LEAD INDUSTRIES ASSOCIATION

60 EAST 42nd STREET

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LEAD HYGIENE and SAFETY BULLETIN No. 133

To the Members of the Lead Industries Association:

Two quite disparate enclosures come to you with this bulletin.

"A LAWYER LOOKS AT PLUMBISM"

Notable among the addresses delivered at our 1959 Annual Meeting was that with the above title by Theodore C. Waters, Esq., an attorney with wide experience in industrial liability practice. In this, Mr. Waters sought to point out the obligations to their workers and to the public, in terms of health and safety, imposed on employers by federal, state and municipal statutes, and the potential costs involved in neglect of their provisions. It will bear careful reading.

"LEAD POISONING IN CHILDREN: DIAGNOSTIC CRITERIA"

Though a problem of only indirect consequence to many of our members, lead poisoning in children is a source of more adverse publicity to our industries than are all other forms of plumbism combined. Having found that the diagnosis of such cases was often on a most inaccurate basis, resulting in frequent false allegations of lead poisoning, our organization recently teamed up with the National Paint, Varnish and Lacquer Association to secure the creation of a medical committee whose activities have borne fruit in the issuance of our second enclosure by the U.S. Public Health Service. It is hoped that these criteria will have general acceptance throughout the country.

Manfred Bowditch
Director of Health and Safety

LEAD INDUSTRIES ASSOCIATION
60 EAST 42nd STREET
NEW YORK 17, N. Y.

A LAWYER LOOKS AT PLUMBISM*

Theodore C. Waters
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In addressing myself to the executives of your Association I wish to call your attention to two phases of potential legal liability of management - (1) the liability to employees who may be exposed to the hazard of plumbism during the course of operations, and (2) the liability of member companies to the consuming public in materials that are sold containing lead.

In this enlightened age I do not believe it is necessary to labor the responsibility of management in the two categories to which I have just referred. You are aware of your responsibility to give to your employees a safe place in which to work and safe tools with which to work; certainly with respect to the consuming public you are charged with the responsibility that the materials which you produce and market contain toxic substances. From the standpoint of the intention of management, you recognize your obligation and the industry's obligation to protect the consuming public from any potential damage that may result from the use of your products. For the orderly presentation of my subject, I have broken it down into the classifications just mentioned, and trust that my remarks may be of interest

* Presented at the 31st Annual Meeting of the Lead Industries Association, Chicago, Ill., April 22-23, 1952

and assistance to you in the conduct of your operations.

FIRST. The liability to employees who may be exposed to the hazard of plumbism during the course of operations.

Compensation laws are now effective in all states of the union, together with all our territories and federal jurisdictions. They are the result of social need to remove from the field of common law litigation disputes arising between employers and employees with respect to industrial injuries arising out of and in the course of employment. They impose upon the employers the liability of an insurer for those injuries made compensable under the various statutes and assure to the injured workman a method for the prompt determination of his claim for injury with an insured obligation for the payment of that liability.

The laws of our respective states are not uniform; they differ with respect to coverage, requirements of insurance, injuries compensable, benefits payable, and administrative agencies to which is assigned the administration of the laws. However, their basic purpose is similar and with respect to the injury so compensable, they provide the exclusive remedy of the employee for compensation for such injury.

Since their original enactment, these laws have been repeatedly amended and each legislative year countless bills are introduced into our respective legislatures for the purpose of effecting such amendments. The general tenor and trend of such legislation is to liberalize the laws extending their benefits, increasing an employer's liability not only with respect to monetary payments, but with respect to the concept of the injuries made compensable under the statutes. For example, the original purpose and objective of this legislation

was to provide compensation for traumatic injuries, but by amendment and interpretation, we now find that benefits have been extended to compensation for occupational diseases in all states except two (1)*. Again, we find differences with respect to the diseases that are made compensable under the statutes. Eighteen states (2)* provide so-called schedule coverage defining the term "occupational disease" by specific reference to the disease compensable as, for example, the term "lead poisoning." Twenty-nine states (3)*, the District of Columbia and federal jurisdictions provide so-called general coverage which makes compensable any and all occupational diseases arising out of and in the course of employment.

May I direct my comment for a few moments to the subject of the imposition upon industry for the payment of compensation for all industrial injuries, including occupational diseases, arising out of and in the course of employment. I know that in this enlightened age every member company of your Association desires to provide compensation for any truly industrial injury that your employees may sustain. It is your responsibility as employers to provide for your employees a safe place in which to work and safe tools with which to work. Your employees are justly demanding safe, sanitary and clean working conditions.

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(1)* Mississippi and Wyoming.
(2)* Alabama, Arizona, Colorado, Georgia, Idaho, Iowa, Kansas, Louisiana, Maine, Montana, New Hampshire, New Mexico, North Carolina, Oklahoma, South Dakota, Tennessee, Texas, Vermont.
(3)* Alaska, Arkansas, California, Connecticut, Delaware, Florida, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Nebraska, Nevada, New Jersey, New York, North Dakota, Ohio, Oregon, Pennsylvania, Rhode Island, South Carolina, Utah, Virginia, Washington, West Virginia, Wisconsin.

However, the purpose of compensation statutes is to provide compensation for those injuries truly occupational in nature and not to make compensable the ills of ordinary life unrelated to employment. However, the trend of compensation legislation and decisions of courts and commissions in construing such laws is to treat all injuries arising out of and in the course of employment as being compensable whether or not they are occasioned by accident and whether or not the particular disease for which compensation is sought is characteristic of or peculiar to the industry wherein it arises. In this connection, I wish to stress the importance to your industry of the role of the industrial physician and engineer in effecting control of hazardous conditions within your plants.

Time does not permit a detailed discussion of the progressive legislative trends increasing monetary benefits and liberalizing legislative provisions providing compensation for injured workmen. Our general standard of living has materially improved. The cost of living is higher than ever before, wages are higher and industry will be met by the continuing demand of spokesmen for labor to relate monetary benefits under the compensation acts to such increased schedule of wages. Industry must adjust itself to such reasonable demands and price its product to make provisions for the increased cost incident to the payment of industrial injuries.

I feel certain that no one would disagree with the general statements just made and immediately there arises the question as to what, if anything, can be done by management to effect proper controls and protection for employees against hazards peculiar to your industry.

This is a matter that is the subject of the responsibility that stems from top management. Show me the top executive who concerns himself with the health, welfare and protection of his employee from industrial injuries, and I will show you an industrial organization where compensation costs are at a minimum resulting from the prevention and control of injuries.

It is somewhat easy for management to adopt slogans for the safety and protection of employees, passing on to subordinates the job of executing such programs; but I say that the responsibility of management does not end with the promulgation of such plans, but in carrying out their execution. Those of you who do so will find that this is good business, not only in saving yourself the cost of compensation, but in winning the confidence, respect and affection of your employees in demonstrating your personal interest in their welfare.

I have made reference to the role of the industrial physician and the engineer with respect to the control of hazardous health conditions in your plants. Their effective use is the ultimate answer to compensation costs and compensation problems. If you have well-developed medical and engineering control methods then the compensation costs arising under the different statutes will become minimum. Furthermore, it is simply good business and good industrial relations for management to concern itself with the health and welfare of employees.

In his role, the industrial physician may become one of the most effective agencies for the promotion of good relations between management and its employees. It may be that in some of the plants the employment of a full-time physician is not justified. However, there

is available to every member company the services of part-time physicians and unless and until an effective medical controls program is established you are simply not going to know the condition of the health of your employees and are not going to have intelligent records that enable you to evaluate compensation costs.

The fact is that an industrial physician, if he properly fulfills the assignment that is given to him, may well be the "father confessor" to the employees in the plant that he is called upon to serve. This should not be limited to the employee himself but should also extend to his family so that he may become familiar with the problems that are incident to the family life of the employee. It is needless to repeat that management should conduct pre-employment and post-employment physical examinations. I know of many companies that have come to appreciate the value of the physician who renders service to the employees of those companies. Believe me, they are real, and I am certain that through their efforts many matters of industrial relations are resolved before they reach the stage of compensation.

The maintenance of medical records is invaluable, particularly with respect to the ultimate trial and disposition of compensation claims. I am not going to embarrass you by asking how many of the companies here present are following a constructive medical program, but am certain that there is much room for improvement. From time to time I have heard criticism of rising compensation costs but until top management becomes convinced of the need for competent medical service and control you will be faced with rising costs for compensation which may seem to you to be out of reason. Therefore, let us stop

talking about this phase of our problem and do something about it. There are others in attendance at this meeting who are better able to advise with respect to the details of such services than I am. I honestly believe that if effective programs are developed you will not only realize the benefit of decreasing costs for compensation but will enjoy a much more satisfactory relationship with your employees.

With respect to engineering control, bear in mind that you are dealing with a toxic material and the existence of exposure to that material in your plans may well tend to indict the company as being responsible for health hazards that may arise therein. It is certainly necessary to have engineering control with the maintenance of records that indicate exposure. However, these records should be primarily for the purpose of indicating the particular parts of the operation where hazards exist. In other words, they should be used by the company to effect methods of control. From the standpoint of being effective in defense in compensation cases on trial, I must confess that they do not have much value unless it can be shown that there is actually no injurious exposure. The fact is that if an employee testifies to his exposure to an atmosphere containing a toxic material, immediately the compensation commission accepts this testimony as indicating a potential injurious exposure. You must come to accept this and to do everything you can to eliminate any possible exposure in your plants.

SECOND. The liability of member companies to the consuming public in materials that are sold containing lead.

The manufacturers and producers of lead also have a potential liability under labelling laws and regulations enacted and promulgated by governmental agencies designed to protect the general public from

hazards involved in the use of toxic materials. Only recently, the Committee on Toxicology of the American Medical Association has recommended the enactment of a Uniform Hazardous Substances Act in the several states. While I do not wish to present any argument of the pros and cons of this proposed legislation, it is of itself a warning to those concerned with the production and manufacture of lead that they may be required to comply with the requirements of that Act if it should be passed in the several states. There are already in existence various ordinances and regulations enacted in various jurisdictions having as their objective the same purpose as the legislative changes referred to. These ordinances and regulations are not uniform and industry may be confronted with one type of ordinance or regulation in a given jurisdiction and an entirely different type of ordinance or regulation in another jurisdiction. It is needless to say that the obligation rests upon the manufacturer and producer to comply with any given ordinance or regulation in the jurisdiction where such products are sold. Violation thereof would impose the liability provided by the ordinance or regulation with resulting prejudicial publicity.

The responsibility of member companies of this Association extends to the general public which purchases or consumes the products which you produce and sell. Your responsibility embraces the potential injury to those who may not be informed as to the toxic features of your materials that may cause injury to some person not aware of their hazard. Here the manufacturer, producer or user may be subject not only to punishment for violation of a given ordinance or regulation effective in the jurisdiction where the product is sold but may also be subject

to the possibility of the institution of a common law action for damages to an injured party arising out of the failure to comply with the ordinance or regulation effective in the particular jurisdiction in which the product is sold. Actions at common law are typical damage suits filed in law courts where a jury is empowered to award such damages as may be justified in its discretion, provided, however, that the injured party establishes the fact that failure of the manufacturer to disclose the toxic or hazardous substance of the material so sold caused the injury that is the subject of complaint. It is somewhat idle for me to tell you of the seriousness of this type of litigation. Complaints are based upon the alleged negligence of the manufacturer or user in specifying or requiring the use of paints or other materials in the manner which rendered it unsafe or harmful because it contained an excessive amount of deleterious substances such as lead, and failing to warn the injured party of the deleterious nature in order that protective clothing or appliances could be used by the person so using the material. Assuming that there has been a violation of some statute or regulation with respect to the labelling of the toxic substance, then the manufacturer may be legally responsible for resulting injuries providing there is a direct causal relationship between exposure to the toxic substance and the incidence of injury.

Members of this Association are fully advised with respect to the particular ordinance or regulation that may exist within the jurisdictions where you sell your products and I will not attempt to discuss this phase of the matter in any detail. However, there is a continuing concern on the part of the public and public health agencies to see

that the public is fully protected against any unknown hazard incident to the use of toxic substances. Your Association, through your Director of Health and Safety, has done an excellent job in apprising you of rules and regulations enacted or effective in the various jurisdictions where your products are sold. However, there is a continuing need for this type of service not only to the end that you may be properly advised of the status of the law under which you may be governed, but also to consult with and advise governmental agencies about the details of statutes, ordinances or regulations which may be the subject of enactment. You people and your Association have more information about this subject than any governmental agency could possibly obtain and it is submitted that you recognize your responsibility in this connection. On the other hand, many well-intentioned governmental agencies not having the benefit of the information which you have, may frequently consider ill-advised, ineffective or unnecessary legislation which may be highly prejudicial to your industry and to the public that uses your products. Therefore, may I suggest a program for your Association involving continued and increased concern dealing with the possible enactment of statutes, ordinances, rules or regulations relating to the labeling of your products, to the end that such legislation upon becoming effective may accomplish the objectives for which it was designed without the imposition upon your industry of unnecessary, unwise or unjust burdens.

Poison Control Centers

U. S. DEPARTMENT OF
HEALTH, EDUCATION AND WELFARE
Public Health Service
Washington 25, D.C.

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LEAD POISONING IN CHILDREN: DIAGNOSTIC CRITERIA

As the summer months drew near, it is reasonable to expect an increase in the number of cases of lead poisoning in children in many large cities throughout the Nation. This seasonal incidence has been repeatedly noted in studying the epidemiology of childhood plumbism.[1,2,3] The factors relevant to the increased summer incidence are not yet defined. Increased lead absorption caused by actinic rays of the summer sun[4] and increased heat of the summer leading to dehydration have been suggested.[5] Byers[6] feels that the summer incidence is a reflection of the greater chance of exposure to lead paint on the part of children playing outdoors, as compared to indoors. The seasonal variation in the occurrence of this disease should keep physicians alert to signs of lead poisoning in children in the summer.

That interest in this disease increases the incidence of diagnosed and reported cases has been borne out from the experience of cities such as Chicago, Cincinnati, Baltimore, and New York where interest and awareness concerning childhood lead poisoning are high. Where such interest does not exist cases may be frequently unrecognized.

A need for accurate diagnosis in childhood lead poisoning exists. Prognosis and institution of proper treatment depend to a great extent on the early and accurate diagnosis of this disease. Criteria for diagnosing cases of childhood plumbism have been formulated. The purpose of this communication is to present and discuss these criteria.

Diagnostic Criteria

In requiring a group or combination of conditions be present to make a diagnosis of a specific disease, there is a risk of missing some cases or erroneously diagnosing the entity in some cases in which it is absent, depending on the extent and specificity of the criteria set forth. The criteria listed below are based on selected collective experience with childhood lead poisoning and are designed to detect a minimum of false positive and false negative cases. After a reasonable period of carefully followed use these criteria will be revised, if necessary.

A service of the Accident Prevention Program, Division of Special Health Services, Bureau of State Services

1. Clinical and Laboratory Criteria

A. Gastrointestinal Manifestations

One or more of the following:

1) Anorexia
2) Intermittent vomiting
3) Abdominal pain
4) Constipation

B. Central Nervous System Manifestations

One or more of the following:

1) Irritability
2) Drowsiness
3) Persistent vomiting
4) Incoordination
5) Convulsions
6) Coma
7) Weakness or paralysis
8) Hypertension
9) Papilledema
10) Paralysis of one or more cranial nerves
11) Elevated cerebrospinal fluid protein content
12) Cerebrospinal fluid pleocytosis
13) Elevated cerebrospinal fluid pressure

C. Hematologic Manifestations

One or both of the following:

1) Hypochromic microcytic anemia
2) A significant degree of basophilic stippling of the red blood cells

D. Excessive Coproporphyrinuria

E. Urinary findings

One or both of the following:

1) Glycosuria
2) Amino-aciduria

F. The demonstration of increased radiologic density at the metaphyses of long bones.

2. Criteria for Lead Absorption

The following findings present evidence for absorption of lead in quantities that are known to be capable of inducing intoxication.

A. The finding of a concentration of lead in the blood, as determined by a method of known high sensitivity and precision,[7] of 0.08 mg. per 100 gm. of whole blood or greater. Values of 0.06 - 0.08 mg. per 100 gm. of whole blood are indicative of abnormal absorption of lead, but often not a degree of absorption which is capable of inducing symptoms of intoxication. Repeat determinations are preferred.

B. The finding of urinary excretion of lead, as determined by methods of analysis of known high sensitivity and precision,[7] in amounts of 0.08 mg. or more per 24-hours[6,8] in patients not receiving treatment to increase lead excretion. Repeat determinations are preferred.

3. Exposure to a Lead Source

A confirmed history, by chemical identification of the source, of exposure to lead of such severity and of such duration as to be indicative of a dangerous degree of absorption.

Discussion

The child who is poisoned by lead will have taken in and absorbed dangerous amounts of lead. The presence of clinical and laboratory manifestations in such a child enables a diagnosis of lead poisoning to be made.

Clinical and Laboratory Criteria - Manifestations included under clinical and laboratory criteria are non-specific, since any of these can be found in other illnesses. Even the increased radio-opaque areas or lines at the metaphyses of the long bones are not specific indications of lead absorption, for these radio-opaque lines are seen with other diseases, e.g., abnormal absorption and storage of other heavy metals and healing rickets. Such lines are not indicative of illness, but are so frequent in their occurrence in small children who are absorbing abnormal amounts of lead as to serve as warning. A child exhibiting this manifestation should be investigated carefully, with respect to the extent of his absorption of lead.

When any two of the criteria listed under clinical and laboratory criteria occur together with one of the criteria for lead absorption, a diagnosis of lead poisoning may be made.

Two or more of the clinical and laboratory criteria listed may be used to make a presumptive diagnosis of plumbism in children with early manifestations of increased intracranial pressure; such children require removal from the source of lead and emergency treatment. A delay in treatment while a blood or urine analysis for lead is being performed may be hazardous. Edathamil calcium disodium (calcium EDTA or edathamil) therapy can be instituted while blood or urine determinations are being performed. Treatment can be stopped if repeated lead analyses show the provisional diagnosis to be in error.

The central nervous system is frequently involved in children with lead poisoning. When involvement is such that abnormal cerebrospinal fluid findings (most commonly elevation of protein content) become manifest, the diagnosis of lead poisoning with encephalopathy may be made.[1]

Excessive coproporphyrinuria is a constant finding in acute episodes of lead intoxication, and can be demonstrated by a relatively simple qualitative test on freshly voided urine. Briefly, the urine is acidified to pH4 with acetic acid. Coproporphyrin is extracted immediately from the acidified urine into ether and then from the ether into 1.5 N. hydrochloric acid. Intense red fluorescence of the hydrochloric acid layer when viewed under a Wood's light is indicative of an increased amount of coproporphyrin. Quantitative coproporphyrin determinations on 24-hour urine collections can also be performed.[9] These may be helpful in long-term management of patients.[10]

The coproporphyrinuria encountered in lead poisoning is incompletely understood, but derangement in hemoglobin synthesis and interference in prophyrin metabolism in tissues other than blood are probably underlying factors.[6]

Criteria for Lead Absorption - Once the suspicion of lead poisoning is aroused, the most important single consideration in the differential diagnosis is whether or not lead has been absorbed in quantities sufficient to induce illness. This can best be demonstrated

by determining the lead content of the blood. The threshold value cited above, 0.08 mg. of lead per 100 gm. of whole blood, is a critical one. Lead concentrations between 0.06 and 0.08 mg. per 100 gm. of whole blood are indicative of abnormal absorption of lead, but often not of a degree of absorption which is capable of inducing symptoms of intoxication.

Extensive studies have been made on the variability of the concentrations of lead in the blood and urine of adults and children, both under ordinary circumstances and under conditions of abnormal exposure to lead.[8,11-13] In a group of children between the ages of six months and four years, in whom there was no evidence of abnormal intake and absorption of lead, the average blood lead concentration was 0.027 mg. per 100 gm. of blood.[11] In a recent paper the upper normal limit of blood lead concentration in young children is stated to be 0.05 mg. per 100 gm. of blood.[12]

The appraisal of the significance of lead absorption by means of analysis of the urine is much more difficult and much less effective than that of analysis of the blood, especially with children. In young children there is a wide physiologic variation in 24-hour urinary volume. Factors such as dehydration and acidosis, often accompanying the acute episode of lead poisoning in children, can alter urinary lead output in the untreated patient, so that the amount excreted may fall within the normal range. The collection of an uncontaminated sample of urine from a young child for the purpose of lead analysis is usually difficult, extreme precautions being required to prevent contamination of the urine with lead.[6]

Administration of calcium EDTA to patients who have abnormal amounts of lead in their tissues is followed by a rise in urinary excretion of lead.[14,15] This increased lead excretion following edathamil administration has been suggested as the basis for a diagnostic test.[16] Patients receiving edathamil therapy should excrete 1.5 mg. or more of lead in the urine on any one of the first three days of treatment. This test, while by no means as satisfactory as that of the determination of the level of the urinary excretion of lead prior to any therapy, may be more practical than the collection and analysis of a 24-hour urine specimen from an untreated patient in those instances where a delay in therapy is hazardous.

Different methods for analyzing blood and urine for lead are available. A simplified procedure for the determination of lead in small samples of urine and blood has been reported.[17] This procedure requires only 2 ml. of blood where most determinations require 10 ml. The requirement of a smaller volume of blood is advantageous when working with children. Certain other analytical procedures are described in articles listed in a monograph published by the American Public Health Association.[7]

Glassware and other equipment used in the collection and analysis of blood and urine samples can and should be rendered free of any possible contaminating lead by rinsing with warm 20 percent nitric acid, followed by thorough rinsing in "lead-free" distilled water. Other special precautions must be taken in the laboratory to prevent contamination of the samples from lead-containing airborne sources during ashing and analysis.

Exposure to a Lead Source - Childhood lead poisoning is, in general, a disease of poverty,[18] almost always found in areas of old, run-down housing. The source of lead

is usually lead pigment paint applied and re-applied early in this century, to walls and fixtures which more recently have been neglected and allowed to fall into disrepair. These coats may be buried beneath other coats of paint, covered with wallpaper, or may cover wallpaper or plaster. With neglect the paint and painted wallpaper peel, and the painted plaster crumbles. Particles may then be picked and ingested by young children. Lead paint in good condition has been chewed off of surfaces also. An adequate safe substitute indoor paint was not made available until about 1940. Lead paint applied to outside surfaces has also been reported to be the source of lead in cases of childhood plumbism.[1,6]

Children's toys and furniture are not significant sources of lead unless repainted with lead pigment paint. Since 1955 the American Standards Association has recommended that only paints with a lead content of one percent or less may be considered safe for use on children's toys, furniture and in housing interiors.[19]

Other sources of lead should be kept in mind. Numerous cases of poisoning have occurred in both children and adults from inhalation of lead fumes[20] and exposure to ashes[21] resulting from the burning of lead storage battery casings for fuel, a practice sometimes resorted to by destitute families. Other sources of lead involved in childhood poisoning can be found in the medical literature, but in this country these sources play a relatively unimportant role. References to these are listed.[22-25]

In most cases of childhood lead poisoning, pica, the abnormal appetite for non-edible substances, is responsible for lead being taken into the body. Children, usually between the ages of one and five years, most often exhibit this abnormal appetite which may result from emotional disorder[26] or nutritional deficiency.[27] It has been shown that lead is retained in small amounts in the tissues of an adult with a daily intake of 1 mg. of soluble lead in addition to the normal daily dietary intake (0.2-0.4 mg. of lead).[28] Since lead pigment-containing paint peelings may contain 100 mg. or more of lead, the repeated ingestion of small amounts of these peelings is compatible with absorption and retention of dangerous quantities of lead in the tissues. This will eventually result in clinical manifestations of poisoning if the exposure is not interrupted.

A history of ingesting paint chips or chewing on walls or woodwork may or may not be obtained. Often such activity goes unnoticed or the amount ingested is considered insignificant by the parents. The history may be obscure, incomplete or fragmentary. The possibility of the existence of lead poisoning, therefore, must occur to the clinician from the nature of the illness itself, and he must be prepared to make a presumptive diagnosis in an acutely ill child without an elicited history of lead ingestion. Diagnosis (and therapy) must not be delayed because a source of lead is not readily demonstrable. The explanation of the origin of the disease, if it turns out to be lead poisoning, is often found after the fact.

A positive history of pica for paint and a roentgenogram of the abdomen demonstrating radio-opaque material in the intestinal tract are valuable clues to the ingestion of lead. In New York City, blood lead analyses are performed on all children under the age of six years enrolled in the City Well Baby Clinics with a history of pica; young household siblings of these children are also examined in this manner.[29] The absence of these clues does not rule out the possibility of lead poisoning.

Exposure to a lead source may be confirmed by demonstrating that the source contains lead in excess of recommended limits. In children the history of lead exposure may usually be established by analyzing paint particles taken from the environment of the child and demonstrating excessive lead concentrations. The analytical procedure used should be an accepted one and should be performed by competent and experienced personnel.

Classification of Final Diagnosis - In making a final diagnosis involving a child exposed to lead, the following classification for diagnosis is recommended:

A. Asymptomatic Increased Lead Absorption

This diagnosis refers to the child who shows evidence of presence in the tissues and absorption of abnormally large amounts of lead, but who is asymptomatic. A source of lead, evidence of lead absorption, and increased radiologic metaphyseal density of long bones may be demonstrated.

B. Lead Intoxication

1. Lead Intoxication Without Encephalopathy -

Two or more of the clinical and laboratory criteria excluding central nervous system manifestations accompanied by abnormal cerebrospinal fluid findings, evidence for absorption of lead in dangerous quantities, and demonstration of a lead source enable this diagnosis to be made.

2. Lead Intoxication with Encephalopathy

Two or more of the clinical and laboratory criteria including central nervous system manifestations accompanied by abnormal cerebrospinal fluid findings, evidence for absorption of lead in dangerous quantities, and demonstration of a lead source enable this diagnosis to be made. This category may be subdivided, on the basis of severity of encephalopathy, into lead poisoning with mild and lead poisoning with severe encephalopathy. The latter group should include those patients who convulse and/or who are comatose for 24 hours or longer.[1]

The long-term prognosis of childhood plumbism (with reference to mental and neurological function) may depend upon the severity of the acute symptomatic episode. Therefore this classification should be of prognostic value.

The above diagnostic classification is also suggested in order that children who are ingesting abnormally large quantities of lead and children with lead poisoning without encephalopathy will not be overlooked. Early diagnosis is essential for a good prognosis in this disease. Removal from lead exposure and therapy with calcium EDTA[15] will more often result in a favorable outcome if instituted early. Therapy with calcium EDTA is not as effective once acute lead encephalopathy has occurred. This drug has not significantly reduced the 10 - 15 percent mortality rate from lead poisoning in children

and seems to be no more effective than older measures in terminating the acute episode of encephalopathy.[30] However, there is some evidence suggesting that neurologic and mental sequelae associated with childhood plumbism, and especially with encephalopathy, may be reduced by the use of calcium EDTA.[30,31]

These communities with active programs for the control of childhood lead poisoning, where only cases of lead encephalopathy and death are being reported, are undoubtedly missing numbers of early cases. Detection of these early cases is an important activity which should be undertaken by physicians, public health workers and poison control centers in communities where sources of lead may exist.

The Public Health Service offers consultation services and technical assistance to any community with a childhood lead poisoning problem. Case finding and prevention activities together with the institution of adequate diagnostic services are essential for controlling this problem.[2] For more details contact the National Clearinghouse for Poison Control Centers, U. S. Public Health Service, Washington 25, D. C.

Summary

Criteria to be used in diagnosing lead poisoning in children have been presented. Clinical and laboratory criteria, criteria for lead absorption, and exposure to a lead source are the three areas under which the diagnostic criteria fall. Two or more clinical and laboratory criteria coupled with one or both criteria for lead absorption enable a diagnosis of lead poisoning to be made. Although chemical identification of the lead source involved is important in arriving at a final diagnosis, treatment must not be delayed if the source is not readily demonstrated.

A classification for final diagnosis concerning the exposure of a child to lead is recommended. The importance of recognizing early cases of lead intoxication and even earlier asymptomatic cases in which increased lead absorption occurs is emphasized by the classification. Use of this classification should aid in establishing a long-term prognosis. Early diagnosis is necessary to reduce sequelae and mortality from lead poisoning in children.

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