

J. K. Dyer, M.D.

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LEAD POISONING

REPORT OF CONFERENCE

PHYSICIANS AND SURGEONS OF MEMBER COMPANIES

HELD IN CHICAGO

APRIL 6, 1937

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LEAD POISONING

SIMPOSIUM OF

PHYSICIANS AND SURGEONS OF MEMBER COMPANIES

Lead Industries Association
Palmer House, Chicago, Illinois.
Tuesday, April 6, 1937.

(First Printing)

In Eighty-Nine Pages
Fourteen Diagrams.

ROSTER OF ATTENDANCE

Guest Speakers

Dr. Joseph C. Aub	Professor of Applied Physiology Harvard Medical School
Dr. Lawrence T. Fairhall	Principal Industrial Toxicologist U.S. Public Health Service

Member Company Representatives and Guests

Allen, Dr. H. M.	St. Louis Smelting & Refining Co.
Boand, J. F.	National Lead Co., Chicago
Bridges, Clark D. (Guest)	Imperial Type Metal Co.
Brockway, Dr. G. E.	National Lead Co., New York
Brown, Dr. H. A.	Eagle-Picher Lead Co., Galena
Carney, Dr. P. S.	Division Lead Co.
Case, F. O.	International Smelting & Re- fining Co.
Clark, Dr. George A.	The Glidden Co.
Coombs, Dr. J. O.	Eagle-Picher Lead Co., Joplin
Dawson, George	Imperial Type Metal Co.
Deppe, Dr. A. H.	St. Louis Smelting & Refining Co.
Dettweiler, A. N.	Goldsmith Bros. S. & R. Co.
Dunn, Dr. R. H.	National Lead Co., Charleston
Ernst, Dr. H. C.	U.S. Smelting Refining & Mining Co., East Chicago, Ind.
Eustaphieve, A. A.	Anaconda Wire & Cable Co.
Gardiner, H. E.	American Smelting & Refining Co., El Paso, Texas
Gay, Dr. W. W.	National Lead Co., New York
Gesswein, Dr. C. A.	Goldsmith Bros. S. & R. Co.
Goldsmith, M. K.	American Smelting & Refining Co., Monterrey, Mexico
Gonzalez, Dr. Vela	Hammond Lead Products Inc.
Groman, Dr. H. C.	National Lead Co., Chicago
Harrison, Dr. R. M.	St. Joseph Lead Co., Herculaneum
Hensley, Dr. O. E.	Sherwin-Williams Co.
Hess, Dr.	Electric Auto-Lite Co.
Jarrett, Dr. W. A.	Anaconda Sales Co.
Johns, Dr. D. R.	International Smelting & Re- fining Co.
Johnson, G. E.	National Lead Co., Philadelphia
Koerber, Dr. K. A.	U.S. Smelting Refining & Mining Co., East Chicago, Ind.
Lutkus, E. L.	Bunker Hill & Sullivan Mining & Concentrating Co., and Hecla Mining Co.
McCaffery, Dr. Glen	American Metal Co. Ltd., Carteret, N. J.
Mark, Dr. Joseph S	Eagle-Picher Lead Co., Cincinnati
Matuska, Dr. A.	

Merrick, E. W.
Miller, Dr. C. W.
Nibecker, Karl
Norton, Dr. F. J.
Patchanian, Dr. G. H.
Prusait, Dr. Walter
Reichhard, L. G.
Rice, J. D.

Rodge, Dr. Jacob

Roth, Dr. S. R.
Smith, Dr. D. E.

Smith, H. I.

Wilks, William, Jr.
Wood, Dr. Wm. G.
Woodruff, Dr. Charles

Young, C. D. B. (Guest)

U.S. Smelting Refining &
Mining Co., East Chicago
St. Louis Smelting & Refining Co.
Imperial Type Metal Co.
Goldsmith Bros. S. & R. Co.
National Lead Co., Chicago
Chicago
National Lead Co., Chicago
American Smelting & Refining
Co., New York
American Smelting & Refining
Co., El Paso, Texas
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American Smelting & Refining
Co., Salt Lake City
Eagle-Picher Lead Co.

MR. WORMSER: I am gratified to see so many of you here. It is my pleasant duty to open this conference which, as you know, is a meeting of the physicians of our member companies who are interested in a common problem that every company faces, namely; the question of the lead hazard in industry. This conference is an innovation in our Association's affairs, and I hope that before the session is over it will be the success it deserves to be.

We have two guests whom I will introduce to you subsequently, and I think that the information you will derive from them will alone be well worth the trouble, time and expense you have incurred to come to this session.

There are one or two requests I am going to make of you in conducting this session. One is that you do not distribute any publicity yourself, so that if any statement is released about the conference it will be through the offices of the Association. There is a good reason for this because our industry, you know, is very often the recipient of unfair and unfortunate publicity. I am reminded of that by a clipping that I received from a Chicago newspaper. It was in Dr. Bundeson's column as follows: "My home smells of fresh paint because I use this paint around the house often. I get pains across my back and in my stomach....", and the article is entitled, "It May Be Lead Poisoning."! Our industry is always anxious to avoid unsound publicity.

We are going to have a complete transcript made of the session so that you need not bother to take notes. In that connection, after the session is open, I hope you will all announce your names when you take the floor so it will be possible for the stenographer to record the speaker.

The first order of business will be the election of a chairman for this meeting. I am only a layman - I am not a doctor - and I will be delighted to receive nominations for your chairman.

DR. JOENS: I move the nomination of Mr. Wormser as chairman of this gathering.

ANONYMOUS: Second the nomination.

also scattered (this is only four hours after injection) 23 per cent in the skeleton and the rest just scattered over the body. You see it is everywhere, in the lungs, the kidneys, the liver and in the skeleton, largely in the muscles. (Fig. 4.) If it is given in another way, through the gastro-intestinal tract, (this animal received over two and a half grams of lead in the eighteen days) only 24 milligrams of that lead were stored in the body, the rest having been excreted and never having been absorbed. But when it is absorbed by lung, it is again scattered over the body, in the liver, in the muscles and the kidneys, almost half of it being in the bones. (Fig. 5.) As time goes on, 19, 42 and 96 hours, it practically all is found in the bones where it is accumulated from the lead originally in the liver and other tissues. This accumulation in the bones can be observed within 24 hours.

The problem of chronic lead poisoning is not a problem of lead being scattered all over the tissues, it is a problem of controlling its storage in the bones. When it causes acute pain, lead is scattered over the tissues and when a person has been relieved of pain, practically all of the lead will be found in the bones. That is important from a medical point of view. It is of enormous importance because lead in the bones is inert, it doesn't do any harm, but lead in the tissues does do harm.

Your problem is whether lead is circulating in the body or not. In an autopsy made in St. Louis recently, for instance, where no lead could be found in any of the tissues, like the liver or kidney, proved that the death of that individual had no relationship to lead poisoning. In order to die of lead poisoning, one must have lead circulating in the body. Lead, as long as it is stored in the bones, is of no importance from a medical view - it does no harm. Practically everyone has a little lead stored somewhere in their bones, according to Barth, of Germany, but it is important, from the medical-legal standpoint, as to whether it is scattered around in the body. A child died of lead poisoning and 18 milligrams of lead were found in the liver. That shows that lead was scattered over the body in that child, and, therefore, was a contributory factor at least to her death.

DR. AUB: I am going to let Dr. Fairhall answer that. The great trouble with lead is that it is largely excreted by bile, and therefore, by feces. It is obvious that urinary tests only show a small fraction of lead which is being excreted. That is the danger of urinary analyses, from my point of view. I'd rather let Dr. Fairhall answer that.

DR. BROWN: Another question, Dr. Aub. Will you find the stippling in older, or chronic cases of lead, necessarily?

DR. AUB: I think all of you men have had, probably, much more experience with those chronic cases than I have, because you see them all the time. I think when you have lead doing damage to cells, you ought to find stippling in the blood, because of all the cells in the body that lead injures, it injures the red cells as much as any. Therefore, as long as it is causing damage, it ought to give you stippling. You may disagree with me in that because you see all of these cases more than I do. That has been my experience, at least.

DR. CARNEY: What is your standard of stippled cells? Have you got a definite standard?

DR. AUB: Various people have various standards. On the whole, the best is a hundred stippled cells per million red cells. What we mostly examine is a smear of blood and we think that a stippled cell every three or four fields means you are running into danger. I think you all have had more experience than I have and I am looking forward to your discussion of that problem.

Now the question arises as to lead in bones and one of the questions on the list is what about the lead line in bones. I am going to discuss at length what happens to lead in bones, because of its enormous importance in this whole problem. In the first place, let me make it clear - you never get a lead line except in growing bones. You do not see the lead line in an adult. That seems to be a generally misunderstood thing, because I repeatedly get letters saying that the patient had no lead line. You can't get a lead line in an adult bone. You only get them in children.

Here you see a beautiful example of Dr. Vogt of a lead line in a child. (Fig. 6) This child died and had five times as much lead in the lead line as it had in the bones. This change is partly lead and partly bone calcium. From a child's bones, you can get an idea of what happens to lead in circulation in the body. Here

is a child acutely leaded. You can see this bright line here. Here is the same view at three months and at six months later. (Fig. 7) In all of these, you see the original line, which hasn't changed in length. But, as the child grows, this lead is redistributed around through the circulation and gets redeposited. The lead being dissolved, circulates around and gets redeposited as the bones grow. To get rid of the lead in children is almost impossible, because it is always being dissolved and circulating around.

DR. MCCARTREY: How do you differentiate between that line and the line in rickets?

DR. AUB: It looks differently. This child hasn't rickets. There is no fuzziness along the epiphyses. It is an apparently normal, growing bone with a very sharp line. The child goes along and has no evidence of rickets. In rapidly healing rickets, one may get a heavy line similar to the lead line.

DR. BROCKWAY: Isn't there a marked difference in opacity, Doctor, in rickets and lead?

DR. AUB: Yes, there is a very sharp heavy line in lead, and in rickets there is the reverse as you would expect with poor calcification.

DR. MARK: An interesting thing occurred to me several times. In cases of people suffering from lead absorption and having a fracture, the fracture line is deposited with an excess of calcium. Why isn't there a lead line there?

DR. AUB: I am unable to tell you, but I shall be able to tell you in two months. I am doing that experiment now. I can't give you the answer now. We have done that to dogs to which we have given lead. We have fractured the bones and we are going to see whether there is a large amount of lead present at the fracture. It doesn't prohibit the union at all. Anybody with lead poisoning will heal fractures well.

I have to leave lead for a minute and talk to you about the functions of bones, work which came out of these lead investigations. To make a long story short, the bones are divided into two parts. There is the hard cortex, the part which supports us, and then, all through the bones, in the marrow are fine trabeculae. These are bones from two cats kept in the laboratory for the same length of time, (Fig. 8) one fed without milk (344) and one fed with milk (339.) These trabeculae are lost if the animal is kept on a low calcium diet. There is

I want to go back a little, for I had several things in regard to the physiology, I wanted to speak about before I took up treatment. First of all the question arises as to an individual's susceptibility to lead. We spent a great deal of time on the problem of detecting individuals who are going to be susceptible to lead. We thought there might be variations in the response of red blood cells when exposed. We were never able to find any variation at all. As far as I know there is no way of telling whether an individual is susceptible to a heavy metal poisoning or not. The best way to find that would be in the blood. What happens to that individual who deposits lead and deposits calcium in the bones and who has not been affected at all? It is the individual who has much lead circulating in the blood stream who would be apt to get lead poisoning. It is known that certain races are susceptible to lead. Negroes are very susceptible to lead as compared to whites. Women and children are susceptible as compared to men. Further than that I know no way of picking out an individual susceptible to lead before exposure.

The question of whether lead poisoning produces arteriosclerosis is also a problem always coming up. There is no good evidence that I can find that lead produces arteriosclerosis. The idea has been handed down for generations that it does. In the literature there is no good evidence for it. There is evidence now, since Jarvis Nye's book, that lead does produce chronic nephritis. He studied children who were known to have lead poisoning and he found that a large percentage of them died later of nephritis.

I think we now have to agree that lead may injure the kidneys; but that there is no good evidence that lead produces arteriosclerosis. The other question also asked; does lead injure the teeth? Is the great amount of caries which is present in the lead workers due to the lead? Lead gets in the teeth, and of that there is no question, but whether it does some injury to the teeth there I do not know. I have the impression it increases caries on the clinical basis of the very bad teeth seen in most lead workers.

MR. WORMSER: I think we'd better stick to lead. The sixth question is: "Is de-leading by the use of drugs advisable in a case of mild lead poisoning?" May I have your comments about the answer to this question?

DR. WOOD: Following the period of storage, yes, but by lead poisoning you are speaking about poisoning, not absorption, which means intoxication, I presume.

DR. BROCKWAY: That should be clarified, I think. Men will have different ideas on this. There is a question whether the man is going to continue to work or whether he is going to be relieved of his work and be de-led. I think Dr. Aub has spoken quite a bit on this, but I think we should certainly clarify that, whether he should continue to work or rest.

MR. WORMSER: This appears to be related to the following question: "At what point in a case showing lead absorption, is it inadvisable to attempt to de-lead?" Both questions seem to be related. Dr. Aub, have you any comment you care to make?

DR. AUB: No, I think this is the sort of a question you men can answer better than we can. I think one thing is clear, that is, where you are dealing with mild intoxication cases, the first thing you want to do is to get control of a situation. The first thing to do is reduce the lead stream, and get it tucked away in the bones. I think that is clear to all of us. Whether to de-lead them afterwards or not, I think is a matter of practical experience. I am learning a lot from you this afternoon. In that regard, whether it is better for them to keep that lead tucked away in their bones or whether it is better to de-lead them, is a matter that you can answer much better than I. Of course, I think it is probably better to de-lead them, but that may be an academic point of view.

DR. BROCKWAY: Talking from the standpoint of the industrial physician, I think we always have to bear in mind the possibility of litigation, and in my experience, almost every man who has a case of acute lead poisoning, is a potential case for the lawyer. I think we have to look at it a little bit from that point of view. Once they have been cured of their acute lead poisoning, they have always in mind the money they are going to get out of it as a result of that poisoning. From that point of view, I think it is essential to try to render that blood as clear of any laboratory evidence of lead absorption as we are able to do.

In my experience, it has been a good thing to take this man out of a lead absorption and de-lead him as far as possible, in such a way that when he comes before the compensation board, his blood will be practically normal. If this can be accomplished, when the final examinations of his blood are made months after this acute lead poisoning is past, and we find that his blood is practically normal, I think we stand a much better chance of minimizing his permanent disability when we come before the referee than if there are a lot of stippled cells in his blood. I think that is the way to look at that.

Years after a man has not been exposed to lead, whether he comes down with an acute lead poisoning or not, I don't know. Personally, I have never seen a case of acute lead poisoning in a man who has been away from lead for a number of years. When you bear that in mind, I think it is better to de-lead them, as far as possible.

Dr. Aub mentioned this morning that, in his opinion, it was not possible to get rid of the lead in the bones entirely, no matter how vigorous the treatment is. In connection with that, I can cite one case that is of great interest to me. It concerns a man who had a case of lead poisoning. He was cured and promptly put on a de-leading treatment. I treated him in this way for about four months, up to the point where I thought no further de-leading was possible. At that point, his blood was absolutely normal, his hemoglobin was normal, he had no stippled cells, and his relationship of his blood was normal. I continued to treat him and after that a supporting treatment until I thought he was as good as any man could be after his experience. When he was at last returned to work, instead of coming back to work, he went to a lawyer and formal litigation was started against the company for the permanent results of lead poisoning.

We opposed the suit, as, in our opinion, there was no condition detrimental to his health. The night before the trial, the man dropped dead. There was great excitement about it, both on the part of the company and on the part of his legal staff, and it was the consensus of both parties concerned, to have an autopsy performed. This was done and the long bones, sections of the heart, liver, kidneys and some of the muscles were taken for chemical analysis and the chemical analysis was done by a very competent man, one who does the toxicological work for one of the large counties of New Jersey. There was no sign of lead poisoning in the man's system. I have been on the lookout for another case, and not one has dropped dead yet. I think this should be brought up at this meeting, in an effort to find anyone who has had similar experience.

hazard and given iron, they build up their resistance. You can give it by mouth, in the form of ferrous sulphate. Lead anemia is merely a peripheral blood destruction. When you don't have lead in the blood that destruction will cease.

DR. KOERBER: How about arsenic?

DR. AUB: I don't happen to use arsenic.

DR. KOERBER: I was wondering if there was some point in not using it?

DR. AUB: I don't know, I don't just happen to use arsenic. I don't know about arsenic hardening the surface of red blood cells. I don't know whether it does or not.

DR. KOERBER: If I remember right, that is what we were taught. What about liver extract, Dr. Aub?

DR. AUB: Liver extract has been repeatedly shown to be of little value in secondary anemia, but its use would do no harm.

DR. MARK: I think ferrous sulphate if given to some people would cause a little gastric disturbance. If it is given with or after the meals that will do the trick nicely. I have been using ferrous sulphate tablets. I give four tablets a day, one at each meal and one before retiring. They cost less too. When you compare that with injecting it intramuscularly and buy these ampules you will find the cost running up quite a little. Why use expensive medication when the cheaper will do the work?

DR. WOOD: I presume that the man is not kept in the lead hazard.

DR. AUB: He should be removed from the hazard and given a full diet with iron which should be the proper treatment.

DR. BROCKWAY: Preparing a case seems to give a lot of worry about compensation. If you are pretty free of lead, if you want to just prime him for the compensation court examination, if you will inject him with liver you will find it will bring him up, but it doesn't do him any good. The bone marrow is pretty active and you can shove in a little liver at that time and you can make the blood cells pump out into the system for a few days. That will get you by the compensation board, if you are interested in that.

after number of hospital cases. Of course, as time rolled on, those things were taken care of, as well as they could be, and we eventually have gotten down to the point that when I was coming up Sunday, I said: "I will be very proud to announce the fact that we haven't had a case of lead poisoning for two and a half years". On Sunday, as I was playing golf, I had to leave to go and see a case of lead colic. I gave this chap the treatment that I have mentioned, and I believe it will be beneficial in getting him back on his feet. It has proven so in my experience of fifteen years.

MR. WORMSER: Thank you, Dr. Dunn. Have you any comments on that, Dr. Aub?

DR. AUB: No, I think it is a good idea.

MR. WORMSER: Shall we proceed with the discussion of our first question: "The value of industrial dental hygiene?" Does anyone here care to make any observations on this topic?

DR. BROCKWAY: All I can say is, we are taking care of the teeth of our employees. We take care of them in a number of different ways. They all look better. I don't know whether that is because because they have plates or what. I think it is an important thing, at least taking care of the pyhorrea and yanking out a bunch of stumps which most of them have, enabled us to cut down on the lead line, which the shyster lawyer will attack.

DR. WOOD: How many men have you there?

DR. BROCKWAY: Three hundred and fifty.

DR. WOOD: You have a full time dentist, do you?

DR. BROCKWAY: No, the plant has an arrangement whereby the dentist gets all the material furnished by the plant and he charges a very reduced fee, about what he would get in any good dental clinic.

MR. WORMSER: Any further comment? If not, we will pass on to number 2: "The efficiency of respirators in lead work." I believe various government departments have measured the efficiency of respirators and about all the companies here have been having various experiences.