

Pediatrics

VOLUME 22

OCTOBER 1958

NUMBER 4, PART I

AMERICAN ACADEMY OF PEDIATRICS

PROCEEDINGS

A STUDY OF PICA IN RELATION TO LEAD POISONING

By Morris Greenberg, M.D., Harold Jacobziner, M.D., Mary C. McLaughlin, M.D.,
Harold T. Fuerst, M.D., and Ottavio Pellitteri, M.D.

Department of Health, New York City

IT HAS BEEN KNOWN that lead may cause poisoning in man since ancient times.¹ Only in comparatively recent years has attention been called to its toxic effect in children,^{2,3} in whom the diagnosis can be easily overlooked until encephalopathy occurs, and may be missed even then. The incidence of the disease is difficult to determine, because in most states it is not reportable and since the diagnosis is made with difficulty. In New York City where the condition is reportable, notification was received of 416 cases from 1950 to 1957 inclusive, an average of about 52 cases a year (Table I). Yet 60% of the cases were reported from three hospitals, mainly because one or several members of the staffs of those hospitals were particularly interested in the condition.⁴

It will be noted that more cases were discovered in the last 3 years than in the previous 5 (an average of 91 as compared with 29 per annum) and that the mortality was higher in the former period than in the latter (27 as contrasted with 13%). These are probably reflections of the case-finding

program in the latter period, which brought cases to treatment at an earlier stage than before. About 95% of the cases occurred in the ages 1 to 4 years, and about 40% in the 2-year-olds. The sexes were equally represented.

Many of the investigators of lead poisoning in childhood point to its close association with pica, a craving for inedible substances. This suggested that a case-finding program could be based on children manifesting pica.

PLAN OF STUDY

The child health stations of the Department of Health, New York City, examine and oversee approximately 160,000 infants and young children a year. Supervision continues throughout their preschool ages although, as in private practice, the older they become the less medical supervision is requested by the parents. An inquiry about pica is part of the medical record.

Since 1955, physicians in the stations have been particularly urged to ask the parents whether the child or any others in the family had manifestations of pica. If so, a careful

Presented at the Spring Session, April 22, 1958.

ADDRESS: (M.G.) 125 Worth Street, New York 13, New York.

PEDIATRICS, October 1958

TABLE I
LEAD POISONING IN CHILDREN, NEW YORK CITY, 1950-1957

Year	Total Cases	Age (yr)					Deaths	
		1	2	3	4	5+	Number	Per Cent
1950-1954	143	39	56	31	10	7	39	27
1955-1957	273	64	125	50	22	12	36	13
Total	416	103	181	81	32	19	75	
Per cent	100	25	43	19	8	5		18
Sex	Male—221	Female—195						

physical examination was made by the pediatrician, with especial reference to symptoms associated with lead poisoning. The findings were entered on a special form.

A specimen of blood was obtained in a lead-free tube and sent to the laboratory. If the concentration of lead in the blood was 0.06 mg/100 ml or higher, the child was referred to the private physician, or lacking one, to the nearest hospital for diagnosis and treatment. A sanitarian visited the home to make a general sanitary inspection, with particular reference to evidence of ingestion of painted objects. He also examined the plumbing for lead pipes and took samples of water for chemical examination where indicated.

At the beginning of the study, in 1955 and early in 1956, scrapings of objects chewed by the child were taken by the sanitarian for determination of lead content. Most samples had a high concentration of lead. However, in a few instances where a definite diagnosis of plumbism was made in the child, the samples showed no lead. This was puzzling until it was discovered that these children frequently visited the homes of neighbors and ate paint there.

The public health nurse made follow-up visits to see that the child was receiving medical care, to urge that siblings be brought in for examination and to educate the family in the prevention of lead poisoning. The reports from the physician, hospital, nurse, sanitarian and laboratory were directed to the epidemiologist who reviewed the cases.

A diagnosis of lead poisoning was considered to be established if the concentration of lead in the blood was 0.06 mg/100 ml or more and two or more of the following symptoms or signs were present: 1) gastrointestinal (anorexia, vomiting, abdominal cramps and constipation;

two of these were required); 2) neurologic (convulsions, irritability or lethargy); 3) hematologic (anemia, marked pallor, basophilic stippling or blue gum line); 4) roentgenologic (increased density at the metaphyseal ends of the long bones).

If the concentration of lead in the blood was more than 0.06 mg/100 ml, but there was only one of the symptoms mentioned or there were no symptoms, the case was considered as one of probable lead poisoning.

RESULTS

This report covers the years 1956 and 1957. The number of cases of pica examined was 194. The number varied from one health district to another depending on the interest in the problem shown by the health officer and the physician in charge of the clinic and on the type of population served. The distribution of cases by sex, age and race is given in Table II. The cases are concentrated in the first 4 years of age, only 4% occurring after that. It is interesting that 12% of the cases of pica occurred in infants under 1 year of age, although there were no cases of lead poisoning among them. The sexes were equally represented. The large percentage of cases among Negro and Puerto Rican families is not a racial characteristic but it is due to the fact that the health districts in which the greatest interest in the investigation was shown had predominantly Negro and Puerto Rican families.

Table III lists the cases, and probable cases, of lead poisoning among these children. There were 28 of the former and 20

TABLE II
CASES OF PICA IN CHILD HEALTH STATIONS, NEW YORK CITY, 1956-1957

Year (No.)	Age (yr)						Sex		Race			
	Under 1	1	2	3	4	5+	M	F	W	N	PR	Unk.
1956 (91)	5	31	29	9	11	6	50	41	20	32	35	4
1957 (103)	19	38	26	14	4	2	50	53	15	57	22	9
Total (194)	24	69	55	23	15	8	100	94	35	89	57	13
Per cent	12	36	28	12	8	4	52	48	18	46	30	6

of the latter. This means that 14% of the children with pica had lead poisoning and 10% probably had lead poisoning (Fig. 1). None occurred in an infant under 1 year of age, probably because infants do not get an opportunity to chew objects painted with lead. Cribs and toys do not play an important part any longer in lead poisoning. Most manufacturers use paint free of lead or with lead content less than 1% for indoor painting and for objects used by children. The paint having a high lead content was usually found on walls in old tenements in which new coats of paint were applied over old ones without scraping. It was also found on window sills, and in peelings from ceilings, walls and other objects which the tenants had painted with outdoor paint. The cases of poisoning were chiefly in ages 1, 2 and 3 years, approximately equally divided between boys and girls. There were no deaths.

COMMENT

Lead poisoning in children is a serious disease, leading to death in about 15 to 25% of the cases^{3, 5, 7, 15} and to neurologic dis-

turbance in about 25% or more^{3, 6-9} of those that survive. The majority of cases do not come to the attention of physicians until encephalopathy has occurred. Even after treatment with calcium edathamil disodium, the prognosis for normal mental development is not too good. It is extremely important to find cases early. In the field of public health, case-finding programs have been used to uncover early cases of many diseases for the purpose of reducing mortality and morbidity and of promoting prophylaxis by means of health education. Good results have been obtained in such varied diseases as tuberculosis, diabetes and cancer.

Lead poisoning in children is intimately associated with pica.¹⁰ This is emphasized by most students of the disease. Cases occurring in children who do not have pica have occurred as a result of burning battery casings¹¹ or occasionally by the accidental contamination of water, food or fingers. In the aggregate they do not add up to a significant percentage of the total cases.

We have at hand, therefore, a simple

TABLE III
CASES, AND PROBABLE CASES, OF LEAD POISONING IN CHILDREN WITH PICA, NEW YORK CITY, 1956-1957

Group (No.)	Age (yr)				Sex		Race			
	1	2	3	4	M	F	W	N	PR	Unknown
Cases (28)	10	14	3	1	15	13	6	10	10	2
Probable cases (20)	6	9	5		10	10	4	9	6	1
Total (48)	16	23	8	1	25	23	10	19	16	3
Per cent	33	48	17	2	52	48	21	40	33	6

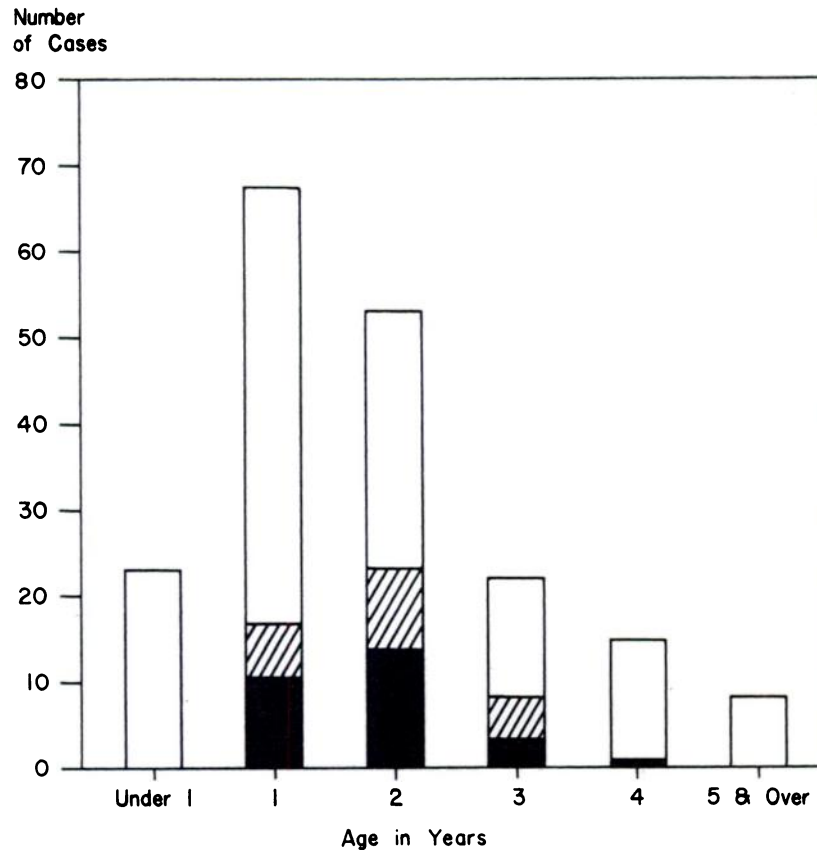


FIG. 1. Distribution of cases. Height of column indexes all with pica; solid portion, lead poisoning; cross-hatch portion, probable lead poisoning.

case-finding program which can be used by the physician in his office as well as in children's clinics. Pica is an easily recognized symptom, and parents have no hesitancy in giving information about its occurrence in their children when questioned. All children giving such a history should have an examination of the blood for lead.* If the test is positive, the child should be studied further by means of a careful history, physical examination, examination of the blood for anemia and basophilic stippling, and a roentgenogram of the wrists for evidence of lead deposition.

If a definite diagnosis is made the child should be placed under treatment;^{13, 14} if

* Some investigators test for the presence of coproporphyrin in the urine in a preliminary screening. This is a simple test which a physician can do in his office.¹²

not, the child should be kept under careful observation. In either case an opportunity is offered for the education of the parent in how lead poisoning is acquired by children and how it can be prevented.

SUMMARY

During 1956 and 1957 all children under the care of the child health stations of the Department of Health in New York City, who manifested pica, were examined for symptoms and signs of lead poisoning. A blood specimen was taken and tested for lead content; if the concentration of lead was 0.06 mg/100 ml or higher, the child was referred to a doctor for diagnosis and treatment. Among 194 children with pica, there were 28 cases and 20 probable cases of lead poisoning. The follow-up of children with

pica is a good case-finding method for lead poisoning.

REFERENCES

1. Major, R. H.: *Classic Descriptions of Disease*. Springfield, Thomas, 1932.
2. Holt, L. E.: Lead poisoning in infancy. *Am. J. Dis. Child.*, **25**:229, 1923.
3. McKhann, C. F., and Vogt, E. C.: Lead poisoning in children. *J.A.M.A.*, **101**:1131, 1933.
4. McLaughlin, M. C.: Lead poisoning in children in New York City, 1950-1954. *New York J. Med.*, **56**:3711, 1956.
5. Williams, E. H., Kaplan, E., Couchman, C. E., and Sayers, R. R.: Lead poisoning in young children. *Pub. Health Rep.*, **67**:230, 1952.
6. Jenkins, D. C., and Mellins, R. B.: Lead poisoning in children. A study of 46 cases. *Arch. Neurol. & Psychiat.*, **77**:70, 1957.
7. Byers, R. K., and Lord, E. E.: Late effects of lead poisoning on mental development. *Am. J. Dis. Child.*, **66**:471, 1943.
8. Gibb, J. W., and MacMahon, J. F.: Arrested mental development induced by lead poisoning. *Brit. M. J.*, **1**:320, 1955.
9. Thurston, D. L., Middelkamp, J. N., and Mason, E.: The late effects of lead poisoning. *J. Pediat.*, **47**:413, 1955.
10. McKhann, C. F., and Karpinski, F. E.: Lead poisoning, in *Brennemann's Practice of Pediatrics*, Vol. I. Hagerstown, Prior, 1957, chap. 18.
11. Williams, H., Schulze, W. H., Rothschild, H. B., Brown, A. S., and Smith, F. R., Jr.: Lead poisoning from the burning of battery casings. *J.A.M.A.*, **100**:1485, 1933.
12. Winters, R. W.: Lead poisoning in children. *GP*, **13**:107, 1956.
13. Byers, R. K., and Maloof, C.: Edathamil calcium-disodium in treatment of lead poisoning in children. *Am. J. Dis. Child.*, **87**:559, 1954.
14. O'Donohoe, N. V.: Lead poisoning in childhood treated by the subcutaneous administration of a chelating agent. *Arch. Dis. Childhood*, **31**:321, 1956.
15. Jacobziner, H.: Accidental chemical poisonings in children. *J.A.M.A.*, **162**:455, 1956.

ETIOLOGIC FACTORS IN OBESITY AND LEANNESS, J. Tepperman. (*Perspectives Biol. & Med.*, **1**:293, 1958.)

In recent years the literature placed before the pediatric audience has belabored the role of psychogenic factors in the causation of obesity. This stimulating essay shows promise that this spell is to be broken. In the past the obese person has been pictured as an individual who is the victim of a disordered personality. Insufficient attention has been given to inherent difficulties in the metabolic systems which govern exchange of energy in the body. This paper challenges the concept that obesity is generally due simply to overeating. A review is given of possible variations in efficiency of phosphorylation; aerobiosis versus anaerobiosis; variations in energy utilization; and variations in lipogenesis, any of which may be attributes of the person prone to obesity or leanness. It is emphasized that the maintenance of an optimal body weight by an individual is the result of the algebraic sum of 1) hereditary traits affecting metabolic reactions and 2) the environmental and cultural influences, which may act in conjunction with the former to predispose to either obesity or leanness. One may conjecture that we shall ultimately come to view the simple restriction of intake to be as ruthless a therapy for the obese as we have discovered the simple restriction of carbohydrate to be ridiculous as a treatment for juvenile diabetes mellitus.

A STUDY OF PICA IN RELATION TO LEAD POISONING

Morris Greenberg, Harold Jacobziner, Mary C. McLaughlin, Harold T. Fuerst and Ottavio Pellitteri

Pediatrics 1958;22;756

Updated Information & Services

including high resolution figures, can be found at:
<http://pediatrics.aappublications.org/content/22/4/756>

Permissions & Licensing

Information about reproducing this article in parts (figures, tables) or in its entirety can be found online at:
<http://www.aappublications.org/site/misc/Permissions.xhtml>

Reprints

Information about ordering reprints can be found online:
<http://www.aappublications.org/site/misc/reprints.xhtml>

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™



PEDIATRICS®

OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

A STUDY OF PICA IN RELATION TO LEAD POISONING

Morris Greenberg, Harold Jacobziner, Mary C. McLaughlin, Harold T. Fuerst and Ottavio Pellitteri

Pediatrics 1958;22;756

The online version of this article, along with updated information and services, is located on the World Wide Web at:

<http://pediatrics.aappublications.org/content/22/4/756>

Pediatrics is the official journal of the American Academy of Pediatrics. A monthly publication, it has been published continuously since 1948. Pediatrics is owned, published, and trademarked by the American Academy of Pediatrics, 141 Northwest Point Boulevard, Elk Grove Village, Illinois, 60007. Copyright © 1958 by the American Academy of Pediatrics. All rights reserved. Print ISSN: 1073-0397.

American Academy of Pediatrics

DEDICATED TO THE HEALTH OF ALL CHILDREN™

