AN EXTRA PHARMACOPOEIA COMPANION VOLUME

General Editor: R. G. TODD, F.P.S.

ISOLATION AND IDENTIFICATION OF DRUGS

in pharmaceuticals, body fluids, and post-mortem material

VOLUME 2

Edited by

E. G. C. CLARKE

M.A., PH.D., D.SC., F.R.I.C.

Emeritus Professor of Chemical Toxicology in the University of London at the Royal Veterinary College

Assisted by

Mildred Lang
PH.D., B.SC., M.P.S.

K. G. Marriott
M.SC., A.R.I.C.

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Preface

In the six years that have elapsed since the publication of the first volume of *Isolation and Identification of Drugs* the overall problems facing the toxicologist have become no easier. The annual number of deaths from poisoning in England and Wales, after increasing steadily for several years, has now levelled off at about three thousand:

Year	*1966*	*1967*	*1968*	*1969*	*1970*	*1971*	*1972*
Suicide	1840	1840	1926	1922	1787	1847	1771
Accident	844	873	900	1101	1122	1217	1151
Total	2684	2713	2826	3023	2909	3064	2922

But fatal cases of poisoning do not alone give a true representation of the position, as the great majority of cases recover. When we consider the total admissions to hospitals we find a much more marked increase. In one hospital in England, for example, the number of cases of poisoning admitted went up by 75 per cent between 1965 and 1971.

Similar trends are seen in other countries. For example, the figures for cases of accidental poisoning among children under five years of age reported by the Poisons Control Centres in the United States were:

1969	*1970*	*1971*	*1972*
76,155	70,897	84,370	105,018

Even figures such as these, however, do not give a really true picture of the increasing work of toxicological laboratories. Not only the case-load but also the number of potential poisons has increased, while the problem of drug addiction has assumed even more alarming proportions.

On the other hand, to offset this worsening situation, new and powerful weapons have become available to the toxicologist and increasing experience with older techniques has increased their usefulness.

It is against this background that this supplementary volume has been prepared.

In Part 1, the chapter on Screening Tests for Common Drugs has been completely rewritten in order to meet the changing pattern of drugs found in overdosage and the increasing use made by hospital laboratories of sophisticated equipment. New chapters have been added on the important new techniques of Mass Spectrometry and Radioimmunoassay, while the chapters on Extraction Methods, Gas Chromatography, Infra-red Spectrophotometry, and the Metabolism of Drugs have been supplemented and brought up to date by their original authors. I am most grateful to D. I. Chapman, G. Higgins, P. C. Hirom, J. V. Jackson, H. Leach, A.C. Moffat, M. S. Moss, A.W. Scaplehorn, and R. L. Smith for their contributions.

Part 2 contains 261 monographs, mainly on new drugs, but including revised monographs on eleven of the substances described in the first volume and

monographs on some older drugs for which insufficient information was available when the first volume went to press. I am greatly indebted to A. S. Curry and his staff at the Home Office Central Research Establishment at Aldermaston for supplying ultraviolet and infra-red spectra for most of these compounds, to the Home Office for allowing this work to be done there, to M. S. Moss and his staff, especially P. E. Haywood, for similar data on many of the remaining compounds, to Racecourse Security Services for making these available from their Newmarket laboratory, and to C. Daglish and his staff of the laboratories of the Pharmaceutical Society for providing data on the thin-layer chromatography of the steroids.

Once again, the various pharmaceutical manufacturers listed on page x have been unstinting in their help, both in the gift of drugs and in providing information about them, and again I gratefully acknowledge their co-operation.

Finally, I must express my thanks to Frances Desmond for technical assistance, to my wife for secretarial help, and to the following members of the staff of the Department of Pharmaceutical Sciences of the Pharmaceutical Society for their editorial help: to G. R. Brown for checking the structural formulae, to E. S. Greenfield for his collaboration in the preparation of the chapter on screening tests and in compiling and correlating the ultraviolet and infra-red data, to P. Forbes for assisting with the proofs, and especially to R. G. Todd, Mildred Lang, and K. G. Marriott for their patience and expertise in channelling scientific enthusiasm into the discipline that goes to the making of a book.

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November 1974

E.G.C.C.

Introduction

The arrangement of this supplementary volume closely follows that of the first volume. Such minor modifications as have been considered advisable are recorded at appropriate places in the text. For convenience in cross-referencing and indexing, the page numbers of this volume follow on after those of the first volume, starting at page 871.

Part 1 includes supplementary information on seven of the chapters in Part 1 of the first volume, a rewritten and expanded chapter on Screening Tests for Common Drugs, and new chapters on Mass Spectrometry and the Radioimmunoassay of Drugs. The supplement to the chapter on Paper Chromatography describes an additional system for cannabis. Three new systems for cannabis and steroids are described in the supplement to the chapter on Thin-layer Chromatography which also includes some minor amendments to four of the thin-layer systems described in the first volume.

Part 2 includes monographs on 250 additional substances and revised monographs on eleven of the substances in the first volume—cannabis, hyoscine butylbromide, and the nine substances described in the addenda on pages 599 and 600. The system of presentation of the monographs is the same as that described in the Introduction to the first volume.

Part 3 is arranged in the same way as the corresponding section of the first volume and presents the more important analytical data of Part 2 of the present volume in sequential order and tabular form. The tables are designed to be used in conjunction with the corresponding tables of the first volume.

Appendixes 1 and 2 supersede the corresponding appendixes of the first volume and Appendix 3 is a bibliography of the 490 references cited in the present volume. For references cited in the first volume, the bibliography on pages 810 to 823 of that volume should be consulted.

The general index is a cumulative index to both volumes but, to avoid confusion, references have been omitted to those parts of the first volume that have been superseded in this supplementary volume.

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Abbreviations

A—ampere(s)
Å—ångström(s)
AMA—American Medical Association
a.m.u.—atomic mass unit
ASTM—American Society for Testing and Materials
AWRE—Atomic Weapons Research Establishment
B.P.—*British Pharmacopoeia*
b.p.—boiling-point
B.P.C.—*British Pharmaceutical Codex*
cal—calorie(s)
Ci—curie(s)
cm—centimetre(s)
cm^3—cubic centimetre(s)
cm^{-1}—reciprocal centimetre(s)
d.c.—direct current
e—electron
ed.—editor; edited by
Edn—edition
e.g.—*exempli gratia*, 'for example'
et al.—*et alii*, 'and others'
eV—electron volt(s)
F—Fahrenheit
FAO/WHO—Food and Agricultural Organisation *and the* World Health Organisation
f.p.—freezing-point
g—gramme(s)
gal—gallon(s)
GC—gas chromatography
GC/MS—gas chromatographic and mass spectrometric linked system(s)
g/kg—gramme(s) per kilogram
GLC—gas–liquid chromatography
GSC—gas–solid chromatography
i.e.—*id est*, 'that is'
in—inch
I.R.—infra-red
KeV—Kiloelectron volt(s)
kg—kilogram(s)
l—litre(s)
lb—pound(s)
LD50—a dose lethal to 50% of the specified animals
λ—wavelength
M—molar
m—metre(s)
m^2—square metre(s)
max—maximum
m/e—mass-to-charge ratio
mEq—milliequivalent(s)
mg—milligram(s)
mg/kg—milligram(s) per kilogram
mg/kg/hour—milligram(s) per kilogram per hour
mg/l—milligram(s) per litre
mg/min—milligram(s) per minute
mg/ml—milligram(s) per millilitre
mg%—milligram(s) per 100 grammes or per 100 millilitres
1 mg%—1 milligram per 100 grammes or per 100 millilitres = 10 p.p.m.
ml—millilitre(s)
ml/kg—millilitre(s) per kilogram
mm—millimetre(s)
mmHg—millimetre(s) of mercury
mμ—millimicron(s)—in first volume; replaced by nm(nanometre) in this volume
mol—mole(s)
m.p.—melting-point
MS—mass spectrometry
mU—milliunit(s)
mU/ml—milliunit(s) per millilitre
μCi—microcurie(s)
μCi/μg—microcurie(s) per microgram
μg—microgram(s)
μg/kg—microgram(s) per kilogram
μg/l—microgram(s) per litre
μg%—microgram(s) per 100 grammes or per 100 millilitres
μl—microlitre(s)
μsec—microsecond(s)
N—normal
NCIB—The National Collection of Industrial Bacteria (maintained at the Torry Research Station, PO Box 31, 135 Abbey Rd, Aberdeen, Scotland)
ng—nanogram(s)
ng/ml—nanogram(s) per millilitre
nm—nanometre(s)—in this volume; in place of mμ (millimicron) used in the first volume
nmol—nanomole(s)
oz—ounce(s)
PEG—polyethyleneglycol
pg—picogram(s)
pg/ml—picogram(s) per millilitre
pH—the logarithm of the reciprocal of the hydrogen ion concentration
pK_a—the logarithm of the reciprocal of the dissociation constant of the acid
p.p.m.—parts per million
p.v.c.—polyvinyl chloride
q.v.—*quod vide*, 'which see'
Rf—relative flow (see p. 32)
r.f.—radiofrequency
RRT—relative retention time (retention time of the sample relative to that of a reference compound)
Supp.—Supplement
$t_{\frac{1}{2}}$—half-life
TLC—thin-layer chromatography
U.S. *and* U.S.A.—United States of America
UV *or* U.V.—ultraviolet
viz.—*videlicet*, 'namely'
vol—volume(s)
v/v—volume in volume
w/v—weight in volume
w/w—weight in weight
wt—weight

PART 1: Analytical Techniques

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