from 7 to 10 μ. in diameter were noted, these being for the most part rounded or slightly oval, possessing a single capsule and having a clear centre completely void of any trace of cytoplasm. However, in some instances within such cells small reddish granules were observed, the significance of which could not be determined.

The largest forms varied from 18 to 27 μ. in diameter, were usually rounded or oval, and for the most part lay embedded in a more or less gelatinous bed which proceeded in stellate prolongations from the individual cells. Consequently, where many such cells were closely arranged the effect produced was that of a fine, almost mosaic, pattern. Some of these larger forms were possessed of clear centres similar to the smaller organisms, but the majority possessed basophilic material, present in such quantities in some cells that all other cellular structure was obliterated. Throughout the lung substance budding forms were occasionally seen. Ascospores were looked for and although occasional forms were noted within some of the larger cells, these, while very suggestive, could not be definitely established as such.

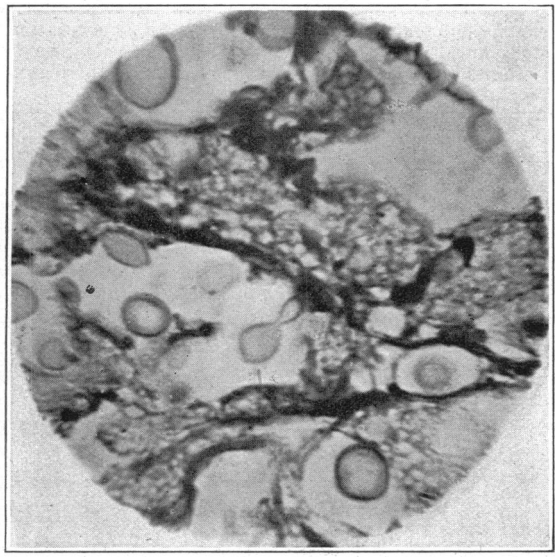

FIG. 3.—Some mature yeast forms in lung, one showing budding. (x 1350).

Yeast infection is relatively rare in man and for this reason, if for no other, the case reported is of interest. The organism present does not fall readily into any of the broad divisions of the yeast family and, admittedly, its identity could have been finally established only by means of cultures, which unfortunately were not secured. The tremendous variation not only in the size of the fungus but also in its structural characteristics is, to say the least, unusual, and the small forms are as typical of that stage as the large forms were characteristic in their peculiar arrangement.

This fungus was apparently of low pathogenicity, since it occurred only to a limited degree in a patient considerably under par in whom fairly extensive growth might have been expected once the organism had gained a foothold within the respiratory parenchyma.

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LEAD POISONING IN CHILDREN*

BY H. S. MITCHELL, M.D.,

Montreal

LEAD poisoning is a subject which has received considerable attention from time to time, and one which is of medical interest not only from the standpoint of diagnosis but also from that of etiology. As the cases which are apt to receive more prominence are those in adults, and as lead poisoning is said to be an intoxication second in frequency only to alcoholism, it was thought that a brief presentation of two cases in young children would be of value. Plumbism in adults is nearly always due to occupational hazards. In children this is not so. The exposure is more subtle, the juvenile system reacts more severely to a much smaller exposure, and the manifestations of intoxication are different.

Except in rare instances of food-poisoning, lead is usually acquired as a manifestation of pica, that perverted appetite which leads children to indulge in ordinarily repulsive objects. Occasionally the habit becomes almost a mania, and the child will go to unthought-of lengths to satisfy its perversions. Usually, lead painted chairs, toys, and cribs are attacked, and the amount of paint which these children can remove from a crib in the space of half an hour of diligent concentration is remarkable.

The amount of lead required to produce

* From the Medical Department, Children's Memorial Hospital. Read before the Montreal Medico-Chirurgical Society, January 22, 1932.

clinical symptoms is apparently variable and difficult to determine, but in one of our cases, *viz.*, a two-year old child, relapse followed a three weeks' resumption of paint eating; and in the younger case presented the total duration of lead eating was probably six to eight weeks before the cerebral symptoms developed. The children are usually more or less irritable, but it is seldom that they complain of the colic that plays such a prominent part in the adult form. Constipation is almost invariably present, but seldom noticed or remarked upon by the parents, unless they are cross-questioned. There is usually some pallor; the lead line is frequently present, but less constantly than in adults. Peripheral neuritis develops in children, but there is less tendency to involve the shoulder muscles. The legs are more often attacked in children; most important, the cerebral manifestations are more frequent, and often abrupt in onset.

CASE 1

A girl, of 9 years, was referred as a case of poliomyelitis on account of wrist- and foot-drop. There was a history of colicky abdominal pains for several weeks, obstinate constipation, and, during the two weeks previous to admission, tenderness in the muscles, with increasing muscular weakness. There had been no muscular cramps in the extremities. She stumbled when she walked, and could not use her hands properly to feed herself. On admission the striking thing was bilateral foot-drop and wrist-drop. The peronei extensors of toes, and the tibialis anticus were paralyzed, but the supinator longus was active. It is uncommon, except in children, to see paralysis of the tibialis anticus. The mucous membranes were pale, the skin was pallid, and there was a very definite lead line on the gums. There were no cerebral symptoms, no optic neuritis, and no neck stiffness nor head retraction.

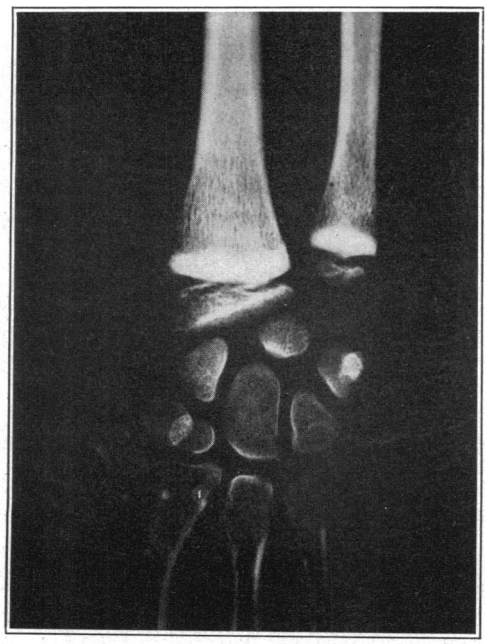

FIG. 1.—*Case 1.* Note the dense lines at the epiphyses of the radius and ulna. It is thought that the broader shadow indicates a longer exposure than in Fig. 2.

Blood examination.—Red blood cells, 3.7 millions; white blood cells, 7,200; hæmoglobin 73 per cent. Blood smears showed 3 to 4 stippled red cells in every field.

It was noted at the time that the hæmoglobin was actually much higher than it might have been estimated. The pallor of lead poisoning is a striking feature and said to be due to vaso-constriction of the skin vessels. Spinal puncture showed clear fluid under pressure of 150 mm. water, and 7 cells per mm. (lymphocytes).

The child was given calcium lactate by mouth, high-calcium diet and the feet and hands were put in cock-up splints. Later, massage was instituted. In six weeks definite recovery was in evidence and now (after three months) she has almost complete return of function in the hands. The feet, as is usual, are slower in recovering.

Urine.—Chemical analysis revealed the presence of lead in small quantities.

CASE 2

A female child, of three years, was referred to the hospital in generalized convulsions of sudden onset, following a period of a couple of weeks of general ill health, marked constipation, irritability, and projectile vomiting. During the last 36 to 48 hours she had developed a squint. This led the family physician to strongly suspect tuberculous meningitis; she was also quite pale and the question of a co-existing blood dyscrasia was raised.

On admission the child was semi-conscious, and when undisturbed lay on her side, with the head retracted, in a stuporous condition. Although there had been several convulsions during the day, none followed admission to hospital, in spite of the absence of immediate institution of specific treatment. There was marked pallor of the mucous membranes. Strabismus and definite stiffness of the neck were present and a questionable bilateral Kernig's sign. Bilateral papillœdema was also present. The knee-jerks, ankle-jerks and biceps-tendon reflexes were all present and slightly exaggerated. The abdominal reflexes were present. There was no Babinski sign. There was no paralysis of any muscles of the extremities. The only muscle paralyzed was the lateral rectus of the left eye. Examination of the heart and lungs was negative. The lymph-glands were not palpable. The bowel contained large palpable fecal masses. The liver and spleen were not palpable.

Blood examination.—Red blood cells, 3.4 million; white blood cells, 22,100; hæmoglobin, 50 per cent. A stained film showed anisocytosis, large numbers of stippled red cells, occasional normoblasts and myelocytes.

Lumbar puncture.—The fluid was clear; pressure, 170 mm. water; cells 200 per c.mm. all lymphocytes. Pandy's test for globulin was strongly positive. No organisms were found on smear or culture (including search for acid-fast organisms). The spinal fluid contained 154 mg. of total protein per 100 c.c. but did not give a positive test for lead.

An intradermal injection of O.T. (1 in 1,000), 0.1 c.c., was negative. In the meantime a faint but definite lead line was discovered on the gums. An x-ray taken to look for possible calcified abdominal lymph-glands showed none, but characteristic findings of plumbism at the ends of the ribs. X-rays of the epiphyses at the wrist revealed the same thing.

On questioning the parents, the source of the lead was found to be in eating furniture paint.

Improvement was continuous and rapid following

interruption of the paint-eating, the administration of a high-calcium diet, calcium lactate by mouth, and calcium gluconate intramuscularly. De-leading was later carried out by administration of NH_4CL and a low-calcium diet.

This case demonstrates that lead poisoning should always be borne in mind as a possible cause of convulsions of obscure origin.

The question of renal impairment is frequently raised in connection with lead poisoning. The younger child has not been investigated along this line, but the older child shows no evidence of disturbance by the Mosenthal test, although her urea concentration factor is lower than normal. She has no albuminuria.

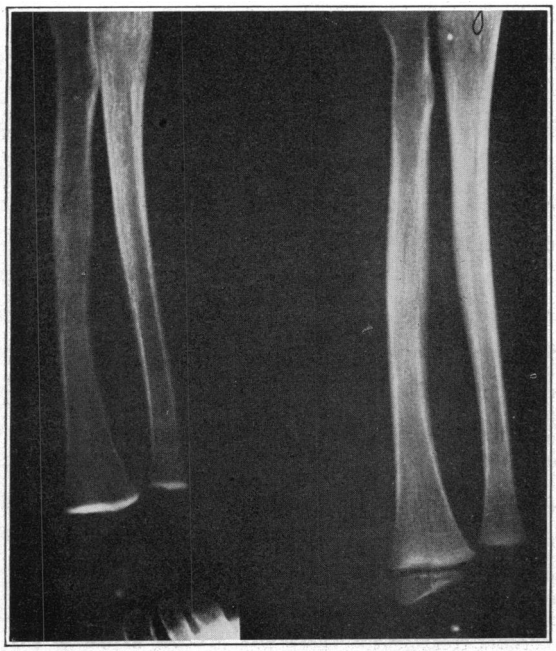

FIG. 2.—*Case 2.* Note the dense lines at the epiphyses of the radius and ulna, on the left; normal x-ray of child same age on right for comparison.

In the last few years a further impetus to the study of plumbism was given by Park, Jackson and Kajdi,[1] and Vogt,[2] who described special changes in the ends of growing bones in cases of lead poisoning. In several proved cases of lead poisoning it was found that there was a broad dense area in the x-ray picture at the ends of the long bones.

Specimens from autopsy material which have been studied showed that there was four times as much lead in the dense areas as farther back in the shaft of the bone. It was also demonstrated by Park that in microscopical sections of the specimens in plumbism the trabeculæ are much more compact in these radiologically dense areas. Therefore, whether the radiological appearance is due to one or both causes is not yet definitely proved. Dense lines are found at the ends of growing bones in several conditions, notably healing rickets, scurvy and congenital syphilis. But as this is associated with other characteristic signs, there should be no confusion. The rare condition of marble-bone[4] should be borne in mind.

It is not claimed that these x-ray findings are characteristic of plumbism alone, as there is good reason to believe that other heavy metals, such as bismuth or arsenic, may produce similar effects, and it has been known for many years that phosphorus produces a somewhat similar picture. Nevertheless the discovery of such an x-ray appearance should raise the question of lead poisoning, especially in an otherwise normal bone; and its demonstration in a suspicious case may be regarded as confirmatory evidence.

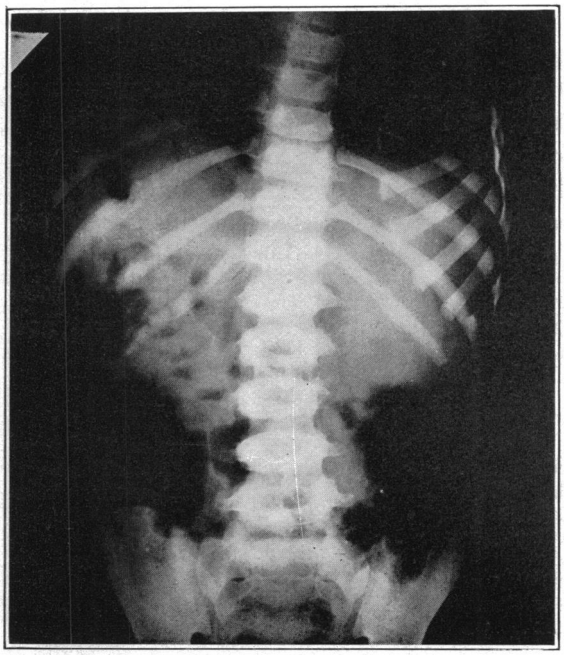

FIG. 3.—*Case 2.* Note the dense lines at the costochondral junctions on the right.

TREATMENT

For many years, in addition to magnesium sulphate by mouth and general dietetic and hygienic supervision, the most used drug was potassium iodide. Later sodium thiosulphate was introduced. Both these preparations very definitely increase the elimination of lead. But in the neurological crises, where there is already too much lead in the circulation it is obviously desirable to remove it rapidly. As shown by

Aub, Fairhall, Minot and Retznikoff,[5] the administration of a high-calcium diet, augmented by calcium lactate by mouth, or calcium chloride intravenously, rapidly removes the lead from the circulation and concentrates it in the bones. By this means the acute phase of the intoxication is easily controlled. Later on, when the acute symptoms have subsided, elimination may be proceeded with. This is accomplished by altering the pH of the blood, either by administration of acid or alkali; the same workers have shown that the combination of an acid salt (ammonium chloride) with a low-calcium diet gives the best results.

It is sometimes argued that if the lead can be satisfactorily stored in the bones, it should be left there, and the patient kept on a high-calcium diet or in a so-called positive calcium balance. As it has been so clearly shown experimentally, in addition to the clinical knowledge, that an acidosis may suddenly release into the circulation large quantities of lead, this temporizing may have serious results. In carefully controlled adults, theoretically, such a stand may be justifiable, but the frequency of acidosis in children, occurring either independently or in association with their many infections, leads one to feel that it is wiser to proceed with elimination of the lead in a quiescent interval than to run repeated risks of acute saturnism.

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REGENERATION OF THE DISTAL PHALANX

By L. H. McKim, M.D., C.M., F.R.C.S. (C.)

Montreal

IT has been known for many years that the distal phalanx is able to regenerate following the removal of the diaphysis for osteomyelitis which has not involved the proximal, or epiphyseal, portion of the bone, or the interphalangeal joint. The number of cases, however, in which amputation is performed following osteomyelitis of this bone leads one to suspect that this ability to regenerate has either been forgotten by many of us, or that it has never been sufficiently emphasized. In this connection it is felt that the following case presents sufficient interest to warrant its presentation.

Case History

Dr. G. S., a House Surgeon of the Montreal General Hospital, received a slight injury by accidentally pricking the tip of the right middle finger with a safety pin on December 29th, 1930. He left for his home at some distance the same evening. A few days later the tip of the finger became inflamed, and, on his return to Montreal on January 6th, 1931, he was found to have a deep-seated felon with pus pointing beneath the nail. The finger was incised, but it was found that considerable damage to the bone of the distal phalanx had already occurred. The infective process did not subside, and on January 21st, x-ray examination showed that sequestration of the diaphysis had occurred. The interphalangeal joint, however, appeared to be intact. Operation was performed the following day, the diaphysis being removed. The cavity was swabbed out with alcohol and tightly packed with iodoform gauze soaked in sterile liquid paraffin. The inflammatory process promptly subsided, and on removal of the packing, four days later, a clean granulating cavity was found. The cavity was filled with liquid paraffin and its walls allowed to collapse. As the swelling of the finger subsided an attempt was made to mould the distal portion to its proper shape by means of adhesive strapping. X-ray examination, made on February 13th, showed that very definite bony regeneration was occurring. The moulding of the finger by means of adhesive straps was carried out at dressings done every three to six days. The finger was completely healed, so far as external appearances went, in about four weeks from the date of operation. X-ray examinations were made at intervals of three to four weeks for a number of months, to show the rate of bone formation. The finger was sufficiently firm to permit of some use in about five or six weeks. About March 5th he sustained a fracture through the newly formed terminal phalanx from too active use of the finger. This fracture is shown in x-ray dated March 6th, 1931. It healed promptly and without discomfort. The final x-ray examination was made August 11th, 1931. At this time the finger was causing practically no inconvenience. The nail had grown to about one-half its former length and the finger, although slightly shorter in its distal phalanx, was functionally almost as useful as formerly.

Fig. I

Jan 21/31 Jan. 24 Jan. 24
Lateral view.