

made with a refined antitoxin or globulin, according either to the old or to the new formula.

Freezing of a three L + dose mixture of toxin-antitoxin containing 0.3 per cent. tricresol, prepared with an antitoxin concentrated without the use of heat, resulted in an increase in toxicity of the mixture.

Freezing of mixtures of toxin-antitoxin made with unconcentrated antitoxin and containing three L + doses of toxin, in which tricresol or phenol is used as a preservative, results in an increase in toxicity of the mixture.

Freezing of such mixtures in which chlorbutanol or chloroform is used as a preservative, or in which no preservative is used, does not cause an increase in toxicity of the mixture.

Only highly refined antitoxin or globulin should be used in the preparation of diphtheria toxin-antitoxin mixtures.

Mixtures of diphtheria toxin-antitoxin containing one-tenth L + doses should be the only formula permitted.

195 College Avenue.

LEAD POISONING IN CHILDREN

WITH SPECIAL REFERENCE TO PICA

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LOS ANGELES

Pica, or parorexia, is a craving for unnatural articles of food—a depraved appetite. It has been observed in hysteria, chlorosis, insanity and pregnancy, but more particularly among children in the latter half of infancy, children from 1 to 2 years of age. It sometimes begins in later childhood when from any cause the general health fails, and the child becomes anemic.

Still¹ states that he has seen fourteen cases. In some of his cases, mud and mortar were especial favorites; in others, coal, cinders and gravel were preferred. In nine cases, the habit began in the second year of life; in one, it began at 8 months.

Thomson,² in a study of pica and its causes, divides this morbid craving in children into two groups:

1. Those instances in which the habit begins at any age, often associated with some marked deterioration of the general health (of which anemia is usually a symptom), and lessens or passes off as the general condition improves.

2. A larger group in whom the morbid craving develops in early infancy, as opportunity for its indulgence offers, apart from any very noticeable cachexia, and without anemia, passing off gradually in most cases, even if untreated, when the child is about 3 years old.

Patients in the former, or cachectic, class may be suffering from a variety of curable and incurable conditions, such as rickets, bronchitis, roundworms, apparently idiopathic anemia, malignant tumor, tuberculosis and other chronic maladies.

Koplik³ believes that this peculiar condition in children is an exaggeration of the normal habit in young infants of invariably placing everything within reach in their mouths. In children who suffer from pica, the sense of wholesomeness is lacking, and they crave sand,

dirt, gravel, cinders, wall plaster, paper, paint and other substances.

Although a child with pica craves many different types of things, it is very fortunate that most of these things are inert, and, although they occasionally lead to minor ailments, such as constipation, fissure-in-ano and other intestinal disorders, they do not cause any serious disturbance of the health of the child.

There is, however, one type of poisoning which these pica children acquire, and that is lead poisoning. This may easily be overlooked, because the average physician has never had his attention called to the fact, and also because the clinical picture is usually very different from that in similar poisoning in adults. There are many ways in which the child may acquire lead poisoning which the average parent could easily prevent.

Some children affected with pica have a morbid craving to gnaw painted objects, such as window sills, white furniture, crib railings, porch railings and other articles around the home within their reach. A child lives in a lead world.

There are many other ways in which lead may be introduced by mouth: in paint from toys; in buns and candies colored with lead chromate; in printers' type used as a plaything; in ointment of lead oxid (litharge), and in water and milk that have stood in lead receptacles. Or the child may become poisoned by improper medication, i. e., by taking lead acetate solution in treatment of poison oak; by sucking paint from the mother's face; by nursing after the use of lead ointment on the mother's breast, or by swallowing leaden objects, such as BB shot.

Holt⁴ reported one case due to inhalation of dust that contained lead. He also stated that the number of authentic cases of lead poisoning in young infants was very small, although much has been written on congenital lead poisoning in extensive studies of the families of workers in lead, in which, in many instances, both parents were suffering from lead poisoning.

Before taking up the general discussion and symptomatology of lead poisoning in children, I shall report two cases, which have come under my observation during the last year:

REPORT OF CASES

CASE 1.—A boy, aged 3 years, normal at birth and always well except for nervousness, caused by irregular sleeping hours and careless parents, for six months previous to observation had complained of severe abdominal cramps associated with vomiting, loss of weight and appetite, listlessness, irritability, night cries, bed wetting and progressive anemia. The abdominal cramps were usually in the afternoon and evening, and were becoming more frequent.

The child had been observed by several physicians in their offices, and in one instance the diagnosis of appendicitis was made. The correct diagnosis, however, might have been made by any one who called at the child's home, because every bit of paint on porch railings, window sills, crib, bureau, chairs and even white enameled door casings, as high as the child could reach, had been gnawed off.

The child was fairly well nourished, and was pale and pot-bellied, but of normal height. There was a distinct lead line on the gums. The abdomen was relaxed, and no tenderness was elicited. The spleen was just felt. There was no paralysis.

The laboratory data were: white blood corpuscles, 15,400; red blood corpuscles, 4,000,000; hemoglobin, 50 per cent. A differential count was normal. There was no stippling, and the red cells showed only the usual evidence of a secondary anemia.

Lead was recovered from both the urine and the feces.

4. Holt, L. E., Jr.: Lead Poisoning in Infancy, *Am. J. Dis. Child* 25: 229 (March) 1923.

1. Still, G. F.: *Common Disorders and Diseases of Childhood*, London, Henry Frowde, 1915, pp. 779-782.

2. Thomson, John: On Pica, or Dirt Eating, in Children, *Edinburgh Hosp. Rep.* 2: 31-44, 1895.

3. Koplik, Henry: *The Diseases of Infancy and Childhood*, Philadelphia, Lea & Feiguer, 1918, p. 793.

As this child would not gnaw varnished objects, it was easy to remove the source of lead by refinishing the entire house; within two weeks, except for some anemia, the child was normal.

CASE 2.—A girl, aged 2 years, normally developed, who had always been well, during the last month had had three series of convulsions. The mother stated that the child gnawed the paint from the crib and the window sills, and had an uncontrollable desire to chew any painted object.

Examination was negative, except for a slight degree of internal strabismus of the left eye, which the mother had not noted before.

The red blood corpuscles numbered 4,520,000 per cubic millimeter; the hemoglobin was 60 per cent. No stippling was seen. No lead was found in the urine, but there were traces of lead in the feces on two examinations.

Since the source of lead has been removed, this child has made an uneventful recovery and is now normal.

SYMPTOMATOLOGY⁵

The history of the case is very important and may lead to an easy diagnosis after all other methods have proved failures. The appearance of the child is usually striking in the chronic cases of lead poisoning, on account of the degree of secondary anemia concomitant with it.

In the early cases, a change of disposition is often the first symptom noticed. The child becomes fretful, peevish and restless at night; the appetite becomes poor; the breath is foul, and frequently hemorrhages occur from the gums. The child may complain of pains in the epigastrium and the legs.

In chronic cases, the pains in the abdomen become continuous and more severe. Constipation is present. Vomiting is rare. There is usually a degree of anemia present, but occasionally the parents overlook all manifestations until the development of cerebral disturbances. Very few cases reported show the characteristic wrist-drop so common in adults, but paralysis of the cranial nerves, particularly the facial and motor oculi nerves, is common. Gibson⁶ reported a group of eye symptoms, which he referred to as "plumbic ocular neuritis."

The temperature, as a rule, is normal except in the fatal cases and in those with cerebral disturbances, in which it may reach 105 or 106 F. before the death of the patient.

Of the various forms of cerebral disorders produced by lead, convulsive seizure is by far the most common. There is no way, however, to distinguish the convulsions due to lead poisoning from those due to other causes. All types of convulsions are seen. They may be local or general; they may be mild or severe. The convulsions do, however, have one characteristic, and that is that they are very persistent and are attended by a high mortality.

Colic has been more frequently observed than paralysis, but more common than either are irritability, restlessness and a blue line on the gums. It should be remembered, however, that a continuous lead line is seldom found. The characteristic appearance is the presence of minute black dots in the margin of the mucous membrane around the teeth, which are covered with tartar. It is difficult to see, and a hand lens should be used.

The blood picture, except for a secondary anemia, usually tells us nothing, although this is determined by the duration of the poisoning. If the disease has been

present for some time, stippling of the red blood corpuscles may occur.

Direct evidence of lead poisoning is obtained by the demonstration of lead in the urine and feces, there is, however, always a larger amount in the feces than in the urine, and it is often present in the feces when it cannot be demonstrated in the urine.

CLASSIFICATION INTO GROUPS

Because of the variability of the sensitiveness of children to lead, a classification into definite groups is difficult, and when made must be based largely on the severity of the predominating system.

Turner divides lead poisoning in children into four groups:

1. Paralytic cases showing symmetrical wrist-drop, foot-drop, spasm of the calf muscles and, as a secondary lesion, a persistent talipes equinus.

2. Cases characterized by pains in the abdomen and limbs, concomitant with habitual constipation, and occasionally a blue line on the gums. These children are usually irritable and neurotic.

3. Children suffering from ocular neuritis; viz., a neuritis involving the optic, oculomotor, abducens and trochlear nerves.

4. Eclamptic cases with severe and persistent convulsions, which often end fatally.

We are indebted to Australian observers for most of the literature regarding lead poisoning in children, and for an historical account of lead poisoning in the children of Queensland, from the first recorded cases in 1892 to 1917. A recent article⁸ records the probable success of efforts to have an act passed prohibiting the use of white lead paint on veranda railings and outside surfaces within the reach of children's fingers.

TREATMENT

The treatment of this condition may be considered from three points of view:

1. Prophylactic. Careful supervision of children during the age (from 1 to 3 years) in which pica is most prevalent. Wide publicity and education through periodicals and home journals, in order to educate the parents.

2. Symptomatic. For the spasms, chloroform inhalation is the only agent that is efficacious; for the anemia, the various forms of iron and arsenic; for the local palsies, massage and electricity, and for the permanent palsies, surgery should be resorted to, if possible.

3. Medicinal. For the removal of lead from the system, potassium iodid, from 3 to 5 grains (0.2 to 0.3 gm.) three times daily with a morning purge of magnesium sulphate may be tried. This is the usual method, although in severe cases it is not well to give the iodids, since, according to some writers, the liberation of the lead that has been deposited in the tissues may increase the severity of the symptoms.

Gibson,⁷ in 1919, reported successful treatment by the two-bath ionization system. The patient places both hands on an aluminum plate immersed in a salt solution, which is connected with the negative pole, and both feet likewise in a similar bath, which is connected with the positive pole. From 7½ to 8½ volts and 25

5. A complete description of the symptomatology of lead poisoning in children is given by Blackian, K. D.: Lead Poisoning in Children, Am. J. M. Sc. 150:377 (June) 1917.

6. Gibson, J. L.: The Diagnosis, Prophylaxis and Treatment of Plumbic Ocular Neuritis Amongst Queensland Children, M. J. Australia 2:131 (Sept. 8) 1917; On the Importance of De-Ionization in the Treatment of Plumbism in Queensland Children, ibid. 1:272 (April 5) 1919.

7. Considerable urine is evaporated to dryness, and 50 c.c. of fuming nitric acid is added; after the reaction has subsided, it is allowed to simmer over the free flame for one-half hour, and then 25 c.c. more acid is added three times each fifteen minutes. The fluid is then evaporated to a small volume, neutralized with sodium hydroxid, filtered and the lead tested with hydrogen sulphid, which will give a brown precipitate.

8. An Historical Account of the Occurrence and Causation of Lead Poisoning Among Queensland Children, M. J. Australia 1:143 (Feb. 11) 1922.

milliamperes of current given for one-half hour, daily. The lead is deposited on the aluminum plate in the negative bath.

CONCLUSIONS

1. Pica is one of the most important etiologic factors in lead poisoning in children.
2. There are many mild cases of lead poisoning in children, manifested by spasms or colic, the true nature of which are never suspected.
3. Energetic prophylactic measures should be employed with children who habitually eat painted articles.
4. The feces and the urine should be examined for lead in all children with convulsions in which the etiologic factor is not clear.

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TRAUMATIC INJURY OF THE RECTUM

REPORT OF CASE *

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In looking over the literature, including that at the Surgeon General's Library, on injuries to the rectum, I have been unable to find a case similar to the one reported here. Gant epitomizes sixty-four cases that fell under his personal observation. These may be classified as:

1. Those due to injury from foreign bodies, either during instrumentation or as result of accident. Among these, fish-hooks, gunshot wounds, falling on palms or stabs, and use of the speculum and dilators play a conspicuous part.

2. Rupture of the sphincter due to pederasty, or of the perineum during parturition. Rupture of the rectovaginal septum during copulation.

3. Rectovaginal rent induced by rectal distention with an air-filled rubber bag.

4. Perforation of the rectum by foreign bodies left in the abdomen.

5. Ulceration due to phenol (carbolic acid) or turpentine.

The anatomic structures most usually affected are the rectum or sigmoid, urethra, one or both sphincters, the levator ani muscle, and the rectovaginal septum. Only in one case was there mention of any injury to the coccyx and that was when the coccyx was fractured by a kick during a fight.

In the case reported here are present: rupture of the rectum; rupture of the levator ani muscle; rupture of the descending ramus of the

pubes; fracture of the right innominate bone; and a dislocation of the right innominate bone, with a fracture of the descending ramus of the pubes on the right side; the pubic symphysis was separated approximately 1 inch and there was, of course, necessarily some compensatory damage in the sacro-iliac joints.

truck entered an alley, and crushed between it and the side of a brick wall. He was brought soon afterward to the emergency hospital. The pupils were equal and reacted to light and in accommodation. The tongue was coated. The teeth and gums were in good condition. The tonsils were slightly enlarged, but the pharynx was otherwise normal. There were several palpable cervical glands. The chest was firm, and expansion was good and equal on the two sides. The percussion note was resonant throughout. The breath sounds were clear. The heart was not enlarged, but there was a soft systolic murmur at the apex not transmitted to the axilla. The abdomen was slightly distended and tender in the region of the bladder. About the rectum, running anteriorly, there was a laceration, which seemed to go through the sphincter. There was much bleeding, some of which appeared to come from high up in the rectum. An attempt was made to pass a catheter, but this was unsuccessful and only a little blood was obtained. On further examination it was found that the laceration at the rectum included both sphincters and part of the perineal raphe. The finger could be passed upward anterior to the mucous membrane of the bowel, and the sharp edges of the broken ramus on the right side could be felt. Also the urethra was torn in this region, and urine was passed through the opening. Whenever the patient's legs were moved in any way, he experienced great pain in the region of the symphysis. Once when we were moving the patient, the whole pelvis was seen to rock irregularly, and definite crepitus was obtained. There was no evidence of injury to the extremities.

The patient was sent to the operation room. Under general anesthesia, and with the patient in the lithotomy position, a more thorough examination was made. The rectal tube was found practically intact, but the muscles anterior to it were torn and retracted on both sides so as to appear only laterally, and retracted far back toward the posterior surface. The rough edges of the fractured descending ramus of the pubes could be felt. The opening in the urethra was not made out. The torn sphincter muscles and the levator ani were brought together over the midline anteriorly and sutured with chromic catgut. This procedure was facilitated by keeping one finger in the rectal tube. The area above this was left open, and a small amount of packing was placed in the space for drainage and to control oozing. A cast was applied from the knees to the costal margin.

Dr. Groover reported that examination of the lumbar spine, pelvis and hips showed the presence of a dislocation of the right innominate bone, with a fracture of the descending ramus of the pubes on the right side; the pubic symphysis was separated approximately 1 inch and there was, of course, necessarily some compensatory damage in the sacro-iliac joints.

The following day the patient seemed a little better, though very restless. There was some abdominal distention, and he complained of the cast being too tight. This was loosened. There was copious drainage of pus from the peroneal wound, and the temperature rose to 102.2 F. He voided involuntarily through the urethral rent. Two hundred cubic centimeters of physiologic sodium chlorid solution was given by hypodermoclysis. August 14, he had an involuntary defecation. He had a frequent desire to urinate by the normal route, but without success. August 28, or seventeen days after admission, there were some signs of the patient's regaining control of the bowels, but the urethral fistula persisted.

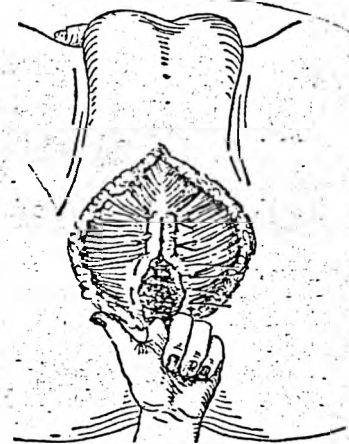


Fig. 2. — Muscles being sutured over the rectum en masse; area between sutured muscle and skin packed lightly with gauze (not shown).

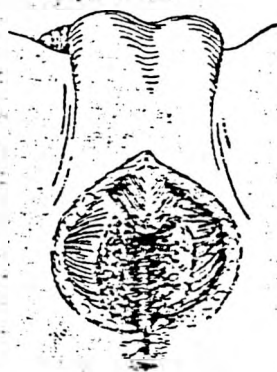


Fig. 1. — Muscles being sutured over the rectum en masse; area between sutured muscle and skin packed lightly with gauze (not shown).

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