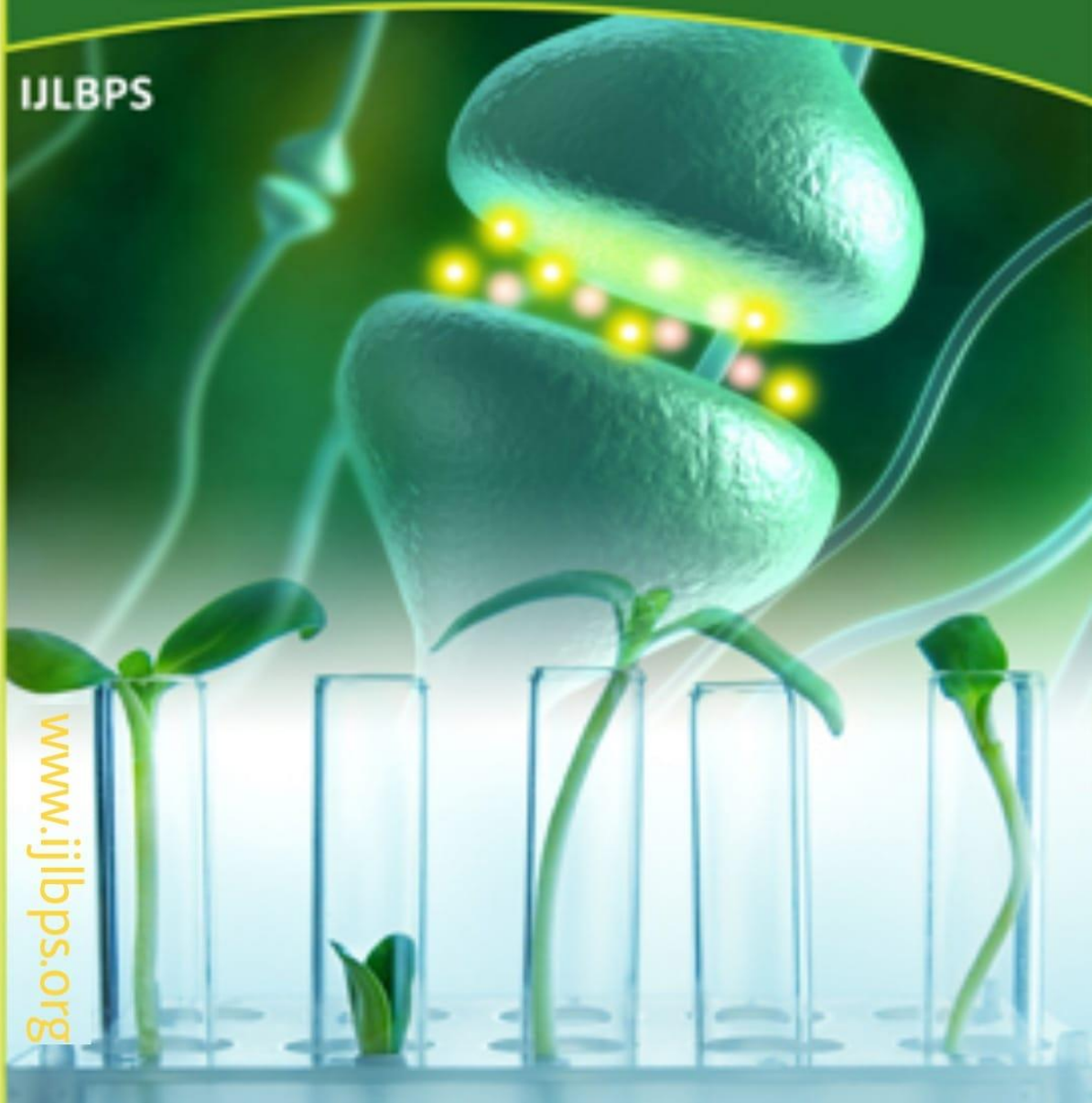




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## Bio-monitoring of automobile workers for lead contamination

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### Abstract

Occupational exposure to hazardous metals and the health risk of metal hazards to humans have both increased as metal usage has become more widespread in industrial operations. Elemental analysis in the human tissues is the most widespread application of biological monitoring of screening, diagnosis and evaluation of such exposure and risk. Bioindicators may be extracted from a wide variety of biopsy samples, including blood, nails, hair, teeth, and bodily fluids. This paper presents the results of a quantitative determination (using atomic absorption spectrophotometer/AAS) of lead metal concentration in the blood samples of people who work in garages and automobile workshops. High blood lead levels are linked to a variety of health issues, including kidney disorder or failure, anemia, and occasionally hypertension and water-borne diseases.

Key-Words: AAS, health problem, blood analysis, occupational exposure

### Introduction

The liquid vital force of all creatures, blood is the transport medium carries all life necessary and non essential components in human body [1]. Exposure to a wide variety of metal salts and metal-lead chromate ( $\text{CrO}_2$ ) is an anion-containing compound. No metal ion (including those which play essential roles in biological systems) is tolerated at high concentration [8], despite a wide range of hazardous concentrations. If the metal ion is absorbed in large enough quantities, it may induce local discomfort, tissue damage, or even systemic poisoning [2]. Copper's position in metalloenzymes (loc. cit) makes it vital to life, yet even at moderately low concentrations, copper salts may induce emesis and significant

gastrointestinal discomfort. Lead affects several metabolic processes due to its high binding to a wide variety of molecules. These include amino acids, haemoglobin, many enzymes, RNA, and DNA. Very low levels, equal to 20-200  $\mu\text{g Pb kg}^{-1}$  soft tissue, which are usually seen in adults, may have effects at the molecular level, such as interfering with processes in haem production [3]. In reality, depending on the metal, any metal loss that enters the circulation in substantial amounts and is not easily eliminated is hazardous [4-6]. It is possible that the metal ion's toxicity results from disruptions in electrolyte balance, direct effects on organs like the kidney or the central nervous system, or i

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interference with essential enzyme activities [7]. Thus, the normal extracellular concentration of  $K^+$  is 16-20 mg per 100 ml but if its concentration is only doubled by parenteral administration, marked effects on nerve and muscular activity occur that can even cause death due to cardiac depression [9]. Toxic symptoms become evident when the lead concentration in blood reaches 0.08 mg per 100 ml from the normal level of 0.03 mg per 100 ml.[10] The human body experienced a wide range of effects due to the elevated levels of heavy metals. Increases in heavy metals were also reflected in other measures of health, such as elevated blood pressure, elevated blood sugar, and a decrease in hemoglobin %. Heavy metals are the root of the problem here [11, 12].

#### Substances and Techniques

Seven people volunteered to have their blood tested for lead exposure at various garages and workshops [13]. The patients' medical histories were also examined for the aforementioned association [14]. The information about the dental health has also been captured for analysis. The majority of these persons said that the lack of fresh air was to blame for their memory issues. Several of them complained of skin discoloration, nausea, and headaches.

#### Collection of Blood

Collecting the specimen carefully is essential. The blood samples were from healthy people in Sagar, Madhya Pradesh (India) who had a documented history of exposure to heavy metals.

To prevent excessive clotting, 1 ml of sodium citrate (3.5%) solution was added to the syringe before collecting blood samples by veiner puncture of the antecubital vein using disposable polyolefin syringes with stainless steel needles. A polycarbonate tube was used to swirl (vortex-mix) the obtained material for a full minute. All samples were kept at 4°C prior to extraction of

plasma from red cells. It took around 15 minutes of centrifugation at 1000 revolutions per minute to separate the plasma from the erythrocytes. Three times, red cells were washed with

0.15 M. Blood was decanted into a sodium chloride solution and then reconstituted with demineralized (saline) water to restore its volume. The samples were kept in a refrigerated unit as per protocol. After centrifuging the blood sample for 15 minutes, the blood serum was filtered and collected for analysis.

The usual health information and heavy metal content in one healthy individual were also measured by AAS [15, 16]. This functioned as a control volunteer. All of the blood samples were taken from people who either work or live in one of the contaminated locations stated above. A qualified pathology technician drew the blood and processed it into serum. The serum was then delivered to a lab where it would be analyzed using an AAS, specifically a SHINADZU AA6800 atomic absorption spectrophotometer.

What We Learned and Why Different age groups in Table 1 have varying levels of Haemoglobin (Hb%) and sugar, but all have advanced to harmful phases, as shown by their blood analyses. Blood haemoglobin levels were below 13%-18%, indicating that the increasing concentration of Pb has inhibited the bonding of Fe and glob in protein in blood, causing Fe levels to drop while sugar remained within normal range. Anaemia was brought on by the elevated levels of Pb [17]. His medical background indicated he had a history of liver enlargement. The participants who were most sought after for this research had spent the previous fifteen to twenty years toiling in an increasingly contaminated environment.

The medical history of the 48-year-old male volunteer 2 (s) indicated that his hypothyroidism contributed to his 10.6% Haemoglobin, higher sugar, higher blood pressure, and higher



cholesterol. The third (v) volunteer, aged 55 and a garage worker who often has his hands in grease, has hypertension, squamous cells in his left ear, and a hemoglobin A1c of 9.8. He had been exhibiting signs of a hearing issue for the last decade [18, 19].

40-year-old painter and volunteer 4 (B) has elevated Pb, and his hemoglobinHis data showed he had a history of hypertension and vomiting due to his elevated cholesterol (13.6).The highest levels of lead and hemoglobin were found in volunteer 5 (T), age 42; his sugar and cholesterol levels also indicate the probability of hypertension and jaundice owing to his employment in an automotive repair.Volunteers 6(U) and 7(w) had higher Pb; they were 43 and 47 years old, respectively; they had low Hb% and low sugar and cholesterol; their occupation was painting; and Volunteer 8 was the only person suffering from diabetes; he lives near the garages of Bhagwanganj and uses the water sources near the Bhagwanganj sites B1 and B2 of Sagar city (MP) India, both of which have heavy traffic, garages, automobile workshops, etc. Because of his chronic exposure to harmful air, water, and food, his blood serum has 0.09 ppm of lead. There were no harmful parameters discovered in the 9(H) volunteer, who did not live or work in a polluted environment and whose elevated sugar and cholesterol levels were the result of his own lifestyle rather than environmental pollution.

### Conclusion

People whose blood was sampled after being exposed to places like car repair shops, paint businesses, etc. If these conditions increase high contamination of pollutants like lead metal in living beings [20].

This survey shows that the people living around the Sagar City Lake are suffering from chronic water bornediseases [21]. The concentration of Pb (0.09 ppm) in human blood by their blood

serum analysis proved that the diseases like kidney disorder, breathing problem, memory problem, skin disease, gastro-enteritis, dysentery etc. due to higher exposure of pollutants and poor hygienic habits in persons who are living or working in and around such environment [22-23].

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port medium carries all life essential and non essential elements in human body [1]. The ingestion of many soluble metal salts and metal-

containing anions such as chromate ( $\text{CrO}_4^{2-}$ ) from lead