

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 that 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 admission 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 admission 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  |

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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

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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 30 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<br>(Leaded<br>Spirits) | Mean monthly<br>Temperatures |           | No. of Shift<br>(Leaded<br>Spirits) | Mean monthly<br>Temperatures |      |
|           |                                     | Max.                         | Min. (°F) |                                     | Max.                         | Min. |
| July      | 17                                  | 112.2°                       | 62.8      | 70                                  | 110.5                        | 83   |
| August    | 11                                  | 111.3°                       | 79.3      | 38                                  | 114.1                        | 81.8 |
| September | 28                                  | 108.6°                       | 73.4      | 66                                  | 106.5                        | 73.8 |
| October   | 27                                  | 94.4°F                       | 62.8      | 69                                  | 97.1                         | 69.3 |
| November  | 36                                  | 85.0°F                       | 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        | ..... | 3 (0.42 mgms. & 0.55 mgms per litre) |
| Pneumonia      | ..... | 1 (0.35 mgms. per litre).            |

TOTAL      31

It is to be regretted that at the time we were working short-handed, and as a result there are many investigations which we would like to have carried out, 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 time we were not aware of the fact that this is a sign of T.E.L poisoning and we were equally certain that they had none of the appearances of Paraffin Dermatitis. There is no doubt in our mind now, however, that these men were suffering from the effects of T.E.L.

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

|                               | <u>More than 0.14 mgms<br/>lead in uring.</u> | <u>Less than 0.14 mgms<br/>in urine.</u> |
|-------------------------------|-----------------------------------------------|------------------------------------------|
| Filling Section               | 25                                            | 9                                        |
| Soldering Section             | 8                                             | 4                                        |
| Cleaning Brums with Petrol(!) | 3                                             |                                          |
| General Duties (Office)       | 1 (0.15 mgms.)                                | 2                                        |
| No history obtained           | 2                                             |                                          |
|                               | <u>TOTAL</u> <u>39</u>                        | <u>15</u>                                |

As one would expect there is a definite preponderance of cases from the Filling Section which shows a high excretion of lead in the urine.

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|                |       |                                      |
|----------------|-------|--------------------------------------|
| Mania          | ..... | 2                                    |
| Weakness       | ..... | 17                                   |
| Fever          | ..... | 6                                    |
| Muscular Pains | ..... | 2                                    |
| Diarrhoea      | ..... | 1                                    |
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| Cleaning Drums with Petrol(!) | 3                                     |                                  |
| General Duties (Office)       | 1 (0.13 mgms.)                        | 2                                |
| No history obtained           | 2                                     |                                  |
|                               | <u>TOTAL</u> <u>39</u>                | <u>15</u>                        |

As one would expect there is a definite preponderance of cases from the 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.

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2. Before the blast walls in the P.O.D were pulled down, the atmosphere at head height over the tinning 100 C.W. spirit (containing 4.7 c.cs T.E.L per gallon) under summer conditions, contained 13-20 mg. lead per 4.6 cu.m. of air.
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 this Refinery.

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