

"Plumbo-phobia"

Occupational Lead Poisoning

—A Study of Cases of Lead Absorption and Lead Intoxication Observed by the Author at the National Lead Company, Atlantic Branch, Perth Amboy, New Jersey, and at the Perth Amboy General Hospital—

WM. C. WILENTZ, M.D.

Part I

0000-NLI-000022564

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Part I

IT IS NOT my intention in this paper to present anything startling on this subject, since years of study and investigation by prominent members of the medical, chemical and engineering professions have provided our libraries with a large amount of scientific material. It is my desire, however, to present certain phases of this subject, along with my own interpretation, to those persons who are interested in the effects of lead as it confronts us daily in industry.

My reason for this is the obvious fact that the lead industries have been on the defensive far too long and unnecessarily. The unfair and insidious propaganda which caused this situation has been permitted to permeate throughout the entire field of industry, government circles, and courts of justice and has, therefore, placed the entire industry in a very unfavorable position. This is due primarily to the fact that too many men have written and are now writing too many books and articles about lead of which they know too little from a practical standpoint. These men, either innocently or by intent, are responsible for this condition which I term "Plumbphobia," meaning "Fear of Lead." With the aid of information obtained by a survey of studies at our plant, we hope to assist in neutralizing this attitude.

I can well recall that when I first undertook the responsibility of looking after the health and welfare of the employees at this plant, I had great fears of what was to come. I did not know what to expect, what dreadful complications were likely to arise, what therapeutic agents we had at our disposal, and what prognoses to anticipate. My trepidation had its origin in the talk and gossip among the people of the community, where "everyone was familiar with the bad effects from lead poisoning." As a matter of fact, the medical and legal fraternities held similar impressions, so that it is not surprising to learn laymen felt the same way.

Such fears and impressions, generally encountered, may have been justified some years ago, but they are not justifiable on any basis today. Industry is spending huge amounts of capital to install the most modern protective equipment, as well as providing the services of well trained physicians and modern medical dispensaries to deal with anything that may arise in the course of employment including the effects such as they may be from exposure to lead.

It is my belief that cases of lead absorption, and intoxication should recover without any resulting disability. This is predicated on the fact that if sound medical observation and treatment are provided in conjunction with present-day cooperation from management, excellent results can be obtained. I will say, however, that without this cooperation anything could happen, will most certainly happen, even today. Let no one misunderstand my thoughts about the toxicity of lead. I am thoroughly acquainted with the possibilities and probabilities of this metal, but I am perfectly satisfied

to state frankly and without reservation that I am no more frightened by its effects than I am about other toxic substance. Let's not continue to consider lead absorption and intoxication as "an incurable disease." Let's put an end to this type of loose talk. We have facts to state and nothing to conceal. Let's make sure that men in laboratories be made familiar with the practical and clinical aspects of the condition, and vice versa. This is the least that we have a right to expect from men of repute.

The exposures prevalent in our plant were from lead fumes and lead dust in combination with oxides, sulfates, hydroxides and antimony, the most prevalent exposure being from lead dust and primary manner of absorption being through the respiratory tract via of inhalation of the dust.

TABLE I
AGE FACTORS

	1929	1940	1941	1942	1943	1944	1945	Average
Average age of intoxication cases (years)...	32	0	32	32	36	34	32	— 32
Average exposure of intoxication cases (weeks).....	10	0	7	14	11	8	14	— 11
Average time lost from work (days).....	30	0	23	22	21	21	26	— 26
Age of youngest intoxication case (years)...	29	0	23	23	24	25	21	— 24
Age of oldest intoxication case (years)....	34	0	46	46	47	54	41	— 46
Length of exposure of youngest case (weeks).....	8	0	3	10	4	4	10	— 8
Length of exposure of oldest case (weeks)...	6	0	12	12	8	6	6	— 6
Length of shortest exposure case (days)...	27	0	29	48	11	11	10	— 27
Length of longest exposure case (days)...	22	0	9	12	16	20	7	— 18

Age Groups Studied:

14 cases between 21 to 29 years.
13 cases between 30 to 39 years.
9 cases between 40 to 47 years.
1 case 54 years.

Table I discloses the wide range of age groups that may become affected, as well as showing clearly a well known fact, viz., that the young and middle-aged men are primarily involved and most susceptible to the effects of lead exposure.

That is the reason why it is important that these younger men be given most careful pre-employment examinations.

The most serious cases encountered were two men who were employed in dismantling an old building. One was 35 years of age with a 16 weeks' exposure while the other was 39 years of age with a seven weeks' exposure. Both were of Spanish descent. Dismantling has always been considered one of the most serious exposures.

It seems to me that average time lost from work of 30 days should compare favorably with other plant figures. We have never made it a policy of insisting

upon quick return to work, but, at the same time, as soon as the subjective symptoms subside or disappear, arrangements are made in providing other types of work. The blood picture guides us in this respect, but only as an aid in estimating the entire picture.

TABLE II.
HOSPITAL AND NON-HOSPITAL STUDIES

Total No. Cases from 1939-1945.....	37
Cases hospitalized.....	21
Cases not hospitalized.....	16
Total.....	37
Hospital case statistics (14 cases)	
Shortest hospital stay.....	5 days
Longest hospital stay.....	34 days
Average stay.....	12 days
Average age of patient.....	36 years (23 to 54)
Average length of exposure.....	9 weeks
Average loss time of case.....	34 days
Non-Hospital case statistics (6 cases)	
Average age of patient.....	32 years (21 to 47)
Average length of exposure.....	13 weeks
Average loss time of case.....	14 days

Table II discloses some interesting facts relating to the hospitalization and ambulatory handling of these cases. It must be clearly understood that we were dealing with different degrees of intoxication, the most pronounced and seriously ill being hospitalized while the mild types were treated as ambulatory.

It is also worth noting that these studies clearly show that the average exposure for the most serious cases (hospital case) was six weeks shorter than the ambulatory case, indicating a more acute fulminating, intense intoxication within a shorter period of time.

Early hospitalization pays dividends—do not hesitate or delay—patients will be grateful—funds will be saved—results will be excellent.

Table III confirms what has always been known as a fact, namely, that there are many conditions other than lead exposure that must be considered whenever this subject is discussed. This truth is still not clear to the general medical and legal professions.

TABLE III.
PRE-EMPLOYMENT STIPPLING STUDIES

Total No. Pre-employment Exam. (1939-1945).....	1253
Total No. showing stippling prior to employment.....	61 — (5%)
Average age of stippling cases.....	32 yrs.
No. groups studied (From 16 yrs. - 55 yrs.).....	28
Age groups showing largest numbers of stippling:	
21 yrs.....	7
29 yrs.....	5
27 yrs.....	5
31 yrs.....	4
Pre-employment occupations of stippling cases:	
1 student	1 jeweler
2 truck drivers	1 iron worker (underweight)
1 telephone operator	1 ceramic worker
1 barber	1 carborundum (and pyelitis)
1 army discharge	3 plumb mill workers
2 tile manufacturers	1 coal miner
1 silk manufacturer	2 brick workers (and pyelitis) (1)
1 railroad worker	2 steel workers (one syphilis)
1 fertilizer	4 cable workers
7 copper workers (one with pyelitis) (one with nephritis)	
2 A.S. & R. workers—smelters (one with nephritis)	
1 detinning worker with terra cotta besides	
1 painter	
12 lead workers and brick worker	(1)
terra cotta	(2)
copper	(1)
A.S. & R. Smelters	(3)
pyelitis	(1)
7 none as to occupations, but following diseases were found on pre-employment examinations in addition to the above:	
3 syphilis	
1 nephritis and underweight	
1 pituitary dysfunction	
1 undernourishment	

It is interesting to observe that no man employed (who had shown pre-employment stippling) has up to the present time shown any inclination towards absorption or intoxication. This fact has greatly assisted us in the employment problem common to all industry today, owing to conditions beyond our control.

TABLE IV.
BLOOD STUDIES

Period of greatest changes in counts and smears—7 to 14 days after acute symptoms arise.	
Period when blood counts and smears return to normal: (according to whether or not hospitalized)	
Hospital cases.....	4½ months
Ambulatory cases.....	8 months
Period when blood counts and smears return to normal: (according to length of exposure)	
20 year group.....	5 months
30 year group.....	4 months
40 year group.....	3 months
Period when blood counts and smears return to normal: (according to length of exposure)	
Short exposure groups (below 10 weeks).....	4.4 months
Longer exposure groups (beyond 10 weeks).....	4.3 months
Range of Red Blood Cells.....	
lowest count (H).....	2,990,000
(A).....	3,740,000
highest count (H).....	4,250,000
(A).....	4,780,000
average count (H).....	3,679,000
(A).....	4,034,000
Range of Hemoglobin Counts.....	
lowest count (H).....	64%
(A).....	68%
highest count (H).....	76%
(A).....	70%
average count (H).....	64%
(A).....	71%
Range of Stipple Counts.....	
lowest count (H).....	37
(A).....	39
highest count (H).....	100
(A).....	141
average count (H).....	119
(A).....	78

NOTE: (H) Hospital case. (A) Ambulatory case.
Stipple cell count per 30 fields.

Treatment

WE DO NOT employ anything unusual in our treatment. We have nothing new to offer. We felt, however, that in view of the facts that during the past five years we have had to treat 37 lead intoxications, and that in no case so far has there resulted any disability, our procedure in handling such cases must have some merit. For that reason, and only for that reason, do I mention it. Does it not prove that these cases are curable? If we can get such results, so can anyone else.

Anyone who wishes the best information on treatment should consult that most excellent pamphlet recently published by the American Public Health Association, entitled "Occupational Lead Exposure and Lead Poisoning." The pamphlet can be utilized as a guide to the fullest extent, and with maximum benefit to all concerned. I agree with all the suggestions, since I have utilized them generally in all my cases prior to their publication, as well as ever since. I do feel that treatment, in order to be satisfactory, must be administered in a definite specific manner, fully recognizing the problem, as otherwise it makes very little difference what you employ as therapeutic agents.

Our general routine is as follows:

DURING THE ACUTE PHASE:

1. Hospitalize.
2. Bed rest (or ambulatory, depending on severity of pain).
3. One ounce magnesium sulfate every morning on arising.
4. Teaspoonful tincture belladonna-phenobarbital mixture Q.4.H. for pain.
5. Narcotics seldom utilized.
6. 10cc. 20% neocalgluconate—intravenously Q.4.H. (preferred); intramuscularly Q.4.H.
7. 15 gr. neocalgluconate wafers or bone phosphate wafers orally Q.4.H.
8. Warm water bag or electric pad for abdominal pain.
9. Diet high in calcium and low in phosphates.
10. Complete blood count and stippling followed by red blood count, hemoglobin and stippling counts every other day.
11. Estimation of lead in urine and urinalysis, followed by occasional urinalyses.

DURING THE CONVALESCENT PHASE:

1. Regular diet permitted.
2. Mild laxatives recommended.
3. Calcium or bone phosphate wafers provided.
4. Iron and vitamin B complex tablets provided for anemia and as tonic.
5. Warn against overindulgence of alcoholics, exposure to colds, etc.
6. Monthly red blood counts, hemoglobin, and stippling counts; *blood + urine + stool; porphyrin exams.*
7. Return to some work as soon as possible for psychological reasons.
8. Make sure compensation payments are made on time for same reason.
9. No further exposure permitted.

DURING THE CHRONIC PHASE:

1. Permanent removal from exposure.
2. Fresh air.
3. Adequate diet.
4. Multiple vitamin tablets for fatigue, malaise and weakness.
5. Vitamin B and its complex for neurologic symptoms and signs.
6. Laxatives for constipation.
7. Calcium therapy if indicated.
8. Adequate treatment for sequelae (if they arise).

REMARKS:

1. Calcium gluconate intravenously must be continued for at least several days after all symptoms of colic subside as safety measure, otherwise pains will recur and you will have to start all over again.
2. Calcium gluconate oral wafers depending on convalescence.
3. No iron preparations during hospital stay—cannot be utilized or absorbed.
4. Vitamins, milk and special diets are questionable as to true value but can be used without any ill-effects if one so desires.
5. Deleading not advocated.

Summary

A COMPLETE and thorough study of 37 lead intoxication cases with no resulting disability has been presented.

2. Table I shows that:

- (a) Young and middle-aged are most susceptible.
- (b) Average lost time is 30 days.

3. Table II shows that:

- (a) Average exposure for most serious cases (hospital case) was shorter than for ambulatory cases.
- (b) Average age of hospital case was two years older than that of ambulatory case.

4. Table III shows that:

- (a) 5% of all pre-employment examinations show stippling.

- (b) 78% of stippling cases had no exposure to lead.

5. Table IV shows that:

- (a) Period of greatest blood changes occur between seven and 14 days after acute symptoms arise.
- (b) Blood counts return to normal earliest in hospital and oldest age group.
- (c) Length of exposure has no effect in bringing about normal count quicker.
- (d) Average R.B.C. and hemoglobin estimates are lower in hospital cases.
- (e) Average stippled count is higher in hospital cases.

6. Treatment is presented.

Conclusions

DO NOT underestimate effects of lead exposure, but a frank attitude toward the entire problem on the

part of management and medical department minimizes the hazard.

2. The physician-in-charge must examine all blood counts as completed within 24 hours—delay may be serious—thorough study must be made in each case, and the following method is recommended.

(A) When a blood count or clinical signs or both signify a "Suspicious" or "Absorption Case," a written order is immediately sent in triplicate to the general superintendent, department head and foreman with designation of "Watch Case," meaning just what it states.

(B) The same procedure is followed when an "Impending" true "Intoxication Case" is present, but here we designate our order as "Keep-Out-Case," meaning keep out of all exposure. An immediate telephone call to the department head always precedes the arrival of written order on the same day.

(C) These orders are again repeated in a Monthly Medical Report to the same members of management, whose duty it is to see to it that all medical orders are carried out without delay. Where discussion of the case is requested by management, a conference is always arranged, but the original medical order stands unless there is unanimous approval of some other procedure. I would like to state at this point that compromise does not fit into this type of work and the medical department should adopt a fair but stern attitude, owing to the great responsibilities involved.

(D) As soon as the condition of the employee changes to a satisfactory level, the medical department issues another order to that effect.

3. All cases must be in absolute control of the plant physician or surgeon, as the treating of these cases requires experience peculiar to this type of exposure. Best results will otherwise not be obtained.

4. Early hospitalization important.

5. Deleading not recommended.

6. Monthly red blood counts, hemoglobin and stippling estimates. Monthly physical examinations. Quarterly urinalyses.

7. No re-exposure permitted without the consent of the medical department.

8. Employees must be impressed with importance of reporting all illnesses immediately to the medical department, so that relationship to exposure be ascertained quickly. If the company has no arrangement to provide medical care to the employees other than for those conditions arising out of their employment, then I strongly suggest that the plant physician visit the home of the sick employee for the purpose of determining this relationship. If this policy is not adopted, it is easy to see what dangers are inherent.

9. Employees must be educated to this hazard by intelligent means.

10. Employees must be educated in the value of hygienic measures, such as cleanliness of hands and body, dental care, frequent change of working clothes, ingestion of sufficient and proper foods, sufficient sleep and rest, as well as reasonable abstinence from alcoholics.

11. Central eating places should be established. We suggest providing employees with an extra 10 minutes prior to eating time for purpose of "getting cleaned up." We suggest also that everyone be compelled to eat in this central cafeteria, even if some are permitted to bring their own foods to the plant.

12. Lead absorption and intoxication cases should recover with no resulting disability.

13. The public is entitled to know our views, and it is our responsibility to them, as well as to the profession, to see that they have access to these opinions.