

## Quantitative Determination of Heavy Metals in the Water Samples of Four Areas of Hyderabad in Telangana State

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**Abstract:** Quantitative determination of six heavy metal ions viz, Pb, Cd, Cu, Cr, Fe and Zn in the water samples of Balapur, Jeedimetla, Patancheru and Tarnaka areas of Hyderabad city have been carried out using atomic absorption spectrophotometry. Calibrations were constructed for the six metals using standard solution. The analysis showed that the concentrations of Pb, Cd and Cr are moderately high in the water samples of Balapur and Patancheru where as Cu, Fe and Zn had no significant differences of concentrations compared to standard given by WHO. Twenty water samples collected from different bore wells of each area.

**Key words:** Heavy metal ions, Analysis, Atomic absorption spectrophotometry.

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### I. Introduction

Environmental pollution is a major global problem posing serious risk to man and animals. The development of modern technology and rapid industrialization are among the foremost factors for environmental pollution. The environmental pollutants are spread through different channels. Many of which finally enter into food chain of livestock and man<sup>1</sup>. There is increasing concern about environmental pollutants emanating into the livestock production systems<sup>2</sup>. Pollution of the environment has significant impact on living organisms. Heavy metals' toxicity is one of the major current environmental health problems and each potentially dangerous because of bioaccumulation through the food chain<sup>3</sup>. Water pollution is the contamination of water bodies (e.g. lakes, rivers, oceans and ground waters). Water pollution occurs when pollutants like heavy metals are discharged directly or indirectly into the water bodies. The presence of polluting metals like Pb, Cd, Cu, Cr, Fe and Zn are known to show effect<sup>4-5</sup> on human body. Non-essential heavy metals have directly or indirectly an adverse effect on biological activities. The presence of heavy metals in water degrade their quality which affect human health. Even the essential metals at higher concentration are toxic. The livestock systems are prone to general problem of pollution emanating from industrial activity. Excessive accumulation of Pb causes impaired kidney functions,<sup>6</sup> multiple sclerosis, anaemia neurological diseases and encephalitis. Excess Cd leads to nephritis and wrong bone metabolism<sup>6</sup>. Wilson's disease is caused by excess Cu<sup>6</sup> and excess Zn causes the disease of metal fume fever<sup>6</sup>.

Water is one of the most essential component of life on earth. In its purest form it is odourless, colourless and tasteless but due to human and animal activities, it is usually contaminated with solid, human wastes, effluents from chemical industries and dissolved gases. During last decade it is observed that ground water got polluted drastically due to increased human activities. Consequently number of cases of water borne diseases have been observed. In continuation of our research on toxic metals on soil<sup>7</sup> and spectrochemical analysis<sup>8</sup> of ground water taken from four areas of Hyderabad, we have selected some ground level water from industrial effluent areas of Hyderabad in Telangana state (Balapur, Jedimetla, Patancheru and Tarnaka) for the present study of quantitative determination of heavy metal ions.

### II. Experimental

**2.1 Chemicals:** Analar (AR grade) samples of Lead Nitrate, Nitric acid, Copper Nitrate, Cadmium Chloride, Chromium Chloride, Zinc Nitrate and Ferrous Sulphate were purchased from SD fine chemicals. Reagents of Analar grade and triply distilled water were used throughout the study. The apparatus and the glasswares were thoroughly washed and dried in oven. Pre concentration of the samples were carried out and the residue was leached with 0.1M HNO<sub>3</sub> acid (Analar) solution. This solution was used for the determination of Pb, Cd, Cu, Cr, Fe and Zn using atomic absorption spectrophotometer (AAS).

**2.2 Collection of samples:** 20 different water samples of each area were randomly collected to serve as the subject of study. These water samples comprised of bore well water. These samples were collected in two litre capacity polypropylene bottles (pre acid washed) and 1.0 mL conc. HNO<sub>3</sub> were added to 150mL of each sample to avoid microbial activities. The water samples were then boiled or evaporated up to one-fourth of original volume. The samples were then kept in a refrigerator for two weeks to stabilize the metals. From the

pool 100mL water sample was filtered and concentrated to about 60mL in 100mL standard flask to which 5.0mL HNO<sub>3</sub> was added. This was made up to the mark with de-ionized water. After digestion, samples were analysed for Pb, Cd, Cu, Cr, Fe and Zn using atomic absorption spectrophotometer according to standard methods as described in the manual supplied along with the atomic absorption spectrophotometer.

### 2.3 Instrumentation:

Elico SL 163 Atomic Absorption Spectrophotometer is used to analyse the concentration of metal ions. The calibration curves were constructed using standard solution of the metal ions by following the procedure given in the manual using appropriate detectors in the wavelength range suitable for the concentration range. Six replicates of each experiment are carried out. The calibrations are precise and accurate as demonstrated by % RSD being less than 2.

### III. Results And Discussion

The analysis of water from the study area showed that water samples have no colour and odour. The analytical results of metals in the samples of water are shown in the table. This data showed that the concentration of Pb, Cd, Cr and Fe are found to be present moderately high in the samples of Balapur and patancheru, where as Cu, Fe and Zn concentration in all the study areas had no significant difference of concentrations when compared with WHO data. The table shows the results of analysis together with the permissible range of metal ions as defined by WHO.

### IV. Conclusion

The presence of heavy metals with moderate high concentrations in the water samples indicate that there can be a chance of damage<sup>9</sup> to water and animal kingdom including human beings. Hence continual assessment and enlightenment is highly essential.

**Table:** Analytical results of metals in the samples of water

S.No	Metals	Concentration found in ppm				Permissible <sup>10</sup> concentration by WHO (in ppm)
		Balapur	Jedimetla	Patancheru	Tarnaka	
1	Pb	0.03±0.02	0.04±0.02	0.05±0.02	0.03±0.02	0.01
2	Cd	0.004±0.02	0.003±0.02	0.004±0.02	0.004±0.02	0.003
3	Cu	1.9±0.02	2.01±0.02	1.8±0.02	2.01±0.02	2.00
4	Cr	0.06±0.02	0.059±0.02	0.07±0.02	0.06±0.02	0.05
5	Fe	0.4±0.02	0.4±0.02	0.5±0.02	0.4±0.02	0.2
6	Zn	3.1±0.02	3.8±0.02	3.1±0.02	2.9±0.02	3.0

### V. Acknowledgements

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