Compendium of Safety Data Sheets for Research and Industrial Chemicals

Edited by
LAWRENCE H. KEITH and DOUGLAS B. WALTERS

Part VI

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SPECIAL NOTICE
FROM THE EDITORS

The information contained herein is based upon data drawn from the literature or experimentally determined and is believed to be accurate. Great care has been taken to assure the typing, editing and accuracy of the information contained in this **Compendium.** However, no warranty or representation is expressed or implied by the editors or the publisher regarding the accuracy of these data or the results to be obtained from the use thereof. This applies to all of the information herein and expressly to the information in the first aid, health hazards and shipping sections.

Erratum

Freon* (trichlorofluoromethane), Part 3, number 809, page 1648, was incorrectly listed under *Acute Hazards* as "toxic". The listing should read "none known". A published rat oral LD_{50} of 3725 mg/kg has been brought to our attention (T. Slater, *Biochem. Pharmacol.* 14(2), 178-181, 1965; CA *62* 12351 h) which was previously unknown to the authors. The *Exposure Limit* should have the additional information reported by the ACGIH (Threshold Limit Values and Biological Exposure Indices for 1986-7, ACGIH, Cincinnati, Ohio) that both the TWA and the ceiling value are 1000 ppm.

Preface

There are many excellent compilations of chemical and physical data available as references. The same can be said of medically related reference books. Fewer references, however, are available as guides to safe usage, storage, cleanup and shipping regulations, and fewer yet contain any information pertaining to selection of glove materials for personal protection against exposure to any but the most common of chemicals and solvents. It is the objective of this **Compendium** to provide in a single source the most commonly sought and useful information for safety oriented needs involving chemicals of both research and industry. Instead of having to search through multiple reference sources for this information, one can simply use this **Compendium**. The information herein is compiled from over fifty reference sources.

The utility of this **Compendium** has become even greater with the recent promulgation of the OSHA Hazard Communication Standard. This standard requires manufacturers, formulators, repackagers, distributors, and importers of hazardous chemicals or mixtures which contain as little as 1% of hazardous chemicals (and 0.1% of carcinogenic chemicals) to provide their employees with Material Safety Data Sheets (MSDSs). Most of the specific information required in the MSDSs will be found in this **Compendium** for those compounds which are listed. The **Compendium** data sheets cannot be used as substitutes for MSDSs because information such as appropriate engineering controls, work practices and personal protective equipment are not included herein. However, all of the "searchable" information, which is so time-consuming and expensive to gather, is incorporated in these **Compendium** data sheets.

The majority of the compounds in this **Compendium** are drawn from information compiled by the National Toxicology Program (NTP). The NTP was established as a U.S. Department of Health and Human Services cooperative effort to coordinate and provide information about potentially toxic chemicals to regulatory and research agencies and to strengthen the science base in toxicology. Chemicals for testing in NTP programs are screened and selected by a Chemical Selection Committee. Criteria for selection include potential for human exposure through use in manufacture, formulation and research. To these compounds the editors have added selected compounds of importance to chemical synthesis and research. The fact that most of the compounds in these volumes have also been chosen for study by the National Toxicology program further enhances the utility of this **Compendium** by prioritizing many of the compounds that are suspected of being potentially hazardous chemicals. This does not mean that they are hazardous chemicals — merely that they were chosen for study for one reason or another.

These three volumes contain detailed information on 740 different chemicals. When added to the first three volumes which contained data on 867 additional chemicals, it brings the total to 1607 chemicals for which this information is now available.

As with any reference of this kind, information and regulations are rapidly changing, particularly regarding shipping. It is wise, therefore, to consult the latest government regulations before using the information contained herein as the final reference.

Acknowledgments

The editors wish to express their appreciation to Sherri Mayfield and Charles E. Hudak for their diligent efforts in helping to prepare these data sheets. Both have spent countless hours at computer terminals working with the massive amounts of data contained within these data sheets. Michelle Flicker, M.D., Ph.D. and Richard A. Smith, C.I.H. contributed greatly to the important sections containing medical and industrial hygiene advice. Each spent many hours reviewing symptoms of exposure and first aid recommendations and safety regulations that apply to these diverse compounds. Special thanks are also extended to Virginia H. Keith who was invaluable in helping to produce the initial indexes and to K. Dianne Walters for her invaluable assistance in preparing the manuscript for publication.

The Editors

Lawrence H. Keith

Dr. Keith is the Chemistry Development Coordinator at Radian Corporation in Austin, Texas, where he is responsible for helping to coordinate the implementation of new ideas into expanded areas of business. He maintains an active role in developing and implementing new analytical methods for analyzing organic pollutants, an activity begun while he was employed by the U.S. Environmental Protection Agency. He is author or coauthor of more than fifty technical publications and editor or co-editor of fourteen books.

Dr. Keith also serves as Principal Investigator for the National Toxicology Program's chemical repositories at Radian. In this capacity, he is involved with the storing, shipping, safe handling and analysis of the hazardous chemicals in these repositories.

A member of the American Chemical Society's Division of Environmental Chemistry Executive Committee, Dr. Keith is a delegate of the USA National Committee to the International Association of Water Pollution Research and Control, and an alternate councilor for the Division, as well as past chairman, councilor and secretary of local sections of the American Chemical Society and is also a past member of the National Research Council Committee on Military Environmental Research.

Dr. Keith is a member of Editorial Board of the new **International Journal of Chemical Health and Safety**. He is also chairman of the Subcommittee on Environmental Monitoring and Analysis, a part of the American Chemical Society's Joint Board/Council Committee on Environmental Improvement.

Douglas B. Walters

Dr. Walters is head of the Chemical Health and Safety for the National Toxicology Program at the National Institute of Environmental Health Sciences in Research Triangle Park, North Carolina. He is former chief of the safety office and the former technical programs manager of the Laboratory of Environmental Chemistry at the National Institute of Environmental Health Sciences.

Since joining the National Institute of Environmental Health Sciences, Dr. Walters has been involved in diverse projects which apply chemistry principles to a broad range of environmental health and safety concerns. Included in these areas are the design of high-hazard chemistry laboratories, establishment of a chemical repository with associated analytical and synthetic support, implementation of a comprehensive health and safety program, and formulation of health and safety guidelines and requirements for various types of toxicology studies. His work covers a range of areas of interest including: design of

specialty equipment and facilities for chemical containment, application of human factors engineering to chemical health and safety, chemical control and management of environmental quality, health and safety in multidisciplinary operations, and use and application of chemical health and safety information.

Dr. Walters is a past chairman and secretary of the Division of Chemical Health and Safety of the American Chemical Society (ACS). He also has served as chairman of the Northeast Georgia Section of the ACS and was appointed by the National ACS headquarters as ACS Science Advisor to U.S. Senator Herman Talmadge and U.S. Congressmen Robert G. Stephens and Doug Barnard, all of Georgia, from 1973 to 1978. He has lectured throughout the United States and is the author or coauthor of numerous technical publications, including seventeen book chapters and two two-volume books on the subject of safely working with hazardous chemicals.

Dr. Walters is an Editorial Board Member of the new **International Journal of Chemical Health and Safety** and serves on the Editorial Boards for both the **Handbook of Environmental Chemistry: Chemical Waste** and the ACS Advances in Chemistry and Symposium Series.

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1359

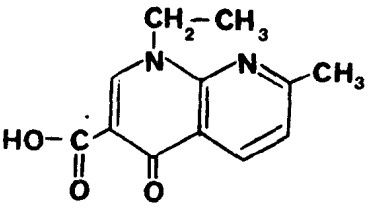
IDENTITY

PREFERRED NAME: Nalidixic acid

Synonyms:

3-Carboxy-1-ethyl-7-methyl-1,8-naphthidin-4-one

1-Ethyl-1,4-dihydro-7-methyl-4-oxo-1,8-naphthyridine-3-carboxilic acid



CAS Registry Number:

389-08-2

NIOSH Registry Number:

QN2885000

Formula: $C_{12}H_{12}N_2O_3$

Molecular Weight: 232.26

WLN: T66 BN EV JNJ B2 DVQ I1

PHYSICAL PROPERTIES

Physical Description: Cream-colored powder

Melting Point: 227-229°C

Boiling Point: Not available

Density: Not available

Specific Gravity: Not available

Flammability: Not available

Stability: Stable under normal laboratory storage conditions.

Flash Point: Not available

Reactivity: Not available

Solubility In:

Water:	<1 mg/mL @ 21°C	**Acetone:**	1-5 mg/mL @ 23°C
DMSO:	1-10 mg/mL @ 21°C	**Ether:**	<1 mg/mL @ 23°C
Ethanol:	<1 mg/mL @ 21°C	**Benzene:**	Not available

Other Physical Data: Solubility in chloroform is 35 mg/mL @ 23°C, in toluene is 1.6 mg/mL @ 23°C, in methanol is 1.3 mg/mL @ 23°C; soluble in potassium hydroxide and in sodium hydroxide.

SHIPPING

D.O.T. Shipping Name: Hazardous substance, solid, n.o.s.

D.O.T. Identification Number: NA9188

D.O.T. Hazard Classification: ORM-E

Other Shipping Regulations: None; no limit with passenger or cargo aircraft.

Exceptions: None. Specific requirements, 173.1300 in Code of Federal Regulations, Title 49 (1984).

PREFERRED NAME: Nalidixic acid

1359

HEALTH HAZARDS

Acute Hazard: Emits toxic fumes of NOx when heated to decomposition.

Symptoms & Signs: Nausea, vomiting, abdominal pain; allergic reactions with pruritus, urticaria, various rashes, photosensitivity and eosinophilia; fever, and possible liver damage.

Exposure Limits: Not regulated

FIRST AID

Skin Contact: Flood all areas of body that have contacted the substance with water. Don't wait to remove contaminated clothing; do it under the water stream. Use soap to help assure removal. Isolate contaminated clothing when removed to prevent contact by others.

Eye Contact: Remove any contact lenses at once. Immediately flush eyes well with copious quantities of water or normal saline for at least 20-30 minutes. Seek medical attention.

Inhalation: Leave contaminated area immediately; breathe fresh air. Proper respiratory protection must be supplied to any rescuers. If coughing, difficult breathing or any other symptoms develop, seek medical attention at once, even if symptoms develop many hours after exposure.

Ingestion: Contact a physician, hospital or poison center at once. If the victim is unconscious or convulsing, DO NOT INDUCE VOMITING or give anything by mouth. Assure that his airway is open and lay him on his side with his head lower than his body and transport immediately to a medical facility. If conscious and not convulsing, give a glass of water to dilute the substance. Vomiting should not be induced without a physician's advice.

ADDITIONAL INFORMATION

Storage Precautions: Store in a refrigerator or in a cool, dry place.

Spills and Leakage: Remove all sources of ignition and dampen spilled material with 60-70% acetone to avoid airborne dust, then transfer material to a suitable container. Ventilate the spill area and use absorbent paper dampened with 60-70% acetone to pick up remaining material. Wash surfaces well with soap and water. Seal all wastes in vapor-tight plastic bags for eventual disposal.
Suggested Gloves: Not available

Uses: Inhibitor of DNA synthesis; antibacterial; has been used for urinary tract infections.

Additional Reference Sources:

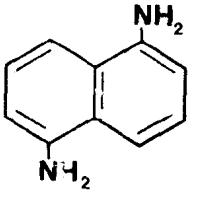
Dangerous Properties of Industrial Materials, N. I. Sax, 6th Ed., p. 1334 (1984), Van Nostrand Reinhold.
Dictionary of Organic Compounds, J. Buckingham, 5th Ed., p. 4137 (1982), Chapman and Hall.
The Pharmacological Basis of Therapeutics, L. S. Goodman and A. Gilman, 5th Ed., p. 1007 (1975), MacMillan.
Merck Index, M. Windholz et al, 10th Ed., p. 911 (1983), Merck.

1360

IDENTITY

PREFERRED NAME: 1,5-Naphthalenediamine

Synonyms:
1,5-Diaminonaphthalene
1,5-Naphthylenediamine



CAS Registry Number:
2243-62-1

NIOSH Registry Number:
QJ3400000

Formula: $C_{10}H_{10}N_2$

Molecular Weight: 158.20

WLN: L66J BZ GZ

PHYSICAL PROPERTIES

Physical Description: Colorless to light purple crystals

Melting Point: 185-187°C

Boiling Point: Sublimes

Density: 1.4 g/mL @ 20°C

Specific Gravity: Not available

Flammability: Not available

Stability: Stable under normal laboratory storage conditions.

Flash Point: Not available

Reactivity: Not available

Solubility In:

Water:	<1 mg/mL @ 20°C	**Acetone:**	10-50 mg/mL @ 20°C
DMSO:	>=100 mg/mL @ 20°C	**Ether:**	Soluble
Ethanol:	1-5 mg/mL @ 20°C	**Benzene:**	Not available

Other Physical Data: Soluble in hot water and in chloroform.

SHIPPING

D.O.T. Shipping Name: Hazardous substance, solid, n.o.s.

D.O.T. Identification Number: NA9188

D.O.T. Hazard Classification: ORM-E

Other Shipping Regulations: None; no limit with passenger or cargo aircraft.

Exceptions: None. Specific requirements, 173.1300 in Code of Federal Regulations, Title 49 (1984).

PREFERRED NAME: 1,5-Naphthalenediamine

1360

HEALTH HAZARDS

Acute Hazard: .Emits toxic fumes of NOx when heated to decomposition.

Symptoms & Signs: Unknown

Exposure Limits: Not regulated; positive animal carcinogen (IARC Monographs).

FIRST AID

Skin Contact: Flood all areas of body that have contacted the substance with water. Don't wait to remove contaminated clothing; do it under the water stream. Use soap to help assure removal. Isolate contaminated clothing when removed to prevent contact by others.

Eye Contact: Remove any contact lenses at once. Immediately flush eyes well with copious quantities of water or normal saline for at least 20-30 minutes. Seek medical attention.

Inhalation: Leave contaminated area immediately; breathe fresh air. Proper respiratory protection must be supplied to any rescuers. If coughing, difficult breathing or any other symptoms develop, seek medical attention at once, even if symptoms develop many hours after exposure.

Ingestion: Contact a physician, hospital or poison center at once. If the victim is unconscious or convulsing, DO NOT INDUCE VOMITING or give anything by mouth. Assure that his airway is open and lay him on his side with his head lower than his body and transport immediately to a medical facility. If conscious and not convulsing, give a glass of water to dilute the substance. Vomiting should not be induced without a physician's advice.

ADDITIONAL INFORMATION

Storage Precautions: Store in a refrigerator or in a cool, dry place.

Spills and Leakage: Remove all sources of ignition and dampen spilled material with 60-70% acetone to avoid airborne dust, then transfer material to a suitable container. Ventilate the spill area and use absorbent paper dampened with 60-70% acetone to pick up remaining material. Wash surfaces well with soap and water. Seal all wastes in vapor-tight plastic bags for eventual disposal.

Suggested Gloves: Not available

Uses: Organic synthesis; used in polymer manufacture.

Additional Reference Sources:

Dangerous Properties of Industrial Materials, N. I. Sax, 6th Ed., p. 1972 (1984), Van Nostrand Reinhold.
Condensed Chemical Dictionary, G. Hawley, 10th ed., p. 715 (1981), Van Nostrand Reinhold.
IARC Monographs on the Evaluation of Carcinogenic Risk of Chemicals to Man, Vol. 27, p. 127 (1982), IARC.
Registry of Toxic Effects of Chemical Substances, R. Lewis (1985), NIOSH.

1361

IDENTITY

PREFERRED NAME: 2-Naphthyl lactate

Synonyms:
2-Hydroxypropanoic acid 2-naphthalenyl ester
2-Naphthol lactate
beta-Naphthyl lactate

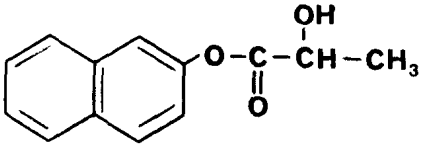
CAS Registry Number:
93-43-6

NIOSH Registry Number:
Not available

Formula: $C_{13}H_{12}O_3$

Molecular Weight: 216.23

WLN: L66J C0V1Q1



PHYSICAL PROPERTIES

Physical Description: Crystals (from alcohol)

Melting Point: Not available

Boiling Point: Not available

Density: Not available

Specific Gravity: Not available

Flammability: Not available

Stability: Stable under normal laboratory storage conditions.

Flash Point: Not available

Reactivity: May hydrolyze under alkaline or acidic conditions.

Solubility In:

Water:	Insoluble	**Acetone:**	Not available
DMSO:	Not available	**Ether:**	Insoluble
Ethanol:	Moderately soluble	**Benzene:**	Not available

Other Physical Data: Not available

SHIPPING

D.O.T. Shipping Name: Not Restricted

D.O.T. Identification Number: None

D.O.T. Hazard Classification: None

Other Shipping Regulations: None

Exceptions: None. Specific requirements, none in Code of Federal Regulations, Title 49 (1984).

PREFERRED NAME: 2-Naphthyl lactate

1361

HEALTH HAZARDS

Acute Hazard: Unknown

Symptoms & Signs: Unknown

Exposure Limits: Not regulated

FIRST AID

Skin Contact: Flood all areas of body that have contacted the substance with water. Don't wait to remove contaminated clothing; do it under the water stream. Use soap to help assure removal. Isolate contaminated clothing when removed to prevent contact by others.

Eye Contact: Remove any contact lenses at once. Immediately flush eyes well with copious quantities of water or normal saline for at least 20-30 minutes. Seek medical attention.

Inhalation: Leave contaminated area immediately; breathe fresh air. Proper respiratory protection must be supplied to any rescuers. If coughing, difficult breathing or any other symptoms develop, seek medical attention at once, even if symptoms develop many hours after exposure.

Ingestion: Contact a physician, hospital or poison center at once. If the victim is unconscious or convulsing, DO NOT INDUCE VOMITING or give anything by mouth. Assure that his airway is open and lay him on his side with his head lower than his body and transport immediately to a medical facility. If conscious and not convulsing, give a glass of water to dilute the substance. Vomiting should not be induced without a physician's advice.

ADDITIONAL INFORMATION

Storage Precautions: Store in a refrigerator or in a cool, dry place.

Spills and Leakage: Remove all sources of ignition and dampen spilled material with 60-70% ethanol to avoid airborne dust, then transfer material to a suitable container. Ventilate the spill area and use absorbent paper dampened with 60-70% ethanol to pick up remaining material. Wash surfaces well with soap and water. Seal all wastes in vapor-tight plastic bags for eventual disposal.

Suggested Gloves: Not available

Uses: Intestinal antiseptic.

Additional Reference Sources:

Merck Index, M. Windholz et al, 10th Ed., p. 920 (1983), Merck.
TSCA Chemical Substances Inventory, (May 1979), U.S. EPA.

1362

IDENTITY

PREFERRED NAME: 1-Naphthylamine

Synonyms:
1-Aminonaphthalene
alpha-Naphthylamine
Naphthalidine
Fast Gasnet Base B

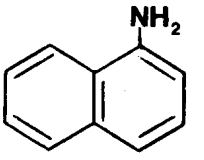
CAS Registry Number:
134-32-7

NIOSH Registry Number:
QM1400000

Formula: $C_{10}H_9N$

Molecular Weight: 143.20

WLN: L66J BZ



PHYSICAL PROPERTIES

Physical Description: White crystals

Melting Point: 50°C

Boiling Point: 300.8°C

Density: Not available

Specific Gravity: 1.0228 @ 20/4°C

Flammability: Combustible

Stability: Oxidizes in air (turns red); sensitive to exposure to light.

Flash Point: 157.2°C (315°F)

Reactivity: Reduces warm ammoniacal silver nitrate.

Solubility In:

Water:	<1 mg/mL @ 19°C	**Acetone:**	>=100 mg/mL @ 19°C
DMSO:	>=100 mg/mL @ 19°C	**Ether:**	Soluble
Ethanol:	>=100 mg/mL @ 19°C	**Benzene:**	Not available

Other Physical Data: Vapor pressure is 1 mm Hg @ 104.3°C; vapor density is 4.93; unpleasant odor; sublimes; steam-volatile; refractive index is 1.6703 @ 51°C; pKa is 10.00; boiling point @ 10 mm Hg is 129-130°C.

SHIPPING

D.O.T. Shipping Name: Hazardous substance, solid, n.o.s.

D.O.T. Identification Number: NA9188

D.O.T. Hazard Classification: ORM-E

Other Shipping Regulations: None; no limit with passenger or cargo aircraft.

Exceptions: None. Specific requirements, 173.1300 in Code of Federal Regulations, Title 49 (1984).