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Effect of Lead on employees working in Paint industry

Mr. Sripathy.L[1] , Hariprasad.B.N, Vinay.G, Vinay Kumar. C and Mr,Venkatesh Tuppil[2]

1.Vivekananda Degree College, Dr. Rajkumar Road, Bangalore-560055
2.Director,National Referral Canter for Lead Poisoning in India,
St,John's National Academy of Health Sciences,Bengaluru-34

ABSTRACT

This paper focuses on a source of lead that has not been completely eliminated in the Bangalore. Lead disrupts the functioning of almost every brain neurotransmitter, says David Bellinger, Ph.D., a psychologist and epidemiologist at Children's Hospital in Boston. Neurotransmitters are chemical messengers between the body's nerve cells. The messenger calcium, for example, is essential to nerve impulse transmission, heart activity and blood clotting, but if it doesn't work right, affected systems may also be askew."Lead fits into binding sites that calcium should," Bellinger says, "so it can disturb cellular processes that depend on calcium.

Keywords : Paint Industry,Paint, Lead Toxicity, Lead Octate .

1 INTRODUCTION

Lead and its compounds are highly used in paints for speeding up its drying and for giving them desired colors. A wide range of colors contain lead, for instance, Yellow contains Lead (II) chromate i.e. PbCrO4, White color contains lead (II) carbonate, PbCO3. Awareness about the toxic effects of non-essential metals (LEAD) is still lacking in developing countries. Lead is one among them, which ranks second in the Agency for Toxic Substances and Disease Registry's top 20 lists of toxic metals. The more widespread environmental emissions of lead have been drastically reduced through the introduction of unleaded petrol. As a result, publicity about this common toxin has considerably diminished. However, there is still a problem from these sources in countries with less developed controls. Furthermore, there is still one source of lead regularly causing poisoning, namely paints, on which this paper focuses. Lead concentrations of blood samples from paint industries in peenya (Bangalore) were determined. We have analyzed blood samples from 12 employees working in **Paint industry** from in and around peenya, the city of Bangalore to assess the feasibility of using the lead in paints. Some of the paints being used even now are known to contain this toxic metal at alarming levels. We have a list of persons who are quite often suffered from head aches and back aches.

Lead is a metal found in the earth, and it is a poison. For years, lead was used in paint, gasoline, plumbing and many other items. Lead is practically everywhere in today's environment. It enters our bodies from many sources including defective glazes (pottery), drinking water, contaminated soil, airborne particulate, leaded gasoline, paint and several other sources. There is no safe age to be exposed to lead. Adults can have problems from lead poisoning, but it is most harmful to children younger than age 6 (especially those younger than age because it can permanently affect their growth and development. A pregnant woman who is exposed to lead can pass it to her unborn baby (fetus). Lead can also be passed to a baby through the mother's breast milk. Lead reduces levels of antioxidants—compounds that mop up toxic free radicals—in the brain. Free radicals kill neurons in the hippocampus, the brain region that controls learning and memory.

Lead poisoning occurs when you absorb too much lead by breathing or swallowing a substance with lead in it, such as food, dust, paint, or water. The result can be damage to the brain, nerves, and many other parts of the body. Acute lead poisoning occurs when a person takes in a large amount of lead over a short period of time. Acute lead poisoning is rare. Chronic lead poisoning occurs when small amounts of lead are taken in over a longer period. Chronic lead poisoning is a common problem among children. Too much lead in

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the body can cause irreversible problems in growth and development in children, including:

- Behavior problems.
- Hearing problems.
- Learning problems.
- Slowed growth.
- Lead is absorbed by ingestion, inhalation and through skin. Absorption varies from individual to individual and depends on the chemical form of lead and type of exposure. The alimentary and respiratory tracts are the main portals of entry for lead into the body. It is estimated that 150-300µg of lead is ingested through the oral route and about 10-20 µg is inhaled via the respiratory tract daily (3). The absorption of lead through oral route is 5-10% and 35-50% from respiratory tract in adults. Unlike adults, children absorb about 50% of ingested lead and retain 8% of dietary lead (4). The organic lead compounds like tetraethyl or tri alkyl lead can be readily absorbed through the unbroken skin. Approximately 90% of absorbed lead is reported to be stored in the bone with a half life of 600-3000 days. The remaining 10% is stored in soft tissues like kidney, brain and liver. The half life of lead in these tissues ranges from 100-200 days (5). Lead passes through the placenta easily and fetal blood has almost the same lead concentration as maternal blood (6). Ninety per cent of the ingested lead is excreted in the stool and urine, whereas the inhaled lead is excreted through renal pathway. Lead is also eliminated through sweat and mother's milk. The aim of this study is to report on levels of lead found in the employees working in Paint industry, providing a reminder that high concentrations certainly do still exist. Directive requires that all paint containing more than 5,000 ppm lead should be labelled with a warning that it must not be applied to surfaces that are likely to be chewed or sucked by children.). This concentration has been considered as a 'safety level' for comparison with paint sample concentrations determined in this study to assess the extent of the hazard. It could be argued that this concentration is too high - the Toys (Safety) Regulations (Home Office, 1974a) specify that paint on toys should contain no more than 2,500 ppm and the Pencils and Graphic Instruments Regulations (Home Office, 1974b) state that paint coatings on pencils, pens and brushes should contain no more than 250 ppm.

- **Methodology**
- **Subject:** 2ml of blood was collected for the analysis, from employees working in **paint industry**, ranging in age from 20 to 45years.
- **Approach:** Concerning to this pilot study, the starting point was a preliminary list preparation and discussion about how this project is to be executed, with the guidance of our Professor. We took up Peenya industrial area as the site area and moved on to the field work i.e; visited the **paint industry** owners, spoke to them, tried to convince. However, it was not an easy thing to convince them, with all the efforts and through recommendations; finally they were convinced and agreed to give us the information as well as the blood samples for the analysis. Each of them searched for data's independently between the period of 1-2 months then we prepared a case study sheet to know and to collect the personal information/data of each individual, authentically. We gave them the date and time of when we are coming to collect the blood samples (2ml) and with the guidance of Mr.Raviraja.A, the blood samples and as well as data were collected from each individual.
- **Sampling:** Venous blood samples were collected in plain vaccutainer tubes with EDTA anticoagulant. All samples were measured using a 3010B ESA Lead Analyzer in St. John's Medical College (NRCLPI).
- **Analytical method used:** From one tube, 100 µl of blood was transferred to the meta-exchange reagent provided by the ESA Inc USA. Calibration of the 3010B analyzer was done using calibration standards supplied by the company. High, medium and low controls

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supplied by Control (USA) were used to check the efficiency of the methodology. Lead concentrations were then analyzed using an Anodic Stripping Voltammetry.

- Lead in blood may be bound to various binding sites on cells. Bound lead will not be plated onto the electrode and thus will not be detected by the lead analyzer. The Metexchange reagent is designed to rapidly displace lead from the bound condition so that all lead in the sample is present in the unbound state.

ASVMethod

Anodic Stripping Voltammetry is a highly precise, virtually interference-free method.

1. Whole blood is added to the reagent solution (Fig. 1),
2. Any lead present is released from the blood components (Fig. 2).
3. Now any lead in the reagent solution is concentrated (plated) onto a thin-film electrode during the plating step of the analysis cycle (Fig. 3).
4. The plated lead is removed from the electrode by applying a stripping current (Fig. 4) and the amount of lead is measured by integration of the electrical current released during this rapid electrochemical step.

Anodic Stripping Voltammetry

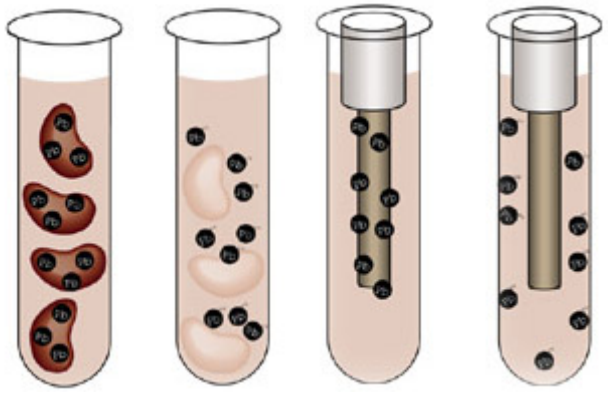

Figure 1 **Figure 2** **Figure 3** **Figure 4**

The current released during the stripping step, is directly proportional to the amount of lead present in the blood sample.

The Model 3010B provides the sensitivity you need for the detection of blood lead in childhood lead screening, industrial hygiene and occupational health monitoring programs.

The study is basically related with the employees working in Paint industry situated in and around Peenya industrial area (Bangalore). The aim of this study is to report on levels of lead found in the employees working in Paint industry, by collecting the blood samples and data as well, providing a reminder that high concentrations certainly do still exist. We have included Paint industry as our site area and excluded some of the industries who were not willing to support with a fear that, the blood collected will be used for something else away from the project.

Results

The main aim of this study is to determine the blood lead level of the employees working in paint industry. It is observed that the employees working in paint industry contain high concentration of lead (Pb) ranging from 9.4 to 26.7. as showen in the table –I and Graph –I

Discussion

There is considerable evidence that lead is neurotoxin at relatively low levels and causes a range of health effects depending on the extent and duration exposure in both children and adults.

TABLE-I Reports of employees working in paint industry

Name	Age/Sex	Exposure	Working hours	Result in µg/dl
Suje Gowda	30/M	6	8	14.7
Shardamma	41/F	8	8	26.7
Yogesh	20/M	Regular visitor	----	19.8
Erappa	30/M	5	8	24.4

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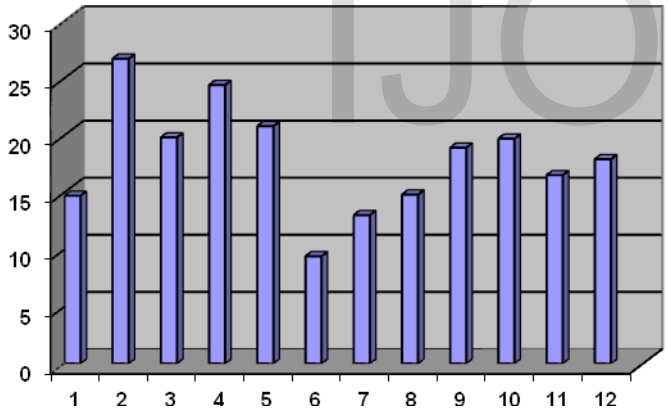
Ilappa	45/M	16	8	20.8
Kumar.Y	40/M	15	8	9.4
Shivlingappa	38/M	8	10	13.0
Natraj.M	36/M	3	10	14.8
Hanumantrayappa.S	34/M	8	10	18.9
Narayan prakash	29/M	2	10	19.7
Gopal Krishna	21/M	6months	10	16.5
Ravi prakash	38/M	8	8	17.9



Blood lead level of workers in paint Industry

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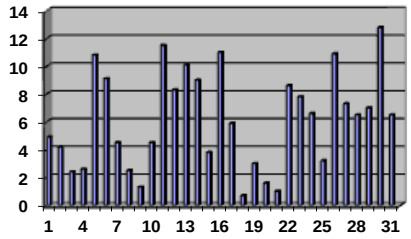
Sl. No	TEST	RESULT in µg/dl
01.	BLL	4.9
02.	BLL	4.2
03.	BLL	2.4
04.	BLL	2.6
05.	BLL	10.8
06.	BLL	9.1
07.	BLL	4.5
08.	BLL	2.5
09.	BLL	1.3
10.	BLL	4.5
11.	BLL	11.5
12.	BLL	8.3
13.	BLL	10.1
14.	BLL	9
15.	BLL	3.8
16.	BLL	11
17.	BLL	5.9
18.	BLL	0.7
19.	BLL	3
20.	BLL	1.6
21.	BLL	1
22.	BLL	8.6
23.	BLL	7.8
24.	BLL	6.6
25.	BLL	3.2
26.	BLL	10.9
27.	BLL	7.3
28	BLL	6.5
29.	BLL	7
30.	BLL	12.8
31.	BLL	6.5

TABLE – II Reports of Controls



Blood lead level of control Courtesy:

Mr.Raviraja.A

St. John's Medical College

The results from the present survey in and around Peenya industrial area (Bangalore) have consistently higher levels of lead than the employees working in flux and printing press.

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I am also thankful to all the respondents for providing the required information and helping us in completing this study successfully.

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