosine.
UCG—urinary chorionic gonadotrophin.
Uganda N.F.—Uganda National Formulary 1966.
UK—United Kingdom.
Univ. Coll. Hosp.—University College Hospital, London.
Univ. of Iowa—University of Iowa Hospitals and Clinics, Iowa City, IA, USA.
UP—under proof.
US and USA—United States of America.
USAN—United States Adopted Name.
U.S.N.F.—The United States 'National Formulary XIV', 1975, and 1st Supplement, 1975.
U.S.P.—The United States Pharmacopoeia XIX, 1975, and 1st Supplement, 1975.
U.S.P. units—units defined in the United States Pharmacopoeia.
USSR—Union of Soviet Socialist Republics.
u.v.—ultraviolet.
V—volt(s).
V.—*Vibrio*.
Val—valine.
var.—variety.
VLDL—very low-density lipoproteins (see p. 362).
vol.—volume(s).
v/v—volume in volume.
v/w—volume in weight.
WHO—World Health Organization.
w/o—water in oil.
wt—weight.
wt per ml—weight per millilitre.
w/v—weight in volume.
w/w—weight in weight.
Wycombe Gen. Hosp.—Wycombe General Hospital, High Wycombe.

Abbreviated Names for Radicals and Groups

The following abbreviated names for radicals and groups are used in approved names and titles:

Abbreviated Name	*Chemical Name*
acetonide	isopropylidene ether of a dihydric alcohol
acetophenide	methylphenylmethylene
aceturate	α-acetamidoacetic acid
amsonate	4,4′-diaminostilbene-2,2′-disulphonate
besylate	benzenesulphonate
bunapsylate	3,7-di-t-butylnaphthalene-1,5-disulphonate
camsylate	camphor-10-sulphonate
caproate	hexanoate
carbesilate	*p*-carboxybenzenesulphonate
closylate	*p*-chlorobenzenesulphonate
cromacate	[(6-hydroxy-4-methyl-2-oxo-2*H*-1-benzopyran-7-yl)oxy]acetate
cromesilate	6,7-dihydroxycoumarin-4-methanesulphonate
cyclotate	4-methylbicyclo[2.2.2]oct-2-ene-1-carboxylate
cypionate	β-cyclopentylpropionate
dibudinate	2,6 di-t-butylnaphthalene-1,5-disulphonate
diolamine	diethanolamine
edetate	ethylenediamine-*NNN′N′*-tetra-acetate
edisylate	ethane-1,2-disulphonate
eglumine	*N*-ethylglucamine
embonate	4,4′-methylenebis(3-hydroxy-2-naphthoate)
enanthate	heptanoate
estolate	propionate laurylsulphate
esylate	ethanesulphonate
fendizoate	*o*-[(2′-hydroxy-4-biphenylyl)carbonyl]benzoate
gluceptate	glucoheptonate
hybenzate	*o*-(*p*-hydroxybenzoyl)benzoate
hyclate	monohydrochloride hemiethanolate hemihydrate
isethionate	2-hydroxyethanesulphonate
laurylsulphate	dodecylsulphate
megallate	3,4,5-trimethoxybenzoate
meglumine	*N*-methylglucamine
mesylate	methanesulphonate
napadisylate	naphthalene-1,5-disulphonate
napsylate	naphthalene-2-sulphonate
olamine	ethanolamine
oxoglurate	2-oxoglutarate
pamoate	4,4′-methylenebis(3-hydroxy-2-naphthoate)
phenpropionate	β-phenylpropionate
pivalate	αα-dimethylpropionate
steaglate	stearoylglycolate
tebutate	t-butylacetate
teprosilate	1,2,3,6-tetrahydro-1,3-dimethyl-2,6-dioxopurine-7-propane-sulphonate
theoclate	8-chlorotheophyllinate
tofesilate	1,2,3,6-tetrahydro-1,3-dimethyl-2,6-dioxopurine-7-ethane-sulphonate
tosylate	toluene-*p*-sulphonate
triclofenate	2,4,5-trichlorophenolate
trolamine	triethanolamine