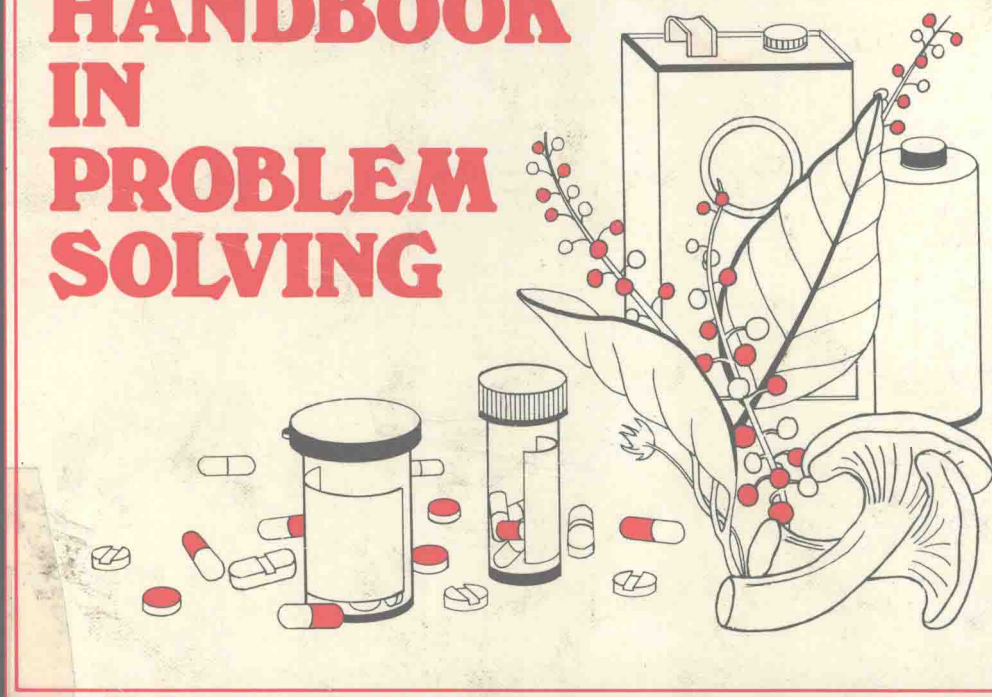


Second Edition

Toxicologic Emergencies

**A COMPREHENSIVE
HANDBOOK
IN
PROBLEM
SOLVING**



Lewis R. Goldfrank

Toxicologic Emergencies

A COMPREHENSIVE HANDBOOK IN PROBLEM SOLVING

Edited by: **Lewis R. Goldfrank, M.D.**
Director of Emergency Medical Services,
Bellevue Hospital Center and New York University Hospital;
Associate Professor of Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Associate
Editors: **Neal E. Flomenbaum, M.D.**
Associate Director of Emergency Medical Services,
Bellevue Hospital Center and
New York University Hospital;
Assistant Professor of Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Neal A. Lewin, M.D.
Assistant Director of Emergency Medical Services,
Bellevue Hospital Center;
Instructor in Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Richard S. Weisman, Pharm.D.
Assistant Professor of Pharmacy,
St. John's University, Queens, New York;
Consultant to the New York City Poison Center, New York, New York



APPLETON-CENTURY-CROFTS/New York

Copyright © 1982 by APPLETON-CENTURY-CROFTS
A Publishing Division of Prentice-Hall, Inc.

Modified forms of the text first appeared as articles in *Hospital Physician*, a monthly magazine of F & F Publications.

All rights reserved. This book, or any parts thereof, may not be used or reproduced in any manner without written permission. For information, address Appleton-Century-Crofts, 292 Madison Avenue, New York, N.Y. 10017.

82 83 84 85 86 / 10 9 8 7 6 5 4 3 2 1

Prentice-Hall International, Inc., London
Prentice-Hall of Australia, Pty. Ltd., Sydney
Prentice-Hall of India Private Limited, New Delhi
Prentice-Hall of Japan, Inc., Tokyo
Prentice-Hall of Southeast Asia (Pte.) Ltd., Singapore
Whitehall Books Ltd., Wellington, New Zealand

Library of Congress Cataloging in Publication Data
Main entry under title:

Toxicologic emergencies.

Includes index.

1. Poisoning—Case studies. 2. Poisoning—
Examinations, questions, etc. I. Goldfrank,
Lewis R., 1941- . [DNLM:
1. Emergencies. 2. Poisoning. 3. Problem
solving. QV 600 T7545]
RA1219.T68 1981 615.9 81-15005
ISBN 0-8385-8965-0 AACR2

Cover Design: Gail Miller
Text Design: Jean M. Sabato
Production Editor: Ina J. Shapiro
Cover Illustration: Janice Belove

PRINTED IN THE UNITED STATES OF AMERICA

Dedicated to

The staff
of our hospital emergency departments
who have worked with remarkable courage, concern, compassion, and understanding
in treating these patients and many thousands more like them.

and

The staff of the New York City Poison Control Center
who have quietly and conscientiously integrated their skills with ours
to serve these patients and many others who never needed a hospital visit
because of their efforts.

and

The ambulance staff on all levels
who cared for these patients in the streets
so that our efforts in the hospitals might be meaningful.

and

The many patients
who taught us a great deal about toxicology
and who had faith in our ability to help them.

and

To my children (L. G.)
who have kept me acutely aware of the ready availability
of possible poisons.

and

To my wife Susan
whose support was essential
and whose contributions will be found throughout the text.

CONTRIBUTORS

Eddy A. Bresnitz, M.D.,
Fellow in Pulmonary Medicine,
University of Pennsylvania,
Philadelphia, Pennsylvania;
Formerly Director of Emergency Medical Services,
The Brooklyn Hospital, Brooklyn, New York;
Consultant to New York City Poison Center, New York, New York

Neal E. Flomenbaum, M.D.,
Associate Director of Emergency Medical Services,
Bellevue Hospital Center and New York University Hospital;
Assistant Professor of Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Lewis R. Goldfrank, M.D.,
Director of Emergency Medical Services,
Bellevue Hospital Center and New York University Hospital;
Associate Professor of Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Robert Kirstein, M.D.,
Private practice in Cardiology, Miami, Florida;
Formerly Attending Physician in Emergency Medical Services,
Morrisania City Hospital, Bronx, New York

Neal A. Lewin, M.D.,
Assistant Director of Emergency Medical Services,
Bellevue Hospital Center;
Instructor in Clinical Medicine,
New York University School of Medicine;
Consultant to the New York City Poison Center, New York, New York

Menachem Mellinek, M.D.,
Associate Director of Psychiatry,
Bronx Lebanon Hospital Center;
Assistant Professor of Psychiatry,
Albert Einstein College of Medicine;
Formerly Director of Emergency Psychiatric Services,
North Central Bronx Hospital,
Bronx, New York

Harold Osborn, M.D.,
Director of Emergency Medical Services,
North Central Bronx Hospital;
Assistant Professor of Medicine,
Albert Einstein College of Medicine,
Bronx, New York

Charles Starke, M.D.,
Instructor in Medicine,
Albert Einstein College of Medicine;
Attending Physician, Department of Ambulatory Care,
North Central Bronx Hospital,
Bronx, New York

Richard S. Weisman, Pharm.D.,
Assistant Professor of Pharmacy,
St. John's University, Queens, New York;
Consultant to the New York City Poison Center, New York, New York

PREFACE

Over the past 10 years the federal impetus for a national emergency medical services program (Emergency Medical Service System Act of 1973) has altered the course of poison management through developmental grants, regional planning, and the utilization of diverse national interested parties. At the same time the American College of Emergency Physicians has begun to flourish, demanding higher standards in the care of the poisoned patient in the emergency setting. Finally, the American Association of Poison Control Centers has adopted standards supporting the development of a meaningful poison center service committed to setting up high-quality regional centers.

It has become obvious that toxicology represents a critical problem for emergency medicine, pediatrics, internal medicine, family practice, and pharmacology. Compared with the 1960s, when the poisoned patient was thought of as a child and the poison center considered the domain of the pediatrician, the late 1970s have demonstrated an awakened concern and interest on the part of internists and emergency physicians as active partners with pediatricians in the prevention and management of toxicologic incidents.

Efforts to enhance information accessibility and comprehensibility have

stimulated a renewed vigor. National guidance, cooperative schemes such as POISINDEX, DRUGDEX, the National Poison Center Network, fine texts in clinical pharmacology and toxicology, frequent symposia, reasonable journal articles, and thoughtful analyses have changed the climate of care.*

*Some of the works in our emergency department library are used routinely to solve toxicology problems. Some of these more classic texts list symptoms and their drug correlates in readily available tables.

Arena JM: Poisoning: Toxicology, Symptoms, Treatments, 4th ed. Springfield, Ill, Thomas, 1979.

Cluff LE, Caranasos GJ, Stewart RB: Clinical Problems with Drugs. Philadelphia, Saunders, 1975.

Doull J, Klaassen CD, Amdur MO: Casarett and Doull's Toxicology: The Basic Science of Poisons, 2nd ed. New York, Macmillan, 1980.

Dreisbach RH: Handbook of Poisoning: Diagnosis and Treatment, 10th ed. Los Altos, Calif, Lange, 1980.

Gilman AG, Goodman LS, Gilman A: The Pharmacological Basis of Therapeutics, 6th ed. New York, Macmillan, 1980.

Gosselin RE, Hodge HC, Smith, Gleason MN: Clinical Toxicology of Commercial Products, 4th ed. Baltimore, Williams & Wilkins, 1976.

Plum F, Posner JB: The Diagnosis of Stupor and Coma, 3rd ed. Philadelphia, Davis, 1980.

Rumack B (ed): Poisindex Microfiche Recorder. Rocky Mountain Poison Control Center, Denver, Colo, 1980.

Poison prevention techniques have decreased pediatric ingestions and minimized mortality. Adults now represent the gravest problem, a problem necessitating sophisticated analysis, management, and planning.

We believe that this book reflects our sensitivity to the patient, and provides a detailed review of the critical care management, diagnosis, and treatment of the poisoned patient. In reporting these cases it has been our goal to stimulate an interest in emergency medicine and toxicology, and ultimately to define the decision-making processes in these areas. Over the past 5 years the contributors to this text have committed themselves to emergency medical services, with a great interest in developing the techniques necessary to teach poison management to a cross-section of providers.

In this book we have selected those articles from our series in *Hospital Physician* that are most pertinent to the provider of poison care and most demonstrative of the type of logic utilized in emergency medicine.

The second edition of *Toxicologic Emergencies* is an attempt to reflect the thoughtful criticism we received in regard to our *Hospital Physician* articles and the first edition of this book.

The editors are delighted to see a revolution in interest among providers for the poisoned patient. We hope that our clinical and academic efforts have assisted in this revolution and that this text will stimulate further interest in a thoughtful and more logical approach to treatment, a renewed commitment to clinical pharmacology and toxicology, and ultimately a better milieu for the care of the poisoned patient.

PREFACE TO THE FIRST EDITION

As attending internists in one of New York City's busiest emergency services, we have had to deal with some of the most amazing and complex problems that any physician could encounter, but in dealing with these problems we have had the pleasure of working with an enthusiastic and dedicated group of house officers who asked innumerable questions. It became obvious at Morrisania City Hospital that the problems we saw most frequently involved those conditions that we were least adequately prepared to treat properly. We have noted, until very recently, almost complete neglect of toxicology in our medical schools. For example, as late as 1969 a classic textbook on pediatrics stated that the leading cause of childhood mortality was poisoning; yet only 12 pages in the text were devoted to toxicology. Only in the most recent editions have the standard texts on internal medicine begun to give comprehensive coverage of this field. Fortunately, the era in which toxicology was to be seen but not heard has ended, but we would like to bring toxicology one step farther. We are attempting to make management of toxicologic problems exciting, so that these unfortunate patients will receive the same kind of care others without self-induced or iatrogenic disease receive. It is time we answered this question:

Who is most responsible for the initiation of addiction or abuse? Is it not the health practitioner?

These case histories and their associated questions represent our attempts to respond to the house staff's needs. We have attempted to be practical yet pathophysiologic. These cases and questions have been used in teaching conferences for several years. When Peter Frishauf, the editor of *Hospital Physician*, proposed a monthly column, we saw that as a means of stimulation. Each of these cases appeared in our column "Toxicologic Emergencies" in the journal *Hospital Physician*.

The fact that 21 percent of the admissions to Morrisania City Hospital's adult medical service in 1974 were for toxicologic ingestion, demonstrates the need for a competent clinical toxicologist. Alcoholism was found in more than 50 percent of those hospitalized at Morrisania City Hospital.

For the sake of structure, we have employed poetic license in some of the aspects of these cases. This has been done to emphasize certain issues and minimize others less relevant to the articles. [In an attempt to clarify a particular type of ingestion we have eliminated the "mixed overdose" component in several cases.]

In many instances drug ingestion

ment. We think that the role of the emergency physician is to make the appropriate judgments rapidly and mimics well-known diseases. In addition, the response to any ingestion is substrate-dependent. If the patient abuses other drugs, if he is ill, or if he has taken a massive ingestion, predictions are impossible. Drug ingestion must be considered when the patient's symptoms evolve without prodrome, when the varied manifestations do not fit any classic disease pattern, and when the patient's history suggests drug ingestion.

We have deemphasized therapy other than that relating to the toxicologic ingestion; we have usually not followed the patient's hospital course, although it would be interesting to do so and we routinely do so in our practice. A number of our readers have criticized us for not being more detailed in our analyses. We have tried to limit our discussion to the necessary problem-solving and the initial therapeutic management in the emergency depart-

expedite the admission of seriously ill patients.

The first three chapters have been added to provide an overall plan for emergency management of any overdose. The introduction is meant to define the ground rules for the case assessments that follow. We have included an index so that the reader may study a differential diagnosis or a particular drug group. We have chosen not to create a table of syndromes but to present cases wherein we discuss the differential diagnosis. In recent years we have seen the development of several excellent handbooks in the field of toxicology and poisoning; yet our students and house officers have not mastered this body of knowledge. In an attempt to make toxicology attractive to the medical staff, we have chosen a problem-oriented approach. We have in no way tried to duplicate or compete with the outstanding works in the field of clinical pharmacology and toxicology. Each article has a number of important references relating to the problem being considered. . . .

ACKNOWLEDGMENTS

We are deeply indebted to our friends, associates, and students who provoked us with their questions to begin this book and then faithfully criticized our answers.

We are grateful to Ms. Joan Goggins, Ms. Sharon Wilson, Ms. Denise Long-Reinberg, Ms. Pat Taylor, Ms. Ronnie Jesser, and Ms. Loretta Sauer who transformed scrawl into manuscript with precision and dedication.

We are indebted to Peter Frishauf and his staff at *Hospital Physician* who

meticulously transformed each article into the finished product for its original publication in that journal.

We are appreciative of the many letters to the editors, verbal communications, and reviews of the first edition that were received.

We are thankful to the many volunteers, students, and librarians, and in particular to the St. John's University students and drug information staff who provided us and continue to provide us with vital technical assistance.

*In the hospital, we learn to scan gently our
brother man, judging not, asking no questions,
but meting out to all alike a hospitality worthy
of the Hotel Dieu and deeming ourselves honoured
in being allowed to act as its dispensers.*

*Sir William Osler,
Doctor and Nurse*

CONTENTS

Preface	xi
Preface to the First Edition	xiii
Acknowledgments	xv
PART ONE: AN OVERVIEW	
1. General Perspective	1
2. General Management of the Poisoned and Overdosed Patient	3
3. Advanced Management	19
4. Preventive Techniques	25
PART TWO: ALCOHOL	
5. Metabolic Acidosis in the Alcoholic (The Drunk)	31
6. Antabuse	41
PART THREE: ANALGESICS	
7. Acetaminophen (The Substitute)	49
8. Salicylates (OTC Overdose)	59
PART FOUR: BOTANICALS	
9. Houseplants	69
10. Locoweed and Other Anticholinergics (The Telltale Heart)	75
11. Toxic and Hallucinogenic Mushrooms	85
12. Cyanide (Bitter Almonds)	93
PART FIVE: DRUGS OF ABUSE AND PSYCHOTROPICS	
13. Sedative Hypnotics (The Deep Sleep)	101
14. Bromide (A Rash Decision)	111
15. Amphetamines (Stop the Noises!)	117
16. Opioids	125
17. Phencyclidine (Angel Dust)	139
18. Barbiturates	147
19. Phenothiazines	153

20. Lithium	163
21. Marijuana	169
22. Cocaine (The Snowstorm)	179
 PART SIX: THE ENVIRONMENT	
23. Hypothermia (The Shiver)	189
24. Heat Stroke	201
25. Toxic Inhalants	213
26. Carbon Monoxide (The Red Alert)	223
 PART SEVEN: FOOD POISONING	
27. Hysteria or Botulism: A Fatal Misdiagnosis	231
28. Pokeweed (The Feast)	241
 PART EIGHT: HEAVY METALS	
29. Arsenic (The Aromatic Vegetarian)	249
30. Mercury (Minamata)	255
31. Iron (The Iron Stomach)	263
32. Lead (The Silent Epidemic)	273
 PART NINE: MIXED PROBLEMS	
33. Organophosphates (SLUD)	281
34. Phenytoin	289
35. Caustics (The Near-Fatal Mistake)	299
36. INH (Isoniazid)	309
37. Hypoglycemia (The Homewrecker)	315
38. Vitamin A (The Healthy Headache)	321
39. Abnormal Urine Color (Rainbow Urine)	327
40. Methemoglobinemia (The Cyanotic Neurotic)	333
41. Hydrocarbons (Mind-Boggling Solutions)	337
42. Digoxin (The Cardiotoxic Emergency)	347
43. Camphor	355
44. Antiseptics	363
45. Quinine	371
46. Rodenticides	377
 PART TEN: SELF ASSESSMENT	
Index	423

PART ONE

An Overview

1

GENERAL PERSPECTIVE

Lewis R. Goldfrank

*Upon my secure hour thy uncle stole,
With juice of cursed hebonan in a vial,
And in the porches of my ears did pour
The leperous distilment; whose effect
Holds such an enmity with blood of man*
William Shakespeare, *Hamlet*

“Leperous distilments” such as opiates, alcohols, and various hallucinogens have been used by man to cope with enemies, anxiety, frustration, and ennui throughout history. Opium was employed therapeutically by the Sumerians and Egyptians over 5000 years ago. Alcohol has had a place in various religions and in preparations for warfare. Hallucinogens have had a basic role in the Indian religions of South, Central, and North America. Cocaine, hallucinogenic mushrooms, and peyote have been used for at least 1000 years.

Food poisoning, whether intentional or accidental, has always existed, and occupational poisoning is well known: poisoning from the hunter's dart, inhaling asbestos fibers, siphoning gasoline by mouth when a motor is stalled.

In this age of pharmaceutical and chemical sophistication, every home has a multitude of lethal preparations available for every purpose. The following statistics, although unquestionably rough estimates, clearly demonstrate the magnitude of the toxicologic problem in the United States. (Figures are given on an annual basis.)

- 100 million persons drink alcohol.
- 20 million persons are alcoholics.
- 8 million persons are poisoned.
- 7.5 million people use sedative-hypnotics.
- 400,000 persons are narcotic addicts.
- 5 million children under the age of 5 ingest toxic products.
- 1000 children and adolescents succumb to ingestants.
- 600,000 persons attempt suicide.
- 30,000 persons commit suicide by ingesting drugs.
- 80% of all poisoning victims are children.
- 20% of poisonings occur in adults as intentional, accidental drug abuse, and industrial events.

80 to 90% of childhood poisonings occur in children less than 5 years of age.

50% of all adult overdoses are mixed ingestions.

90% of all narcotic overdoses are mixed.

1% of all physicians are drug-dependent.

10% of ambulance calls are poison related.

There is less than 1% mortality for patients with drug-induced coma in a toxicologically oriented hospital.

10 to 20% of all admissions to adult medical services are for toxic ingestions.

2 to 5% of all admissions to pediatric medical services are for toxic ingestions.

Over 250,000 drugs and commercial products are available for ingestion.

\$11 billion are spent in the United States for prescribed medicine and \$10 billion for over-the-counter (OTC) medications.

More than 2.8 billion drug orders and prescriptions are written.

27 million prescriptions for barbiturates and nonbarbiturate hypnotics were filled in 1976.

91.5 million prescriptions for nonbarbiturate anxiolytics were written in 1976.

10% of the total U.S. health care budget is allocated to OTC and prescription drugs.

67% of all physician visits result in the use of immunization, injection, desensitization, or prescription.

25 to 50% of patients make errors in self-

administration of appropriately prescribed drugs.

30% of "the reliable" patients take less than 70% of prescribed medications.

22.5 drugs were found in the average household in 1972. Of these 17.2 were OTCs and 5.3 were prescription drugs.

The rapid proliferation to 20,000 different pharmaceutical products has led to excessive dependence on the pharmaceutical industry for information. Far too frequently promotion overwhelms education, with the result that a more expensive, more toxic, or less thoroughly tested drug is often chosen. Mass advertising has a tremendous impact in our society, and it is not always wisely directed: So many preparations promise what was previously unattainable (psychologic and physiologic well-being) that people are led to attempt to achieve these results on their own.

Excluding the most pervasive drug, alcohol, fewer than 20 of these 20,000 products are involved in approximately 90 percent of non-accidental toxic ingestions. The most frequent are the amphetamines, barbiturates, benzodiazepines, narcotics, nonnarcotic analgesics (aspirin, acetaminophen), sedative-hypnotics (glutethimide, methaqualone, ethchlorvynol), and the phenothiazines. The approximately 19,980 remaining products are involved in about 10 percent of toxic ingestions.

2

GENERAL MANAGEMENT OF THE POISONED AND OVERDOSED PATIENT

**Lewis R. Goldfrank Neal E. Flomenbaum
Richard S. Weisman**

One evening during a 4-hour period, the following patients presented to the same emergency room (ER):

Patient No. 1: A comatose male, approximately 20 years old, was carried in by a group of young men. The patient appeared slightly disheveled. He had a small laceration on his occiput with some dried blood and matted hair at the site; his front teeth were individually chipped. After initial assessment and stabilization, when the intern attempted to get a history from the people who had brought in the patient, he discovered that they had left the ER.

Patient No. 2: An elderly gentleman was led into the ER by a neighbor who suspected that the man had ingested pills in a suicide attempt a few hours earlier. The man had become despondent since the death of his wife 3 weeks earlier. The neighbor became suspicious when she came to the patient's house unexpectedly to inquire about his doctor's appointment that day, and astutely noticed an empty bottle labeled

Triavil with that day's date on it. Upon questioning, the patient refused to deny or confirm the ingestion, merely saying, "It doesn't matter."

Patient No. 3: A teenage girl was carried into the ER by her parents. She had broken up with her boyfriend that day and locked herself in her room. When her parents broke the lock and entered the room, they discovered several pill bottles and caps strewn about, and a suicide note pinned to the lampshade. The patient was lying on her bed with her eyes shut tightly.

Patient No. 4: A security guard was caught in a melée that erupted in a line of people waiting to purchase tickets for a rock concert. When the police arrived, they sprayed the entire crowd with mace and the guard somehow ended up getting most of it.

Collectively, these patients represent the problem sometimes referred to as general management of the poisoned and overdosed patient. Since the problem is in part defined by the