

April 16, 1964



J. Ross Davidson, M.D., Chief Medical Officer  
Workmen's Compensation Board of British Columbia  
Vancouver, B. C., Canada

Dear Doctor Davidson:

My secretary has pointed out to me, on my return to my office, certain points in my dictation of a report to you concerning the case of Gerald Beaudoin, as identified above, which gave her some questions of interpretation. I can only agree that she was justified in her attitude, and that in my haste to avoid further delay, I was unwise in instructing her to send this report along without my reexamination of the typed script.

I do not believe that there is any doubt as to my opinion in this case, but there are a few corrections to be made. Having returned the file, I can no longer be certain of one point - namely, the precise manner in which the results of the analysis of the urine were recorded in the documents examined. Yet, although I am suggesting a modification of a possibly ambiguous statement in my discussion, I hardly think my meaning will have been obscure.

In any case, I submit here, a few editorial changes, identified by page and line, so as to eliminate any possible doubt as to my meaning.

- (1) On Page 2 - line 5 from the bottom, the sixth word "rates" should be "routes" in order to make physiological sense.
- (2) On Page 3, item (2), line 2 (after the question) is a grammatical error - "were" should be "was."

(Some commas are needed in a few places, in several parts of the text, but these omissions have not resulted in the confusion of statements.)

- (3) On Page 5, paragraph (c), the first sentence is incomplete, and should read - "The results of the analyses of two samples of urine are not reported precisely or in their temporal relationships, especially to the therapy administered"- the record "etc. .... "
- (4) In the same paragraph, lines 6 and 7, is an ambiguous statement which can be clarified by a slight change to read, "the finding was so reported as not to indicate clearly whether the value given was in milligrams or micrograms." (It was interpreted as 0.19 mg. per liter of urine.)
- (5) On Page 8, line 2 (from top) should read, "methods of sampling and analysis."

J. Ross Davidson, M.D. - (2) - April 18, 1964

In offering my apologies for the errors in the text of my report,  
I trust that they will not have caused any difficulties.

Cordially yours,

RAH:vr

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Robert A. Kenoe, M.D.

Re: [REDACTED]

Workmen's Compensation Board  
#63071596

Resume of Review and Opinion

After reviewing this record, one finds himself in the not unusual position, in relation to a long continued but unresolved, medical controversy, in that the medical evidence by which a definitive conclusion might be reached is not available. There are certain crucial questions which must be answered before a conclusive decision can be arrived at in this (and in many other comparably controversial cases). The answers have not been obtained and are not now, certainly, obtainable. These questions, and the voids in the evidence because of which the questions cannot certainly be answered, are first presented, after which the most likely opinion as to the pertinence of the diagnosis of lead poisoning will be suggested. A decision as to the compensability of this man's illness, must, in the nature of the situation, be made by the Board as a matter of public or legal policy, based upon the issue of the burden of proof, that is, upon whom, whether the claimant or the Board, the burden of proof rests, in a dubious case. This reviewer is concerned only with the environmental and medical evidence, and with its pertinence to a conclusion.

The Issues and Answers

- (1) The first question relates to the probable significance of this man's exposure to lead in the specific employment referred to in this report. The claimant's prior opportunities for exposure to lead, to which no reference is made, is an important part of the medical evidence, for the reason that his "body burden" of lead, at the time of his entrance upon this employment, was a conditioning factor in the additional quantity of absorbed lead required to bring him up to a dangerous overall level of

absorption. In the absence of such evidence one must base a conclusion solely upon the severity and duration of the exposure to lead associated with the employment referred to in the record. There were no determinations of the environmental conditions of this employment, with respect to lead dispersed in the atmosphere. (Incidentally something was said in the discussion about the absorption of lead through the skin. While certain compounds of lead, notably the alkyl lead compounds, are absorbed readily through the skin, the compounds involved in this man's work are not absorbed through the skin. Therefore, one questions only the quantity inhaled and carried into the air cells of the lung, and the quantity swallowed because of deposition of lead in the upper respiratory tract, plus the quantity actually ingested because of contaminated hands and other handled objects introduced into the mouth.)

It is reasonably certain that there were large numbers of particles of spray paint, containing significant concentrations of lead, in the atmosphere breathed by this man. These particles may have reached the terminal air sacs and alveoli of the lungs in some concentration. (There is at present no evidence, so far as I know, on which the fate of dispersions of lead compounds in liquid vehicles can be interpreted. We do not know, except by crude practical experience in industry, the extent of the hazard of the pulmonary absorption of such dispersions. Such experience indicates clearly that cases of lead poisoning do occur. Just why, in terms of <sup>routes</sup> ~~rates~~ of absorption, is unknown.) That many of those particles were trapped in the upper respiratory tract and swallowed is quite certain. The significance of such swallowing is a matter of dosage and time. The dose here may have been large; the time was short (relatively). It is anybody's guess whether the conditions were such that

lead poisoning may have been induced within the time indicated. My guess, based on experience, is that this may well have been the case, and the evidence against this conclusion is not available at this time to anyone (so far as this record is concerned).

The answer to this question is equivocal. The important point is that no one can say, with any degree of certainty, that the environmental conditions of this man's employment were free of a significant hazard. The severity of the exposure is unknown but was probably considerable; the duration (in terms of actual hours or days of exposure to a specific set of atmospheric conditions) is poorly defined but cannot be said, from the record, to have been insignificant. The significance of the exposure, whether capable or incapable of inducing lead poisoning must rest therefore on the interpretation of the claimant's illness.

- (2) The second question relates to the total character of the claimant's illness. Did he have lead poisoning?

The illness described by the claimant, in immediate association with his day's work (nausea, vomiting, etc.) <sup>was</sup> were clearly the result of his inhalation of solvent vapors. This was not caused by the absorption of lead, and while it was definitely an occupational illness against which this man should have been protected by suitable ventilation or respiratory equipment, it is irrelevant to the question of plumbism, except that it demonstrates clearly the fact of the comparatively severe contamination of the atmosphere, in which the claimant worked, with droplets of paint. (On this count alone, in view of the relatively low toxicity of the solvents now being used commonly in spray-paints, one must conclude that the concentration of spray paint in the atmosphere was high.) One should know whether there were significant differences

in the composition of the several spray paints (with respect to the solvents used in this work, but it is unlikely that they differed widely).

The presenting illness at the time Mr. [REDACTED] sought the attention of Dr. Eepkay may have been lead poisoning, and on the basis of the history, the complaints and the laboratory findings, this diagnosis was certainly a reasonable one, as viewed from the aspect of current medical thought and practice. This is not to say that it was as well established (or excluded), as it might have been or, from the aspect of occupational medicine, should have been. A critical review of the clinical evidence will reveal both its weight and its shortcomings.

(a) "Stippling" of the erythrocytes in the peripheral blood was found on two occasions. This, of itself, in clinical medicine, is highly suggestive, and, in association with the history of occupational exposure to lead, it is often taken to be diagnostic. It is of common occurrence, however, in association with anemia, and therefore the nature of the anemia requires careful investigation if the finding is to be taken seriously as a feature of the diagnosis of plumbism. In this case, this phenomenon, of itself, has little true diagnostic significance. Nevertheless it enters into the evidence on the positive side.

(b) The finding of an abnormal amount of certain porphyrins in the urine on one occasion, likewise, is suggestive evidence, while the failure to obtain the same (or a similar) finding later may be explained by the institution of chelation therapy (if indeed

this intervened between the two observations). Unfortunately the record does not reveal the facts in this regard, and here, again, speculation has to be substituted (by this reviewer) for knowledge. Since nothing is said in the report concerning the methods employed in any of the work of the hospital laboratory, one has to take these on faith, despite one's knowledge that such results cannot be trusted without evidence of competence. Nevertheless, taking the record at its face value, the results favor the conclusion that this man had absorbed abnormal quantities of lead.

- (c) The results of the analysis of two samples of urine <sup>*were not reported in detail in their original relationship*</sup> - the record does not show how these samples were collected, when they were collected, and how they were analyzed. Even the report of the result, at second hand, furnishes adequate evidence that some of those concerned had little familiarity with the nature and meaning of such findings, in that the finding was reported in <sup>*with*</sup> milligrams ~~rather than~~ <sup>*and*</sup> micrograms. In view of the delicacy of such determinations, the many opportunities for error, and the overwhelming probability of error in laboratories that do not make a specialty of these procedures, the results obtained in this connection are not to be trusted. Moreover, if the crucial nature of the analytical evidence had been appreciated, the blood would have been the subject of analysis, or a series of samples of urine would have been analyzed, to make up, in part, for the ambiguity occasioned by the variability of the urinary response to the absorption of lead. Nevertheless, the results obtained by the

analysis of the urine, as they stand on the record, indicate that this man had absorbed abnormal quantities of lead. Considering the interval of time, between the collection of urine and the last day of occupational exposure to lead, the results obtained (if valid) suggest (without proving) that the occupational exposure to lead had been hygienically significant. (In this connection, the argument concerning the meaning of these results, in relation to the severity of this man's occupational exposure, on both sides of the issue, is ill founded in physiological facts. That put forth by Dr. Kepkay, concerning the influence of "stress" on the "mobilization" of previously "stored" lead, is based upon a concept of the metabolism of lead which was exploded nearly twenty years ago. It persists only because it is in the literature to which the uninitiated still refer without having had the benefit of examining and understanding the later evidence. There are no known methods of "mobilizing" lead except through the use of specific chelating agents, and even the latter are not very effective, except for brief periods of time.

At the same time, the statements in the record, with respect to the absorption of lead, its retention in the body, and its excretion from the body, on the basis of time, as well as in response to "Versenate" are either untrue or are only partially true (i.e. under appropriate circumstances). For example, Mr.

[REDACTED] exposure to lead, if severe enough during the periods of exposure, would not have been counteracted by the intervals of non-exposure, since several times the length of time is required to eliminate absorbed lead than that represented in the period of

absorption. It is pure speculation to maintain that he did not absorb dangerous quantities of lead. As the record reads, this is not and cannot be known. If there is other evidence on this point, it is not in the record or in the statements which derive from the record. The sole question here, as indicated previously, concerns the actual order of magnitude of his absorption of lead during his employment in the work described. This is not known and cannot be ascertained from the evidence. The statement is made in the record that the levels of lead concentration found in the urine are not high enough to demonstrate the occurrence of a dangerous degree of absorption of lead. This is not true, for the reason that they are not low enough to demonstrate the lack of danger. It is simply untrue that the concentration of lead in the urine must be in excess of 0.19~~0~~ milligrams per liter to be of diagnostic significance. This depends on the time of the sampling of the urine and upon a number of other potent factors, such as the volume of the sample (representing the time during which the urine was being secreted and voided), the manner of its handling in the laboratory (whether taken as an entire sample or as a portion of it), and finally upon the analytical method. Unless each of those is described correctly in detail and is known to be reliable, the actual result is subject to variations of the order of 100 per cent from one laboratory to another. Physiological variations alone (time of day and the volume of the water available for excretion in the urine) is of the order of 20 to 50 per cent. (We have had patients who were suffering from frank lead intoxication whose urinary lead

concentration was below 0.20 mg. per liter as determined by our methods of sampling <sup>and</sup> analysis.) It is for this reason (i.e. the variability) that it is highly advisable in all diagnostic situations involving the inorganic compounds of lead, to analyze the blood. It is helpful in many instances (in the interpretation of the day to day exposure) to have the results of the analysis of the urine, but in the interpretation of the overall quantity of lead in the body, when only one or a few analyses are to be made, the determination of the lead content of the blood is imperative.

Opinion

In view of the incompleteness of the evidence in this case, it is impossible, at this time, from the record, to establish the nature of the illness as described. The clinical findings, such as they are, while inconclusive, tend to favor the diagnosis of plumbism, and because of the lack of evidence in explanation of the clinical findings, otherwise, or in rebuttal of their interpretation by the attending physician, Dr. Kepkay, these findings, as spread on the records tilt the scales slightly in favor of the claimant.

Date: April 13, 1984

Robert A. Kehoe, M.D.

Dictated but not read.