

Human Lead Exposure

Editor

Herbert L. Needleman, M.D.

Professor

Department of Psychiatry
Western Psychiatric Institute and Clinic
University of Pittsburgh
Pittsburgh, Pennsylvania



CRC Press

Boca Raton Ann Arbor London

Congress Cataloging-in-Publication Data

Lead exposure / editor, Herbert L. Needleman.

1 cm.

0-8493-6034-X

Neurotoxicology. 2. Lead—Toxicology. I. Needleman, Herbert

197-

LM: 1. Environmental Exposure. 2. Lead—adverse effects.

1. Poisoning. [QV 292 H918]

.5.H86 1991

25688—dc20

1. DLC

Library of Congress

91-20525

CIP

This book represents information obtained from authentic and highly regarded sources. Reprinted material is included with permission, and sources are indicated. A wide variety of references are listed. Every reasonable effort has been made to give reliable data and information, but the author and the publisher cannot assume responsibility for the accuracy or validity of all materials or for the consequences of their use.

Copyright © 1992 by CRC Press, Inc. All rights reserved. This book, or any parts thereof, may not be reproduced in any form without written consent of the publisher.

For all inquiries to CRC Press, Inc., 2000 Corporate Blvd., N.W., Boca Raton, Florida 33431.

© 1992 by CRC Press, Inc.

International Standard Book Number 0-8493-6034-X

MODERN HISTORY OF LEAD POISONING: A CENTURY OF DISCOVERY AND REDISCOVERY

Jane S. Lin-Fu

TABLE OF CONTENTS

I.	Introduction	24
II.	The Discovery of Lead-Paint Poisoning.....	25
	A. Peripheral Neuropathy Among Queensland Children: The Discovery of Childhood Lead Poisoning in Australia	25
	1. Footdrop and Wristdrop in Brisbane Children.....	25
	2. Basal Meningitis and Other Forms of Lead Poisoning	25
	3. Lead Poisoning — A Toxicity of Habitation	26
	4. Ocular Neuritis	26
	5. A Plea for Lead Paint as the Source of Poisoning	26
	6. Lead-Paint Legislation in Queensland.....	27
	B. Lead Poisoning in Children in the United States	27
	1. 1900s to the 1960s.....	27
	2. Social Turmoil and the Recognition of Childhood Lead Poisoning	27
III.	Meningitis Among Breastfed Infants: Lead in Toiletries	28
	A. Serous Meningitis Among Nursing Infants in Japan	28
	B. Lead Poisoning in Nursing Infants Caused by Toiletries in Other Countries	28
IV.	Lead Poisoning from Burning Battery Casings: The Depression Disease that has Persisted	28
	A. The Baltimore Outbreak in 1932	28
	B. The Depression Disease Past the Depression Era.....	29
V.	Colic and Convulsions from Lead-Contaminated Food and Drinks.....	29
	A. Lead Colic Throughout the Ages	29
	B. Lead Convulsions in Philadelphia From Cakes and Buns.....	29
	C. Outbreaks During the 20th Century	29
	1. Food and Water	29
	2. Improperly Glazed Earthenwares.....	30
	3. "Moonshine" or Illicit Alcoholic Drinks	30
VI.	The Lead World, Late 19th to Late 20th Centuries	30
	A. Hazardous Lead Sources in the Late 19th Century	30
	B. The Lead World in 1924	30
	C. Lead in Gasoline — A Source of Mass Environmental Pollution.....	30
	D. Lead Paint on Dwellings: A Recalcitrant Lead Hazard	31
	E. Lead in Food.....	32

F.	Lead in Drinking Water	32
G.	Lead in Dust and Soil	32
H.	Lead in Folk Remedies	33
I.	Miscellaneous Lead Sources	33
VII.	Epidemiology of Lead Poisoning in Children	33
A.	Early Misperceptions Concerning Childhood Lead Poisoning	33
B.	Reason for Misperceptions	33
1.	Ignorance About the Extent of Environmental Lead Contamination	33
2.	Erroneous Concept of a "Normal" Blood Lead Level	34
3.	Viewing Lead Poisoning as a Clinical Disease	35
C.	Epidemiology of Childhood Lead Poisoning in 1990	36
1.	Basic Facts in Understanding Childhood Lead Poisoning	36
2.	NHANES II Blood Lead Data (1976 to 1980)	36
3.	ATSDR Report to Congress (1988)	37
VIII.	Prevention of Lead Poisoning: A Rediscovery of Old Facts	38
A.	The Toxic Effects of Lead in the Fetus	38
B.	The Preventable Nature of Lead Poisoning in Children	39
IX.	What of the Future?	39
X.	Conclusion	39
	References	40

I. INTRODUCTION

Lead poisoning is an ancient disease uniquely neglected by modern medicine. It is perhaps the only preventable man-made disease allowed to remain pandemic for centuries. Since lead was discovered more than 5,000 years ago, the diverse applications of this useful metal have assured continuous anthropogenic activities and widespread environmental pollution.¹ Today, in technologically advanced nations as well as in developing countries, hazardous exposure to lead has continued to be a common problem, especially among young children. Lead poisoning continues to be one of the most prevalent preventable childhood health problems in the U.S., affecting millions of children.²

For centuries lead poisoning was largely viewed as an occupational disease of adults. The older literature makes reference to the illness in newborns and children of lead workers, but these were presented as by-products of adult occupational exposure.³ It was not until the turn of the century that lead poisoning in children was recognized as an important distinct entity,^{5,6} and only during the last two decades has the problem drawn attention as a major public health problem.^{7,8} As recent research has unveiled lead toxicity at lower and lower

In his letter on lead poisoning dated July 31, 1786, Benjamin Franklin concluded the correspondence to his friend as follows:⁹

You will see by it, that the opinion of this mischievous effect from lead, is at least above 60 years old, and you will observe with Concern, how long a useful Truth may be known, and exist, before it is generally receiv'd and practis'd on.

Two centuries later, little has changed concerning the ignorance and indifference to the mischievous effects of lead. This chapter reviews the modern history of lead poisoning, particularly as it affects children, and examines how many useful facts or truths have been known and existed in the past century, and how few of these have been generally received and practiced on. Lead poisoning in adults, largely from occupational exposure, is discussed in Chapter 9.

II. THE DISCOVERY OF LEAD-PAINT POISONING

A. PERIPHERAL NEUROPATHY AMONG QUEENSLAND CHILDREN: THE DISCOVERY OF CHILDHOOD LEAD POISONING IN AUSTRALIA

1. Footdrop and Wristdrop in Brisbane Children

In 1890, A. Jefferis Turner, a resident physician at the Children's Hospital in Brisbane, Australia, encountered a puzzling case of peripheral paralysis in a 5-year-old boy.⁵ The child had bilateral wristdrop, footdrop, weakness of the legs, and persistent vomiting. The original diagnosis of progressive muscular atrophy proved incorrect when the child recovered from the paralysis. Turner compared the case "hypothetically to chronic lead poisoning." The following year, Turner again encountered footdrop and wristdrop in the outpatient clinics of the hospital. He admitted two children to the hospital under the care of J. Lockhart Gibson who agreed with the tentative diagnosis of lead poisoning. In March 1892, Gibson presented these cases as such before the Medical Society of Queensland where he encountered considerable skepticism over the diagnosis.⁵

Stimulated by the skepticism from the medical community and hospital staff, Gibson zealously pursued the investigation of lead poisoning. Later that year, he reported ten cases of lead poisoning seen at the hospital between December 1891 and July 1892.⁶ The authors observed that no other cases of lead poisoning had been recognized in Brisbane children and that the diagnosis appeared to have been frequently overlooked. They further noted: "The chief reason for this failure of diagnosis is no doubt that lead-poisoning was never thought of as a possible cause of the symptoms." All ten children in the series suffered from both wristdrop and footdrop.

2. Basal Meningitis and Other Forms of Lead Poisoning

At the 1892 Intercolonial Medical Congress, A. J. Turner reported four children between 5 and 6 years of age with headaches, vomiting, internal squint and double optic neuritis. Three of the four children slowly recovered. The course of illness suggested to Turner that these cases were not due to "morbid growth" or "tubercular" in nature, and was probably a form of basal meningitis.¹⁰ Gibson concurred with the diagnosis in 1892, but in 1897, convinced Turner that these were actually cases of "lead neuritis." In the same year, Turner published a comprehensive review of the subject in the *Australasian Medical Gazette*.⁵ In this paper, Turner analyzed 76 cases (55 girls and 21 boys) of lead poisoning treated as inpatients at the Brisbane Children's Hospital in the preceding six years. Seven ended fatally.

Turner divided lead poisoning into four clinical groups in his review:

1. Paralytic cases characterized by footdrop and wristdrop — He also reported of paralysis of the diaphragm.

2. Cases characterized by abdominal pain and pain in the limbs — Turner noted that such symptoms were also often present in the paralytic cases, but were misdiagnosed as "bilious attacks". He observed that these children "become unusually irritable, neurotic, spoilt by their parents, and quite unmanageable."
3. Epileptic convulsive cases characterized by various forms of "fits" — Turner noted that many of the paralytic cases have had convulsions earlier. He went so far as to recommend that lead poisoning should be considered in any Brisbane child between 5 and 8 years of age who has convulsions without identifiable cause.
4. Ocular neuritis characterized by combined neuritis of both the optic and oculomotor nerves.

3. Lead Poisoning — A Toxicity of Habitation

By 1897, the remarkable frequency of lead poisoning in Brisbane children was indisputable, but the source of the poisoning remained a mystery. Turner astutely observed that lead poisoning was a "toxicity of habitation", since symptoms recurred after children returned to their homes.⁹ Testing of tank water suggested that this may be the source, but it was unclear why adults in the same households were not affected. Turner asserted that the medical expert having pointed out that lead poisoning was a problem, "is entitled...as a citizen, to ask that the matter be investigated, that this large amount of suffering, disablement, blindness, and death be put to an end."⁵

4. Ocular Neuritis

In the issue of the *Australasian Medical Gazette* in which Turner's review appeared, Gibson also published a paper entitled "Ocular Neuritis Simulating Basal Meningitis — Plumbism."¹¹ Twenty-four cases of ocular neuritis (which included both optic neuritis and oculomotor paralysis) had been observed by Gibson since 1891. These children also had wristdrop, footdrop, colic, blue gum lines, and lead in the urine. These signs and symptoms left no doubt that the children suffered from lead poisoning. Tank water was thought to be the source of lead. In a paper published two years later, Turner stressed that children were misdiagnosed because textbook descriptions of lead poisoning were based on findings in adults.¹²

5. A Plea for Lead Paint as the Source of Poisoning

The cause of childhood lead poisoning remained a mystery until 1904, when Gibson published "A Plea for Painted Railings and Painted Walls of Rooms as the Source of Lead Poisoning Among Queensland Children."¹³ He noted in the paper that a government analyst involved in studying the children had suggested earlier that lead paint was the source, "but that the idea was pooh-poohed." Gibson found that a majority, and probably all of the affected children, lived in houses with lead paint in rooms or on verandas, and that both fresh paint and old powdery paint in the form of dust adhered readily to children's hands. He demonstrated that a 1-ft² calico cloth rubbed against the painted railings had 0.3 g of lead on it. Gibson also made the important observation that the vast majority of affected children either bit their nails, sucked their fingers, or ate with unwashed hands. He further noted that of 85 children treated for lead poisoning in the hospital from 1889 to 1903, 42 were admitted during the hottest months, i.e., December through February, and 28 were admitted in October, November, March and April. Only 16 were treated during the cooler months. He suggested that outdoor activities during the warm months contributed to a greater exposure.

Gibson concluded, perhaps somewhat naively, that having uncovered the source of lead and the hand-to-mouth activities that introduced lead into children's bodies, it was now possible to prevent both primary attack and recurrence through public education. But cases