Jr. of Industrial Pollution Control 21 (2)(2005) pp 401- 406

CONCENTRATION OF HEAVY METALS AND FLUORIDE CONTENT IN UNDERGROUND WATERS OF VALLIOOR AREA, TIRUNELVELI DISTRICT, TAMILNADU, INDIA

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Key words : Underground water samples, Fluoride, Heavy metals.

ABSTRACT

Concentration of heavy metals such as iron, copper, zinc, manganese and aluminium and fluoride content in underground water samples were analysed in fluorotic and control areas of Vallioor Union. Fluoride content in water samples were correlated with heavy metals.

INTRODUCTION

Fluoride, an element present in natural water and food is an universal phenomenon. Hence its intake in the diet becomes inevitable. Small concentration of fluoride in drinking water has beneficial effect on human body if taken in controlled quantity i.e. less than 1 ppm, preventing dental caries. Nevertheless higher concentration causes serious dental and skeletal fluorosis while present in concentration greater than 1 ppm. Due to the non-availability of surface water in these areas people consumed underground water containing high amout of fluoride for their use.

MATERIALS AND METHODS

Drinking water samples from all the available sources of the selected fluorotic and control areas were collected in high density polythene bottles. While collection, temperature of these areas was noted by 110 ^{0}C thermometer. The depth of wells was about 30 to 40 feet and bore wells was about 100 to 350 feet. Fluoride content was measured by using fluoride ion selective electrode at

Central Electro Chemical Research Institute (CECRI), Karaikudi. Iron, Copper, Zinc and Manganese were determined by using Absorption Spectrophotometer (AAS) at the above Institute, Aluminium was analysed by using Systronics UV Spectrophotometer 107.

RESULTS AND DISCUSSION

Concentrations of fluoride and its impact on toxicity

Table 1 reports the findings of the concentration of fluoride ion in ppm. The amount of fluoride present in the ten fluorotic areas was in the range of 1.2 ppm to 6.0 ppm, wheras in the control areas the values of fluoride were within the prescribed limit.

Fluoride concentrations in drinking water ranging between Ippm and 5ppm cause 'mottled enamel' in teeth and above 5ppm cause skeletal fluorosis. This applies to the villages under investigation.

Since the presence of fluoride was in the above range, people living in fluorotic areas were affected by dental fluorosis and traces of skeletal fluorosis. Hence in the fluorotic areas, where water is naturally high in fluoride endemic fluorosis is prevalent.

The fluoride accumulation of ground water in these fluorotic areas varied recording to the (i) sources of water (ii) geological formation of the area, (iii) the amount of rainfall (iv) and the quantity of water lost by evaporation.

Distribution of iron and its influence on fluoride toxicity

The minimum and maximum values of iron are given in the table 1. Analysis showed that the values of iron in drinking water were within the prescribed limit. The limit for the values of iron in the drinking water is specified as O.3O ppm.

But the total intake of iron through water is far less than the required recommended value. Since the ionic fluoride is mainly responsible for dental and skeletal fluorosis, the fluoride toxicity may be reduced to some extent, when the total intake of iron is adequate.

Distribution of copper and its influence on fluoride toxicity

In there ten fluorotic and two control areas, the levels of copper in drinking water were also extremely low in all the water samples under investigation. The limit for the values of copper in the drinking water is specified as l.5 ppm. Copper is known to be esstential for the maturation of collagen including that of bones, particularly in growing children. Copper deficiency has been shown to be a cause of a special manifestation of fluorosis called 'genuvalgum'. No such type of skeletal fluorosis was observed in any of the fluorotic areas of the present study.

Distribution of zinc and its influence on fluoride toxicity

The minimum and maximum values of zinc are given in the table. The values of zinc in all the samples of water were much less than the recommended values ie limit 0.1 ppm. The total intake of zinc was much less than the recommended dietary allowance. Still no case of ' genuvalgum' was observed.

Distribution of manganese and its influence on fluoride toxicity

In all the fluorotic and control areas, the values of manganese were within the prescned limit. The value of manganese in the drinking water is specified as 0.5 ppm.

The levels of manganese in drinking water were also extremely low in all the areas of the present study. Such low levels of manganese in drinking water could not influence the fluoride absorption in any way and no study has been so far reported in the literature showing the deficiency of manganese influencing the fluoride toxicity in any way.

Distribution of aluminium and its influence on fluoride toxicity

The levels of aluminium in drinking water from all the fluorotic and control areas were extremely low. Intake of aluminium through water was low here. As it has not yet been established that, aluminium is an essential element inhuman nutrition, no values are available in the literature regarding the recommended dietary allowance for aluminium.

CONCLUSION

The amount of iron, copper, zinc and manganese present in all the water sample collected from these areas are within the prescribed limit. But the fluoride content is beyond the limit prescribed by ICMR. Since drinking water is a basic need, the people should consume protected water containing fluoride within the prescribed limit. Thereby the coming generation in these areas will be protected from attacking dental and skeletal fluorosis.

The method used to estimate surfactant is relatively simple, precise and accurate. As the water used is synthetically polluted water solution of commercially available detergents, the method can also be applied to estimate amount of surfactant at part per million level in drinking water samples.

ACKNOWLEDGEMENT

The authors express gratitude to the Management and Principal of S.T. Hindu College, Nagercoil. They are also thankful to the Directors, CECRI, Karaikudi for providing them the necessary facilities to undertake this investigation.

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