

November 12, 1968

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PHILADELPHIA PRINTING PLANT
1309 NOBLE
PHILADELPHIA, PENNSYLVANIA

0-1516-6

Thank you for the enclosed clipping and for the Christmas parcel that arrived Friday. I shall send some of the blood samples for analysis when the load on the laboratory slacks off.

The hair analysis is a worthwhile screening procedure, but it is not sufficiently precise.

I am also disturbed by the semantic confusion surrounding the use of the word "poisoning" in the press clipping. If the examining doctors "could not find a thing wrong with either of them", how can one say they are suffering from lead poisoning? Lead poisoning is a clinical diagnosis not a laboratory produced number, although there are laboratory tests that indicate an interference with biochemical functions in the body. Opinion is divided on whether this necessarily constitutes "poisoning" since it may not take into account adaptive mechanisms within the body.

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DUP 000319

N 3135

Ref.: Medical Tribune, Monday, November 4, 1968.

Analysis of Hair For Lead Poison Tried in Boston

Medical Tribune Report

BOSTON—Children living in the central-Boston slum area are being screened for lead poisoning by a technique of scalp hair analysis developed by scientists at the Children's Hospital Medical Center.

Two pairs of college students have already spent several months calling on families living in neighborhoods or dwellings where there have been instances of lead poisoning, as determined from the hospital's records. They fill out a simple record on each family, which includes a check list of symptoms and a history of pica. They also snip a sample of hair.

In the medical center laboratories, the hair is measured, weighed, washed, and cut into 1-cm. lengths, each labeled as to its distance from the scalp. Each segment is then separately dissolved in nitric and perchloric acids, and quantitative lead concentrations are obtained by atomic absorption spectroscopy.

It is not the amount of lead in each

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Hair Test for Lead Poison Tried in Boston

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portion of hair that is important, although that is taken into account, but rather an abrupt increase from segment to segment, it was explained by Louis Kopito, research associate in clinical pathology at the center. Together with Dr. Harry Schwachman, chief of the clinical laboratories, and Dr. Randolph Byers, consultant in neurology, Mr. Kopito developed the technique originally to measure the amount of sodium and potassium in nail clippings as an aid to the diagnosis of cystic fibrosis.

Scalp hair is an almost ideal diagnostic tool, said Mr. Kopito, because it is a veritable log of how much lead was ingested and when. It is known that hair grows about 12 mm. a month, so that it is possible to chart when the "tail" was eaten.

"Although it is one of the lesser-known sites for lead accumulation," he pointed out, "hair concentrates more lead per unit of weight than any other tissue or body fluid, including bone, blood, or urine."

As hair grows, it also picks up lead from the atmosphere, in amounts that depend on the locale, he said. In central Boston, Mr. Kopito has found the average amount of lead in the centimeter nearest the scalp to range from 20 to 70 micrograms per

Gm. of hair. Lead binds tenaciously to the hair and cannot be washed out.

By analyzing locks from children who live in central Boston but do not have plumbism, scientists at the hospital were able to plot the average curve of accumulation for that area to establish a "neighborhood norm."

"The new craze for long hair for boys has been one of the best things that has happened to me," Mr. Kopito remarked. "Until this year, I had to limit my research to girls' hair."

Needs 6 Inches of Hair

He needs at least 6 inches of growth to find how much lead a child has ingested above the average during the preceding 12 months.

If the lead content in the hair is much higher than the norm, a physician visits the home for a blood sample and a simple examination for overt symptoms of poisoning. If the blood lead level proves to be over the standard 50 micrograms per 100 ml. of whole blood, the child is brought immediately to the hospital for a thorough work-up.

This includes an x-ray of the long bones for lines of arrested growth, indicative of

heavy metal ingestion; a thorough blood analysis with particular attention to stippled red cells, signs of anemia, and hemoglobin level; and the establishment of a base-line urine lead level.

Finally, edthamyl calcium disodium is administered intramuscularly, 35 to 50 mg. per Kg. of body weight. If the child excretes a relatively high quantity of lead in the urine over a certain amount of time, the diagnosis of plumbism is confirmed and the child treated.

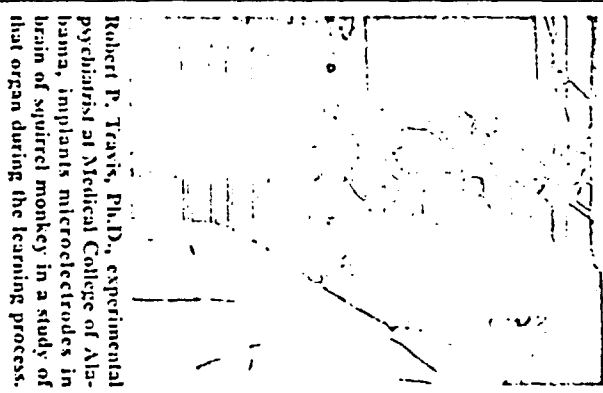
If bringing the child to the hospital is impossible, a base-line urine is taken after administering oral penicillamine. All children are evaluated neurologically for a future long-term follow-up, Mr. Kopito said.

Nine cases of lead poisoning were found in the first 100 families visited in the program, and hospitalization was required in four.

Many of the children do not have any noticeable symptoms, Mr. Kopito noted. He related how two small girls from one family were brought in because their hair analysis showed huge amounts of lead.

"The examining doctors couldn't find anything wrong with either of them—they looked perfectly healthy. Then they got

Conducting Brain Tests



Robert P. Travis, Ph.D., experimental psychiatrist at Medical College of Alabama, implants microelectrodes in brain of squirrel monkey in a study of that organ during the learning process.

the results of the blood tests. One child showed 135 micrograms per 100 ml. of whole blood; the other 116 micrograms. They had positive x-rays, and when they were chelated they excreted large quantities of lead."

Lead poisoning is most common among youngsters under six years of age, Mr. Kopito noted, with 85 per cent of the cases found in toddlers between one and three years old. In one study listed by the Department of Health, Education, and Welfare, 70 to 90 per cent of children with plumbism had a history of pica.

Not Limited to Slum Areas

The chief source of plumbism is lead-base paint, which children find pleasant-tasting and slightly narcotic, so they nibble as it flakes from the windowsills or porches of their homes. Lack of parental supervision combined with deteriorating buildings cause slums to have the highest incidence.

The problem, however, is not limited to slum areas. Mr. Kopito recalled two small children who became patients at Children's Hospital because they ate paint

In these common nonviral infections of childhood:

- tonsillitis
- pharyngitis
- otitis media
- bronchitis
- pneumonia
- skin and soft tissue infections
- sinusitis

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Parents and physicians tend to assume that lead poisoning is a thing of the past, he commented, because lead-base paint is no longer manufactured for indoor use, but base and exterior paints continue to contain lead.

Children with pica or even with no more than a natural curiosity can ingest enough paint flakes in a few days to become lead-intoxicated, Mr. Kopito said, and if not treated in time, may develop permanent brain damage from even a slight case.

The Boston study, supported by the Massachusetts Department of Public Health, hopes to reach all children in the city's most hazardous areas. A team from the hospital's Child Development Center, under the direction of Dr. Siegfried Pueschel, will follow the youngsters treated for poison through their school careers, in an effort to determine just how much retardation is connected with plumbism.

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