

Report on medical examination of men from Lowe Brothers, Inc. plant at Dayton, Ohio exposed to lead, silica, silicates and volatile solvents.

Lead exposure

Eighteen men exposed to lead dust at the plant of Lowe Brothers, Inc., at Dayton, Ohio were examined at the Kettering Laboratory in August, 1946. The examination was designed to assess the general health of the men, and to establish as far as possible the presence or absence of any disaffection related to occupation, particularly lead intoxication.

To this end occupational and medical histories were taken, symptomatology was studied, a complete physical examination, including neurological examination and chest fluoroscopy, was performed, certain laboratory tests to indicate the presence or absence of infection or disease of the kidneys or blood forming organs were carried out, and exposure to lead as measured by the lead concentrations of the blood and urine, was appraised.

Of the eighteen men, five were found who had physical disease that needed attention and made them undue risks for work in an hazardous trade. There was no evidence that their lead, silica, silicate or solvent exposure had contributed to the conditions from which they suffered. These men were

██████████, whose X-ray and laboratory findings could be interpreted as evidence of active pulmonary tuberculosis;

██████████ who had severe and extensive varicose veins and a job in which he was liable to traumatize them;

██████████, who was somewhat deaf, and suffering from certain additional defects that might possibly be best treated by a competent psychiatrist;

██████████ whose fatigability, evidence of malnutrition and chest X-ray might be interpreted as evidence of active pulmonary tuberculosis, and

██████████ whose symptoms were sufficiently suggestive of heart disease to contraindicate his lifting or climbing stairs, and to indicate the advisability of further study by his family physician.

None of the 18 men had symptoms suggestive of lead intoxication. The levels of lead concentration in the blood and urine of the members of this group were double those of men having no occupational lead exposure (Fig. 1 and 2). There was no clinically or statistically significant difference between the two groups representing the years 1946 and 1940 (Table 1), and none of the 4 individuals common to both groups showed any significant difference in the lead concentration in either blood or urine (Table 2) on the two occasions.

These analytical findings suggest that the intensity of the recent lead exposure has not differed appreciably from that of 1940 before the exhaust ventilation was installed. The two sets of analytical data are consistent with the clinical findings on both occasions, and with the previous and intervening experience of the plant, with respect to the incidence of lead poisoning, for it is to be expected in a group of men with this degree of exposure that an occasional man, either because of his working habits or the nature of

RF

his particular job, would absorb toxic amounts of lead, but that most of the men would be free of any evidence of lead intoxication. The facts that all the men are now free of symptoms suggestive of intoxication, that the air analyses have shown that safe working conditions can obtain, and that the potential hazard has not changed in these six years, indicates that the occurrence of an occasional case of lead intoxication is not a necessary concomitant to the plant operations. At the end of the report will be suggestions designed to prevent the occurrence of occasional intoxication.

Silica and silicate exposure

Free silica is not an hazard at the plant, since it is not contained to an appreciable extent in any of the raw materials.

Considerable quantities of combined silica are used, in the form of asbestine. We have been informed by Mr. W. E. Fasig (9-17-46) that the asbestine used at the plant is a form of talc; "tremolite is undoubtedly the parent mineral."

William Siegel, A. R. Smith and L. Greenberg have reported (Study of talc miners and millers, Industrial Bulletin 22, #11 and #12, Nov. and Dec., 1943) their observations on workers mining and milling talc in St. Lawrence County, N. Y. They conclude from evidence which we consider adequate, that "this study identified tremolite talc as a silicate dust capable, like asbestos, of causing a disabling pneumoconiosis. It reveals distinctive pathological findings associated with

exposure to tremolite dust talc which postulate a special etiology for the resulting disease. There is also evidence that tremolite talc fibrosis is associated with increased susceptibility to tuberculosis. In the light of these findings, exposure to tremolite talc dust must be considered to constitute a definite industrial hazard requiring control of dust by suitable engineering methods."

Twenty-three men were examined with respect to this hazard. Among these, eighteen were the mixers and receivers referred to above in connection with lead exposure; two men, [REDACTED] and [REDACTED], were exposed to volatile solvents; and 3 men, [REDACTED], [REDACTED] and [REDACTED], were in the receiving department. The same type of clinical and laboratory observations, outlined above in relation to lead exposure, were carried out on all these men except the three last named, in whose cases the lead analyses and examination of blood smears for stippling were omitted, and other means of study were limited to stereoscopic X-ray examinations of the chest. All the men, with the exception of Brown, [REDACTED], [REDACTED], [REDACTED], [REDACTED] and [REDACTED], had stereoscopic chest X-ray examinations. [REDACTED] [REDACTED] of this last group, had fluoroscopic chest examinations.

No symptoms or X-ray evidence of pneumoconiosis were found in any of these men. This same conclusion resulted from the study of a group of 15 similarly exposed employees of Lowe Brothers Co. in 1940.

It is concluded that the hazard of pneumoconiosis at the plant is satisfactorily controlled by measures now in force.

Volatile solvents

All of the mixers and some of the workmen in other occupations, are exposed to various volatile solvents and irritating fumes. The exposure of [REDACTED], [REDACTED] and [REDACTED] are considered the most significant because of the nature of their jobs and the extent of their exposure to benzol and ethylene dichloride. These three men, also [REDACTED] and [REDACTED], and the eighteen mixers and receivers were examined as outlined previously, with special emphasis upon the detection of possible signs or symptoms of disease of the kidneys, liver or blood-forming organs. Certain special studies were carried out upon the formed elements of the blood of the first named three men, together with tests of their liver function.

With the exception of [REDACTED], [REDACTED] and [REDACTED], it is considered that none of the men gave evidence that their exposure to solvents was more than a nuisance, if that. [REDACTED] a thin, aging man, seemed to have had the greatest potential exposure to benzol and ethylene dichloride. Through an operating error on one occasion, he had been exposed to solvents to such a degree as to develop symptoms of intoxication. At the time of his examination, he was found to have a number of mild abnormalities, some of which might be interpreted as related to hazardous solvent exposure, but none of which seemed to have caused any disability. Nevertheless it is felt, because of the nature of the operations he is handling, as well as his physical condition, that the operation should be redesigned to give

KE 0003835

a greater factor of safety and that he is an undue risk at the operation.

██████ has the single, possibly trivial, abnormality of a slight elevation in serum bilirubin. He is otherwise in excellent condition. This finding should not be communicated to him because it is probably of no clinical significance, and might give rise to unjustified and unnecessary anxiety on his part. It is suggested that he and certain other men might be rechecked periodically.

██████ has certain symptoms that might more properly be referred to the aging process than to exposure to solvents. It would seem that he is an undue risk for such exposure. He should be followed by his family physician after a stereoscopic X-ray examination of the chest is obtained.

██████ has had symptoms which he attributed to solvent exposure in the past. It is felt because of his emotional susceptibilities that he should be kept from solvent exposure in the future.

Acrolein

This hazard has not been evaluated as yet.

Summary and recommendations

- A. The lead hazard is essentially as it was at the time of the previous survey.

The potential hazard is appreciable, but the actual hazard is small under the present and previous conditions in the plant.

RE 0003836

Because occasional cases of lead intoxication may occur and have occurred under these conditions, the following operating changes are recommended:

- (1) That the frequency of house-cleaning be increased, a vacuum system being employed to remove dusts which accumulate on the floor, rafters, and equipment;
- (2) That men who load mixers or ball mills with loaded zinc and pigments containing asbestine be required to wear dust masks while emptying bags of these materials;
- (3) That the men who work on the baling machine also be equipped with dust masks;
- (4) The masks are to be individual, kept in individual cabinets separate from the work clothes, and cleaned, properly maintained and inspected weekly in these cabinets by one man properly supervised and indoctrinated in the care of dust masks.
- (5) That the severity of the potential exposure to lead-bearing and other dusts on the mixing floor be determined again in the winter time in order to gauge seasonal variations.
- (6) The minimum amount of medical control required to protect the men against the actual hazard should be initiated. It is believed

that the collection and analyses of suitable samples of blood and urine for their lead content, together with a brief interview of each man by a qualified internist, will suffice for this purpose if both are carried out at intervals of six months.

B. The hazard of pneumoconiosis at the plant is adequately controlled under the present operating conditions. The present control measures should be continued.

C. The hazard of exposure to volatile solvents is adequately controlled, except for certain conditions indicated below, for which corrective measures are suggested.

(1) The operations in connection with the manufacture of paint removers should be modified to give greater safety to the operator, and the operator should be experienced, carefully supervised, and in good health;

(2) This operator and the solvent mixer (now [REDACTED]) should be examined by suitable clinical and laboratory methods every six months to insure the absence of damage to the blood, kidneys and liver.

(3) All standpipes delivering thinner should be isolated within a properly designed laterally exhausted hood.

(4) All containers and portable tanks should be covered.

D. A considerable number of the men had physical defects which, in relation to their present occupations, might be expected to give rise to undue hazard to themselves, their fellow workers, or the company. These men were [REDACTED], [REDACTED], [REDACTED], [REDACTED], [REDACTED] and [REDACTED]. A number of the remaining men had major and minor abnormalities for which they should receive medical advice. This indicates that the company is not protecting itself adequately against such risks. It is suggested that

- (1) pre-employment and periodic examinations of all the men exposed to dust or solvents should be instituted. Pre-employment examinations should be comprehensive. Periodic examinations should include a brief physical examination, at which time a few pertinent questions can be asked, a miniature stereoscopic X-ray film of the chest taken, the urine examined, and the specific gravity of the blood determined.

E. The acrolein hazard will be reported on later.

Reported by:
Henry W. Ryder, M.D.
Wm. F. Ashe, M.D.

Approved [Signature]
Robert A. Kenoe, M.D.
Director

Date: September 30, 1946

KE 0003839

Table 1

Analytical findings on Lowe Bros. men

Group and Date	Logarithm of Blood Pb, $\mu\text{g.}$		Blood Pb, mg.
	Mean*	Standard Deviation*	Geometric Mean*
18 mixers and receivers, 1946	8.70 - 10 (± 0.022)	0.094 $\pm$ 0.016	0.050 $\pm$ 3.1%
14 mixers and receivers, 1940	8.70 - 10 (± 0.026)	0.099 $\pm$ 0.019	0.050 $\pm$ 3.7%
8 varnish and lacquer workers, 1940 and 1946	8.59 - 10		0.039
Kettering controls (men without occupational lead exposure)	8.386 - 10 (± 0.011)	0.083 $\pm$ 0.008	0.0243 $\pm$ 2.9%
Logarithm of Urine Pb, mg./L			Urine Pb, mg./L
13 mixers and receivers, 1946	8.76 - 10 (± 0.053)	0.22 $\pm$ 0.038	0.058 $\pm$ 7.0%
14 mixers and receivers, 1940	8.84 - 10 (± 0.053)	0.20 $\pm$ 0.039	0.069 $\pm$ 6.3%
8 varnish and lacquer workers, 1940 and 1946	8.64 - 10		0.044
Kettering controls (men without occupational lead exposure)	8.393 - 10 (± 0.022)	0.220 $\pm$ 0.015	0.0247 $\pm$ 5.6%

* and standard error

KF 0003840

KE 0003841

Analytical findings in men studied in 1940 and 1946					
		Urine Pb, mg./L		Blood Pb, mg. %	
	   	0.10	0.06	0.047	0.042
		0.07	0.03	0.045	0.048
		0.07	0.06	0.065	0.055
		0.07	0.06	0.038	0.055
		1940	1946	1940	1946
0.06	0.05	0.049	0.050	Mean	

Table 2

PROBIT - LOG CONCENTRATION DIAGRAM
 CUMULATIVE FREQUENCY DISTRIBUTION OF BLOOD LEAD
 LOWE BROS. MIXERS AND RECEIVERS

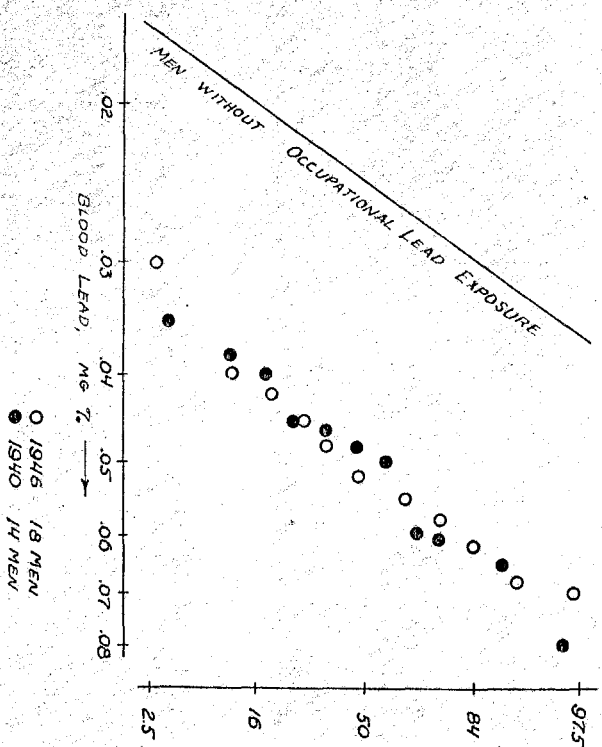


FIGURE 1. BLOOD LEAD

PROBIT - LOG CONCENTRATION DIAGRAM
 CUMULATIVE FREQUENCY DISTRIBUTION OF URINE LEAD
 LOWE BROS. MIXERS AND RECEIVERS

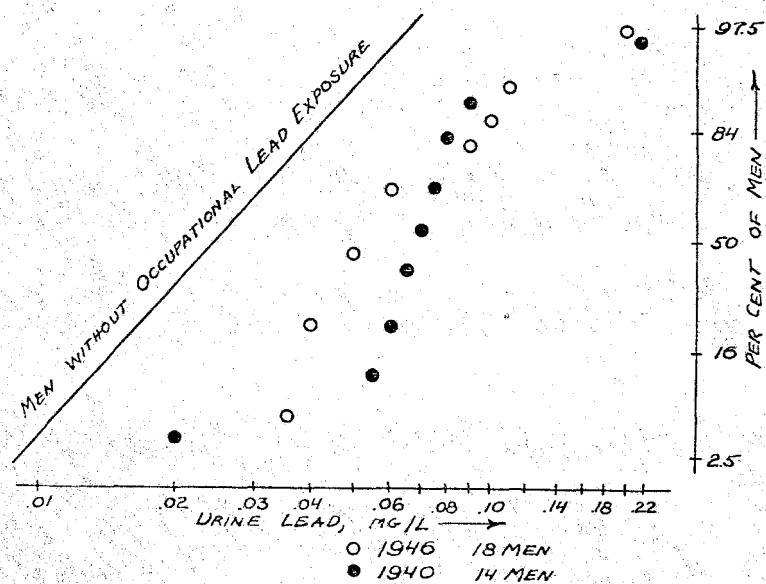


Figure 2. URINE LEAD

RE 0003843