

## ENVIRONMENTAL LEAD DISTRIBUTION IN RELATION TO ROAD DUST SAMPLES IN AND AROUND PUNE

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**ABSTRACT :** In the last two decades the environment has figured increasingly in our every day discussion. This explosive increase of interest has been associated with an everwidening accumulation of related environmental facts. Everywhere an awareness about the environment has developed, its importance has been realised and efforts are being made to understand it with a view to evolve ways and means of its betterment and preservation. The present paper aims at quantifying heavy metals in relation to road dust samples in Pune city. Since automobile emissions contribute a major share in the environmental pollution, an attempt is also made to measure carbonmonoxide and smoke density emitted by automobile exhaust.

### INTRODUCTION

In developing countries like India the continued growth and expansion of existing industries, the development of latest technologies and products and increasing use of motor vehicles coupled with population growth in large urban areas, are emitting varying nature of pollutants in large quantities into atmosphere. Consequently so many questions are arising to which degree the living organism can adjust to the polluted environment and thus it has become a growing concern of nation to save the natural environment from Pollution.

Numerous investigators in the past few years have studied the distribution of lead in various environmental component in relation to sources. Typical of these are studies of the distribution of lead in soils and plants in relation to highway sources such as those of Chow 1970, John 1971, Motto et al. (1970). According to Smith (1981), vehicular exhausts are likely to contribute Pb contamination since motor cars release 80 mg of Pb km travelled. Indeed such levels of emission are liable to make the roadside environment a grossly contaminated environment. The concentration of Pb to be found in the various

environmental compartments bordering a roadway is a function of number of factors namely traffic density, distance from the roadside and meteorology. Most of the reported work indicates that high pB concentrations are to be found closest to the roadside (Smith, 1984, Albasel and Cottenic 1985) and that these concentrations diminish as distance from the road increases. However, it has been pointed out that while some 25% of the vehicularly emitted Pb is in course and thus deposited close to the road the remaining 75% is in sub-micron and thus may remain airborne for large time (Hanna and Al-Bassam 1983).

Pollution studies in India elicited attention quite recently. The National Environmental Engineering Research Institute published one report on air quality in selected cities of India based on data collected in 1978 and 1979. Kumra (1981, 1983) has made the study of the perception of air pollution in Kanpur city. The main study reported here has had two main thrusts. One has been to find out Pb levels over Pune city to ascertain the pattern if any of atmospheric Pb deposition and the second has been to measure carbonmonoxide and smoke density emitted by automobile exhaust.

### SAMPLING, LOCATIONS AND METHOD OF ANALYSIS

The dust samples were collected at 26 location in Pune City (Fig. 1) where traffic density per day varied from 0.05 to 1.4 lakhs. The dust samples at each location were collected on glass plates of size 5 cm × 10 cm. The glass slides were exposed for a period of three days and average dust load per day was calculated, fine dust samples were even dried at 105° to 110°C for two hours and thereafter grounded and passed through a 40 mesh sieve.

0.05 gm of finely crushed power was taken in a platinum crucible and 3 ml of Nitric acid (HNO<sub>3</sub>) and 3 ml of sulfuric acid (H<sub>2</sub>SO<sub>4</sub>) was added. After heating and then cooling for four minutes, 5 ml of Hydrochloric acid (HF) was added and then heated for four minutes. By this procedure, the dust gets completely dissolved.

In order to make solution ready for analysis, .01 N of Boric acid was added to make a volume of 100 ml. This solution was analysed for determination of Pb, Cu, Cd, Zn, Fe, Ni, Sb and Mn by using Parkin-Elmer, double beam atomic absorption spectrophotometer.

### RESULTS AND DISCUSSION

The variation in dust load deposition  $\mu\text{g}/\text{cm}^2/\text{day}$  vs traffic density at different location in Pune City is shown in the form of histogram in Fig. 2. Examination of this figure shows that deposition is directly proportional to traffic density. The concentration of Pb, Cu, Cd, Zn vs traffic density is plotted in Fig. 3. The Pb concentration has shown gradual increase with increase in traffic density. This inference is consistent since vehicular exhaust is the major source of Pb in the atmosphere. Apart from Pb, Cd and Cu concentrations showed some relationship with traffic density. However, concentration of Zn in dust sample does

not show relationship with traffic density. Fe Ni Sb and Mn concentration have shown some relationship with traffic density. As these are soil oriented elements they are also directly related to the total desposition of soil at various locations in the Pune city.

Out of all these elements Pb is important due to its toxicity and hence more stress is given in identifying the area where Pb concentration is above the tolerance limit. Accordingly isoleads lines over Pune city are represented in Fig. 4. The maximum concentration of Pb (1136  $\mu\text{g}/\text{gm}$ ) was observed at Tilak Road crossing near Alaka Theatre, where as minimum concentration 227  $\mu\text{g}/\text{gm}$  was observed at Lohagaon crossing. It is reported that Pb concentration in the dust upto 300  $\mu\text{g}/\text{gm}$  is safe and do not cause harm. It is interesting to note that majority of traffic island have shown the concentration of Pb above 300  $\mu\text{g}/\text{gm}$ .

It has been suggested that the population most susceptible to lead poisoning is children between nine months to 6 years age. Particularly malnourished children have blood disorders such as sickle cell anemia. The analysis reveals that most of the dust samples with Pb concentrations exceeding 500 to 1000  $\mu\text{g}/\text{gm}$  level are located in sensitive areas. If samples of blood are taken from the children belonging to these areas where concentration of Pb have exceeded 500  $\mu\text{m}/\text{gm}$  it is quite possible that levels of Pb in blood might have been high.

As stated earlier attempt has also been made in this study to measure smoke density and carbon monoxide emitted from automobile exhaust. The carbon monoxide is measured with the help of non-disperatire infrared gas analyser and smoke density with the help of Hartridge smoke meter.

About 500 vehicles were examined when vehicles were tested for the average emission levels and compared them with Indian standard it was observed that in 20% of the vehicles plying on the road the proportion of carbon monoxide emitted was more than

prescribed standard i.e. 3.5%. Maruti cars emit low percentage of CO. Ambassador cars emit CO., within limit. In case of some Fiat cars the CO., emitted was above the prescribed limit while tourist taxis emitted as high as 8% of CO., Smoke emission levels for about 500 diesel vehicles were tested with the help of Hartridge smoke unit and it was observed that for about 30% of the vehicles the smoke density level was above the prescribed standard. It is further interesting to note that matadores emitted high percentage of smoke. In addition to matadores old Ford and Dodge cars also emitted higher percentage of smoke while for Tata and Leylands the smoke density is very low, 10%.

Smoke emission by a vehicle may be due to poor condition of engine or the fuel injection system or poor general maintenance.

### CONCLUSION

Unfortunately no information is available on the relative impact of Pb from air, water, food, paint, soil and dust on blood levels in Pune Children. If soil Pb concentration at particular level are to be declared hazardous, it must be recognised that soil is not the sole contributor to elevated blood Pb levels since soil pathways does not operate independently of contributions from other Pb sources.

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