

THE MERCCK INDEX

AN ENCYCLOPEDIA OF
CHEMICALS, DRUGS, AND BIOLOGICALS

TWELFTH EDITION

Susan Budavari, *Editor*
Maryadele J. O'Neil, *Senior Associate Editor*
Ann Smith, *Associate Editor*
Patricia E. Heckelman, *Assistant Editor*
Joanne F. Kinneary, *Assistant Editor*

Published by
Merck Research Laboratories
Division of

MERCK & CO., Inc.

Whitehouse Station, NJ

1996

MERCK & CO., INC.
Whitehouse Station, N.J.
U.S.A.

1st Edition—1889
2nd Edition—1896
3rd Edition—1907
4th Edition—1930
5th Edition—1940
6th Edition—1952
7th Edition—1960
8th Edition—1968
9th Edition—1976
10th Edition—1983
11th Edition—1989

Library of Congress Catalog
Card Number 89-60001
ISBN Number 0911910-12-3

Copyright © 1996 by MERCK & CO., INC.
All rights reserved. Copyright under the Universal Copyright Convention
and the International Copyright Convention.
Copyright reserved under the Pan-American Copyright Convention.

Printed in the U.S.A.

EDITOR'S PREFACE

With the Twelfth Edition, The Merck Index marks the beginning of its second century of publication. A comparison of this one-volume, 2600-page, multidisciplinary encyclopedia with the thin catalog of Merck products that was published in 1889, underscores the vast changes that have occurred in this publication over twelve editions, and in the realm of scientific information. Although the text continues to be designed primarily to serve the needs of chemists, biochemists, pharmacists, and those in allied professions, it contains information of interest to a broad spectrum of scientists and others in a large number of disciplines. The material is assembled with today's quick reference needs in mind, but the commitment to enhanced scientific communication and to excellence in scientific scholarship remains paramount.

This edition contains a diverse collection of over 10,000 monographs of which more than 4,000 are devoted to a wide variety of drugs and pharmaceuticals, over 2,000 describe common organic chemicals and laboratory reagents, and another 2,000 cover naturally occurring substances and plants. An additional 1,000 monographs focus on the elements and on inorganic chemicals, almost 1,000 pertain to compounds of agricultural significance, and several hundred describe endogenous substances and biological agents.

A number of changes have been made since the Eleventh Edition was published in 1989. The monograph section has been extensively revised. The chemical structures have been redrawn employing current conventions for chemical depictions. Nomenclature has been reviewed and stereochemical descriptors have been added, where pertinent. In response to requests from our readership, the section on Organic Name Reactions, which last appeared in 1983 in the Tenth Edition, has been updated and reintroduced. The compilation of Chemical Abstracts Service Registry Numbers has been significantly expanded. Several new tables have been added including a glossary emphasizing some of the newer terminology employed in the fields of molecular biology and immunology.

In recognition of the growing utilization of electronic versions of traditional reference works, THE MERCK INDEX ONLINE is made available through major online database vendors. A CD-ROM version of the Twelfth Edition, which is both text and structure searchable, will also be published in 1996.

Compared with their counterparts of earlier eras, scientists of the 1990s have unparalleled access to information from a multitude of sources. In this environment, it is especially gratifying that so many readers inform us that they refer to The Merck Index on a daily basis. We hope that this edition, published by Merck & Co., Inc., as a service to the scientific community, will continue the tradition and prove to be an indispensable reference to all who consult it.

Susan Budavari, *Editor*
Merck Research Laboratories
Rahway, New Jersey 07065

ACKNOWLEDGMENTS

The creation process for each edition of The Merck Index involves the efforts of many dedicated people with special talents and varied expertise. The successful publication is a tribute to all involved.

The Merck Index Editorial staff wishes to especially thank our coworkers for their untiring efforts and cooperation: *Jo Ann Gallipeau* for assistance in researching and preparing various portions of the manuscript; *Mary Ann D'Arecca* for organizing the data entry of the tabular material and for procuring research materials; *Edward Hendrzak* for preparing tabular material and skillfully drawing the chemical structures; and *Mariann E. Lucas* for diligent editorial assistance in evaluating various topics and standardizing the structures. We also wish to thank *Dr. Norman Penix* for providing computer expertise, custom programming and technical guidance at critical times; *Debra Shelinsky Greene*, *Susan C. Mattson* and *Jon Filderman*, for advice and counsel on intellectual property and contractual issues; and especially, *Gary Zelko*, our Publisher, for facilitating all business aspects of this edition and for providing needed support.

We would like to express our gratitude to *Professor David A. Evans* of Harvard University and *Professor Barry M. Trost* of Stanford University who reviewed various portions of the manuscript for the Organic Name Reactions section and provided salient comments and valuable suggestions.

Finally, we wish to mention and thank the numerous Merck scientists, past and present, who contributed in varying degrees to this book, as well as the many readers who took the time to contact us with comments, suggestions, and corrections.

TABLE OF CONTENTS

Periodic chart	inside front cover
Editor's preface	v
Acknowledgments	vi
Explanatory notes	viii
Abbreviations	xiii
MONOGRAPHS	1-1741
MISCELLANEOUS TABLES	MISC-1–MISC-107
Alphabetical list of tables	MISC-1
Glossary	MISC-2
Common Heterocyclic Ring Systems	MISC-7
Abbreviated terms used by the U.S. Adopted Names (USAN) Council for Radicals and Adducts	MISC-8
International non-proprietary names for radicals and groups proposed by the World Health Organization (WHO)	MISC-8
Cancer chemotherapy drug regimens	MISC-10
Code letters used by companies for experimental substances	MISC-12
Company register	MISC-16
Numerical prefixes commonly used in forming chemical names	MISC-30
Alchemical symbols used in biology and botany	MISC-30
Prescription notation	MISC-30
Latin terms	MISC-31
Greek and Russian alphabets	MISC-33
Roman Numerals	MISC-33
Chemical Terms Translator	MISC-34
Boiling points of solvents	MISC-36
Density of liquids	MISC-42
Percentage solution tables	MISC-46
Isotonic solutions	MISC-47
Indicators	MISC-58
Amino Acid Abbreviations and pKa Values	MISC-60
Saturated solutions	MISC-61
Cooling mixtures	MISC-66
Thermometric equivalents	MISC-66
International system of units (SI)	MISC-67
Universal conversion factors	MISC-68
Table of radioactive isotopes	MISC-78
Radioactive isotopes used in medical therapy and diagnosis	MISC-93
Table of Minerals	MISC-100
ORGANIC NAME REACTIONS	ONR-1–ONR-107
CHEMICAL ABSTRACTS SERVICE REGISTRY NUMBERS	
Alphabetic order by compound name	REG-1–REG-59
CAS Registry Number order	REG-60–REG-124
THERAPEUTIC CATEGORY AND BIOLOGICAL	
ACTIVITY INDEX	THER-1–THER-28
FORMULA INDEX	FI-1–FI-76
NAME INDEX	NI-1–NI-360
Atomic weights	inside back cover

Explore Litigation Insights

Docket Alarm provides insights to develop a more informed litigation strategy and the peace of mind of knowing you're on top of things.

Real-Time Litigation Alerts



Keep your litigation team up-to-date with **real-time alerts** and advanced team management tools built for the enterprise, all while greatly reducing PACER spend.

Our comprehensive service means we can handle Federal, State, and Administrative courts across the country.

Advanced Docket Research



With over 230 million records, Docket Alarm's cloud-native docket research platform finds what other services can't. Coverage includes Federal, State, plus PTAB, TTAB, ITC and NLRB decisions, all in one place.

Identify arguments that have been successful in the past with full text, pinpoint searching. Link to case law cited within any court document via Fastcase.

Analytics At Your Fingertips



Learn what happened the last time a particular judge, opposing counsel or company faced cases similar to yours.

Advanced out-of-the-box PTAB and TTAB analytics are always at your fingertips.

API

Docket Alarm offers a powerful API (application programming interface) to developers that want to integrate case filings into their apps.

LAW FIRMS

Build custom dashboards for your attorneys and clients with live data direct from the court.

Automate many repetitive legal tasks like conflict checks, document management, and marketing.

FINANCIAL INSTITUTIONS

Litigation and bankruptcy checks for companies and debtors.

E-DISCOVERY AND LEGAL VENDORS

Sync your system to PACER to automate legal marketing.