World Journal of Pharmaceutical research

Volume 3, Issue 1, 695-700. Research Article ISSN 2277 – 7105

EVALUATION OF WATER QUALITY IN THE VICINITY OF INDUSTRIAL AREA, SRIKAKUKAM DT.(A.P.)

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Article Received on
15 October2013
Revised on 19 November 2013,
Accepted on 16 December 2013

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ABSTRACT

Analysis of heavy metals in ground water samples has been carried out from eight sampling stations for a period of one year during different seasons (September 2012 to August 2013) in the proximity of industries, in some areas of Srikakukam Dt.(A.P.). The parameters such as pH, temperature, iron, copper, chromium, lead and zinc have been analyzed. It is observed that all the concentration of these metals except nickel are slightly in excess when compared with standards for drinking water.

Key words: Heavy metals-- Pollution -- industries --Srikakukam Dt. -- (A.P.).

INTRODUCTION

The pollution due to toxic heavy metals is increasing with industrial progress [1, 2]. These are known to be biodegradable and persist for longer periods in the environment. These are referred to as heavy, dense, metallic elements that occur in trace levels, but are very toxic and tend to accumulate and hence are commonly known as trace metals. Heavy metals [such as chromium (Cr), iron (Fe), cadmium (Cd), copper (Cu), manganese (Mn), mercury (Hg), lead (Pb) and zinc (Zn)] are major pollutants in marine, ground industrial and even treated wastewaters [3, 4, 5]. In the developing countries like India food safety and quality are most important in maintaining human health. Aqueous effluents emanating from the mining industry and metal plating factories contain dissolved heavy metals. In the light of these it is proposed to take up studies on the determination of heavy metals in the vicinity of M/s. Samkerg pistons & Rings Ltd., Varisham, (V), Ranasthalam (M), Srikakulam District.

MATERIALS AND METHODS

The analysis of heavy metals was carried out during monsoon winter and summer seasons for the ground water samples collected from the following locations belonging to Srikakulam Dt : S_1–Varisam ,S_2– Pydibhimavaram ,S_3 – Jeeru kovadda ,S_4– Nelivada, S_5 – Vallabharavpeta,S_6 – Devasam ,S_7 – Chittivalasa and S_8 – Pishni . The samples were collected in 1lt. sterilized bottles were preserved with 2 mL nitric acid to prevent the precipitation of metals. They were then concentrated and subjected to nitric acid digestion. The samples were analyzed on 10^{th} of each month during Sep 2012 to April 2013. All the chemicals and reagents used were of analytical grade. D.D water was used for the preparation of solutions. Heavy metal analysis was done using Atomic absorption spectrophotometer type- AAS – SVL Spectronics – 205 Model Mercury Analyser – SVL Spectronics – 101 Model Spectrophotometer – Systronics. The pH of water samples was determined by a pH-meter and conductivity was measured by a conductivity meter (Systronics).The results obtained were compared with WHO(1984) and Indian standards(1983) for drinking water.

RESULTS AND DISCUSSION

The results of the analysis of heavy metal concentrations obtained from different sampling stations are presented in Tables – 1 to 3.

Higher levels of pH and alkalinity tend to reduce toxicity of metals in water The pH values of the present investigation were within the prescribed limits as per the standards (7.0 – 8.5) .

The analysis of water samples (for Cd, Cr, Cu, Fe, Pb, Ni and Zn) revealed that , except Nickel all the samples(Cd, Cr, Cu, Fe, Pb and Zn) have recorded slight excess concentrations of these elements from the sampling stations (S3 and S4).

Cadmium(Cd)

Human activities, such as tobacco smoking, mining, smelting, waste batteries, e-waste, paint sludge, incinerations and refining of non-ferrous metals, fossil fuel combustion are responsible for the release of cadmium in the environment, Cigarette smoking can cause significant increases in the concentrations of cadmium in the kidney, the main target organ for cadmium toxicity. Values of cadmium are found to range between ND to 0.065mg/lt.

Chromium (Cr)

Trivalent chromium Cr(III), is found to be essential to human beings and animals. It plays vital role in insulin metabolism as the glucose tolerance factor(GTF). Cr(VI) is more toxic

than Cr(III) .It is also responsible for chrome ulcer and kidney damage[6].Sources of contamination of chromium in the environment are Chlor-alkali, electroplating , leather textiles, pigments, metal finishing, mining and metallurgical industries. The ash from thermal plants of burning of coal as fuel in various industries contain significant amount of chromium which seeps through earth and affects the fertility of land. Total chromium content of the present study varied between 1.1 to 1.281mg/lt whereas hexavalent chromium was observed between ND and 0.21mg/lt.

Copper(Cu)

Copper is both essential and potentially toxic element. Large doses of copper irritate stomach. When present in excess limit(>1.0mg/lt) imparts undesirable taste to drinking water. The values obtained are within the permissible levels recommended by Indian standards[4]. Values of copper are found to range between ND to 0.081mg/lt.

Iron(Fe)

Iron deficiency is quite common among people throughout the world. However iron exposure results in siderosis (mottling of lungs)[7] Standards of iron in drinking water is 0.3mg/lt. In the present study iron content varies between ND to 0.33 mg/lt.

Lead(Pb)

Lead exposure occurs through gasoline additives, food can solder ceramic glazes, drinking water system (from soils) cosmetics, folk remedies, and battery/plastic recycling industry. The toxicity of lead is attributed to the fact that it interferes with the normal function of enzymes. Symptoms include hallucinations, headache, numbness, arthritis, and vertigo [7].The minimum and maximum lead concentrations varied between ND and 0.062 mg/ lt. None of the samples exceeded the relevant prescribed limits for lead in drinking water.

Nickel (Ni)

Major man-made sources of release of nickel are the combustion of coal and heavy fuel oil. Nickel is an important cause of contact allergy, partly due to its use in jewelry. The main uses of nickel and its compounds are in stainless steel, nickel containing alloys with anti-corrosion properties and electroplating. Other industrial applications include automotive, aerospace, electronics, consumer products, chemicals and batteries[8]. Results of the present study indicate that its value ranged between ND to 0.052mg/lt.

Zinc(Zn)

Drinking water contains certain amounts of zinc, which may be higher when it is stored in metal tanks. Low intake of zinc results in growth retardation, immaturity and anemia. Industrial sources or toxic waste sites may cause the zinc amounts in to reach levels that can cause health problems [9]. More than 50% of metallic zinc goes into galvanizing steel, but is also important in the preparation of certain alloys. The low concentration of zinc in drinking water could be due to the fact that pH of water samples were slightly alkaline and its solubility is a function of decreasing pH. Zn content varied between ND to 0.68 mg/lt.

Table –1 Physico – Chemical Parameters of Water Samples Collected in rainy season

Station No.	Temperature (^{0}C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	26.70	7.81	0.20	0.052	0.006	0.081	0.052	0.003	0.006	0.35
S2	26.75	7.50	0.051	ND	0.045	0.005	0.032	ND	0.001	0.22
S3	27.21	7.74	0.027	0.061	0.09	ND	0.036	0.036	ND	0.18
S4	27.45	7.56	ND	ND	ND	0.006	ND	0.062	0.004	ND
S5	27.66	7.82	0.15	0.060	0.032	0.004	0.011	0.014	0.0075	0.45
S6	27.38	8.02	0.13	ND	0.002	ND	0.03	0.022	0.008	0.082
S7	27.32	8.13	0.32	0.085	0.026	0.002	0.049	ND	ND	0.064
S8	27.50	8.31	0.45	0.13	0.065	0.08	0.15	0.044	0.018	0.016

ND = Not Detectable

Table –2Physico – Chemical Parameters of Water Samples Collected in winter season

Station No.	Temperature (^{0}C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	27.85	6.38	0.180	0.075	ND	0.012	0.048	0.007	0.003	0.31
S2	27.60	6.82	0.094	0.007	0.004	ND	0.030	0.001	ND	0.16
S3	27.82	7.05	0.076	ND	0.007	0.001	0.042	ND	ND	0.14
S4	27.80	7.23	0.082	0.003	ND	0.004	0.001	0.052	0.052	ND
S5	27.75	7.46	0.17	0.072	ND	0.009	0.003	0.018	0.009	0.62
S6	27.65	7.50	0.10	0.060	0.002	0.003	0.004	0.020	0.007	0.09
S7	27.54	7.18	0.32	0.014	0.005	ND	0.053	ND	ND	0.052
S8	27.48	7.20	0.37	0.18	0.008	0.072	0.11	0.037	0.011	0.014

ND = Not Detectable

Table –3 Physico – Chemical Parameters of Water Samples Collected in summer season

Station No.	Temperature (^{0}C)	pH	Total Cr	Cr(VI)	Cd	Cu	Fe	Pb	Ni	Zn
S1	28.02	7.60	0.26	0.108	0.005	0.061	0.08	0.005	0.008	0.66
S2	28.10	7.26	0.12	0.06	0.0071	ND	0.06	0.002	0.001	0.35
S3	28.03	7.38	0.09	0.022	0.009	ND	0.029	0.001	ND	0.28
S4	27.86	7.50	0.07	ND	0.002	0.009	0.09	0.048	0.007	0.05
S5	27.65	7.05	0.11	0.08	ND	0.006	0.0063	0.025	0.011	0.68
S6	27.60	6.98	0.19	0.11	0.0032	0.004	0.008	0.029	0.009	0.11
S7	28.02	6.82	0.38	0.093	0.0067	0.006	0.005	0.012	0.002	0.073
S8	27.93	7.36	0.61	0.21	0.009	0.003	0.33	0.046	0.015	0.046

ND = Not Detectable

CONCLUSION

It can be concluded from the present study that the concentration of metals are found more than Spec IS: 10500, 1992 specification for drinking water in all lake water samples. It is recommended that a real assessment of the water and its quality has to be checked periodically keeping in view of its demand for human consumption.

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