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MEMORANDUM

Docket No. 73.

From ABADAN GENERAL MANAGEMENT.

To LONDON.

Mail Division: MISCELLANEOUS.

Memo. No. 34276.

Subject. LEAD POISONING.

Date 25th August, 1943

C O N F I D E N T I A L.

Further to our Memorandum 34254 of 11.8.43 we
now enclose.-

One copy of "Lead Poisoning - Preliminary
Medical Report" and

One copy of "Details of Cases of Lead Poisoning
Abadan 1942".

These two reports complete the medical information
asked for in your telegram 5017 of 23. 7. 43.

(Signed) H. W. Rigden.

JSBF.

KE 0016992

C O P Y

LEAD POISONING
PRELIMINARY MEDICAL REPORT OF CASES OCCURRING
IN ABADAN.

In July and August of 1942, there occurred six cases of lead poisoning amongst workers in the Packed Oil Department all of whom displayed symptoms of Encephalopathy. Unfortunately the first case died of uraemia which had developed before admission to Hospital, and although we are morally certain that it was a case of lead poisoning, we were never able to prove the fact.

The finding of lead in abnormal quantities in the urine of the other five cases led to a visit to the P.O.D. by the Chief Medical Officer and the Pathologist, who found the exigencies of the present War had led to a vast increase in the output of "leaded spirits". A blast wall had been built around the Filling Section which made ventilation very unsatisfactory, and the rapid evaporation of the spirit at the very high temperatures which pertain in Abadan in the summer meant that the air was full of T.E.L. vapour, a fact which was later proved beyond any doubt.

The C.M.O. and the Pathologist made certain recommendations which were immediately put into force with the result that there was an immediate improvement in the figures of admissions to Hospital of cases suffering from lead poisoning.

These recommendations were :-

1. Powerful forced ventilation should be provided at all the "danger points".
2. The blast walls should be pulled down at once.
3. Better washing facilities be provided for workmen along with liquid soap in sufficient quantity, and increased W.C. facilities.
4. Provision for regular treatment of clothes by automatic cleaners.

The figures of admissions to hospital are of interest.

Cases admitted to hospital because of symptoms:-

1942		
July		1
August		5
September		23
October		9
November		6

December 1

It should be noted that the blast walls were built in May 1942, and that they were taken down in September 1942.

The working month at the P.O.D. consists of 90 shifts. The No. of shifts filling leaded spirit in 1941 as compared with 1942 is given in the table below as well as the mean maximum and minimum temperatures for these years.

1941			1942.		
No. of Shift (Leaded Spirits)	Mean Monthly Temperatures		No. of Shift (Leaded Spirits)	Mean Monthly Temperatures	
	Max.	Min. (°F)		Max.	Min.
July 17	112.2°	82.8	70	110.5	83.-
August 11	111.3°	79.3	58	114.1	81.8
Sept. 28	108.6°	73.4	66	106.5	73.8
October 27	94.4°	62.8	69	97.1	69.3
November 36	85.0°	55.9	41	83.0	59.2

It will be appreciated, therefore, that everything - climatic conditions, decrease in ventilation, and pressure of work - combined to bring about this unfortunate state of affairs.

In all, 54 persons were examined, and 39 were found to be excreting lead in the urine in more than the generally accepted "normal" amount i.e. more than 0.14 mgms per litre of urine. Of the 39 persons affected, 31 were suffering from symptoms, and an analysis is given of the prominent symptoms displayed.-

Mania	..	2	
Weakness	..	17	
Fever	..	6	
Muscular Pains	..	2	
Diarrhoea	..	1	
Malaria	..	2	(0.42 mgms & 0.55 mgms per litre)
Pneumonia	..	1	(0.35 " per litre).

TOTAL 31

It is to be regretted that at the time we were working short-handed, and as a result there were many investigations which we would like to have carried out but for which the time was just not available so that only four cases were examined for Punctate Basophilia, and all the examinations were negative.

Apart from the two cases of Mania (Encephalopathy) no signs of any significance were found on examination of the Central Nervous System, and in no case was a "lead line" found on

examination of the mouth.

We find it noteworthy that all the cases who were admitted suffering from a high fever showed a fairly high lead excretion, a point which we have not seen mentioned in any of the publications we have read on the subject. During one of our visits to the P.O.D., we were asked to look at several cases of desquamation of the feet in workers in the P.O.D. At the same time we were not aware of the fact that this was a sign of T.E.L. poisoning and we were equally certain that they had none of the appearances of Petrol Dermatitis. There is no doubt in our mind now, however, that these men were suffering from desquamation due to T.E.L. (1)

With regard to the distribution of the affected and non-affected persons according to their actual employment, the following is an analysis:-

	More than 0.14 mgs. lead in urine.	Less than 0.14 mgms. in urine
Filling Section	25	9
Soldering Section	8	4
Cleaning Drums with Petrol (1)	3	
General Duties (Office)	1 (0.15 mgms)	2
No history obtained	2	
Total	39	15

As one would expect there is a definite preponderance of cases from Filling Section which show a high excretion of lead in the urine. The workers who were filling petrol into tins, for purposes of cleaning, are interesting as they must have been using leaded spirit for the purpose. The one office worker in the "abnormal" list can, I think, be ignored as his lead excretion is hardly to be regarded as abnormal.

The amount of lead in the atmosphere of the Filling Section at the P.O.D. was examined by our Chemical Department, and the following is an abstract from their conclusions:

1. Published data indicate that freedom from ill effects may be expected if the lead in the atmosphere is kept below 2 mg. of lead per working day equivalent to 4.6 cu.m. of air in 8 hours.
2. Before the blast walls in the P.O.D. were pulled down, the atmosphere at head height over the tinning 100 O.N. spirit (containing 4.7 ccs. T.E.L. per gallon) under summer conditions, contained 13-20 mg. lead per 4.6 cu.m. of air.

-4-

3. Under approximately the same conditions but after removing the blast walls the lead content averaged circa 7 mg. per 4.6 cu.m. of air.

This figure is still too high, but since then the system of suction ventilation referred to above has been instituted and is working satisfactorily. The amount of lead in the atmosphere at the Filling Section will be estimated again in the summer when conditions are comparable, and we confidently expect to find that the figure will be well inside normal limits.

As regards the Soldering Section, the amount of lead in the atmosphere was satisfactory, being circa 1.7 mg. lead per 4.6 cu.m. of air, at 1½ ft. above the surface of the molten solder.

It will be appreciated from the above facts and figures that the handling of "leaded" spirits under certain extreme conditions can constitute a very grave hazard, a hazard which, though unlikely to occur under normal peacetime working conditions is very liable to occur under the stresses of War Production.

At the same time, however, we are quite satisfied that all that is required to make conditions entirely safe for workmen is an adequate system of ventilation, plus a keen watch on all possible areas where "spillage" is likely to occur. Since the blast walls at the Filling Section were removed, washing facilities improved and the European personnel of the P.O.D. made aware of the risks, there have been no further cases of lead poisoning reported from the Refinery.

Sd/- A. Anderson

April 1943.

M.B., Ch.B.,
MEDICAL OFFICER.

Reference.- (i) R.A. Kehoe (1925) Jour.Am.Assoc.

KE 0016996

C O P Y

DETAILS OF CASES OF LEAD POISONING
A B A D A N 1942
NOTES ON THE ACCOMPANYING TABLE

1. + indicates that the symptom or sign was present,
- that it was absent. A blank space indicates no record.
2. Only those cases with an excretion of lead amounting to 0.20 mgms. or more per litre of urine are included. There are 34 such cases as against 39 whose urinary excretion exceeded 0.14 mgms. per litre of urine, the figure regarded as "Normal" in our previous report. The reason for this change is that the Principal Chemist suggested that our original figure was too low. The results recorded here demonstrate that as far as our investigations are concerned the increased minimal figure makes little difference.
3. The length of time that these patients had worked in the Packed Oil Dept. varied from 30 years to 4 months. Therefore the inference is that a new factor had caused the illness.
4. Knee jerks and Ankle jerks were done and noted in each case. In the absence of a statement to the contrary it can be taken that they were present.
5. The phrase "Anaemic and Undernourished" could be applied to 90% of the cases here noted. The standard of living just then was low and many employees were newcomers suffering from latest Malaria.
6. Case Nos. 21, 22, 23, 24 & 27 are five of the six cases referred to in the first para of our previous report. The sixth, as we have already stated, died before a positive diagnosis was made, but in retrospect we have little doubt that he was a case of Encephalopathy.
7. This year, 1943, we have examined eleven workers in the P.O.D. The results of urine estimation for lead are given in mgms. per litre - 0.10, 0.02, 0.05, 0.11, 0.05, 0.08, Nil, 0.08, 0.09, Nil and 0.04 - All well below normal limits
8. This year, 1943, air analysis have been done at the P.O.D. with the following results :-

24.6.43 - 0.07 mgms. Pb per Cubic Meter of air.

7.8.43 - Traces of Pb only.

Both these estimations were carried out while the forced draught system of ventilation was in operation. The accepted working standard of safety is 0.15 mgms. per Cu. Meter.

9. Referring again to our previous report, last para, we are now more than quite satisfied that an adequate system of ventilation is the real answer to the troubles experienced last year, but at the same time we fully agree with the

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Abadan, 17.8.43.