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REPORT

Study of Effect of Iron Contamination in Drinking Water of Manihari Block, Katihar District, Bihar (India) and its Effect on Tribal Population

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The study of physico-chemical characteristics of drinking water with reference to iron contamination of two Panchayats namely Mahishpur and Miyanpur of Manihari Block of Katihar District, Bihar was made in Nov.-Dec. 2000. The parameter studied was iron etc.

Key words: Iron, contamination, water, Bihar.

Manihari is a small sub-divisional town situated on the bank of river Ganga of Katihar, which is one of the inportant towns of North Bihar under Koshiu Region. The water quality of the entire Katihar District is very poor due to high iron contamination and other contaminates. Also bacteriological quality of water is doubtful due to low water table of the entire Katihar district. Fluoride ion contamination has also been reported in some parts of Katihar District. But among all contaminants, iron contamination has been classified as a secondary contaminant and although it is not directly related to health-hazard but high content of iron in drinking water affects taste, colour and odour and promotes iron bacteria and may cause gastric trouble in children, constipation, abortion in women, diabetes particularly in women, dysentery, diarrhoea, untimely oldness, damage of liver, untimely greying of hair and other complications. Blood dysentery and jaundice may break out in epidemic form under high iron contamination.

The main source of water for drinking, bathing and other purposes is either wells or hand pumps in the study area and water is found at low level at 15–20 feet and is maximum under this condition in this area which is evident from the fact that water imparts yellow colour to pots, clothes and floors and forms scum when allowed to settle for some time.

Due to high abundance of iron in earth's crust, water from surface and ground sources is contaminated with iron.

In surface waters iron is present as suspension of fine particles of hydrated ferric oxide in colloidal form or in rare cases in soluble complex form.

In brief, iron may be present as soluble ferrous bicarbonates or as soluble ferrous sulphate or soluble ferric hydroxide in wells, hand pumps, springs, rivers, etc. as the case may be.

Over the entire range of neutral water, Fe^{2+} is thermodynamically unstable in presence of oxygen. Iron mainly exists in divalent ferrous (Fe^{2+}) state. It may also

exist in trivalent ferric (Fe^{3+}) state to a certain extent where low pH values are encountered. The oxidation of Fe^{2+} is usually accomplished by the dissolved oxygen introduced into the water by aeration.

$$Fe^{2+} + \tfrac{1}{2}O + 2OH^- + \tfrac{1}{2}H_2O = Fe(OH)_3$$

Thus the formation of reddish brown sediment is due to hydrated Fe_2O_3.

As per I.S. Code the desirable limit of iron content in drinking water is 0.3 ppm in absence of alternate sources. Firstly this means that beyond 0.3 ppm iron content in water is not suggested to be allowed for drinking water purpose in any case. Secondly it is also mentioned in I.S. Code (1991) that beyond this limit (0.3 ppm) taste and appearance are affected and promotes iron bacteria. It is a matter of fact that even at 0.3 ppm level, the promotion of iron bacteria is so tremendous that entire distribution system gets eaten up within less than a couple of years time. At several places, the ground water contains as high as 18 ppm iron. At these places even treating this water to produce I.S. grade water requires a very long and equally complicated series of operations. Again, apart from these microbial and aganoleptic problems, excess iron causes several complications as above. Also, it happens to be permanently deposited within different organs hampering their smooth functioning. For general use, the brown colour and turbidity due to iron make the water psychologically unacceptable, despite the fact that iron is most beneficial for human health.

For estimation of iron concentration, water samples were collected from two different Panchayats of Manihari Block namely Maheshpur and Miyanpur. The samples were taken from hand pumps in the early morning between 6.30 a.m. and 7.30 a.m. and the analysis for iron was done at RSIC, Bose Institute, Calcutta and also at P.G. Lab, D.S. College, Katihar by the methods of PHA/98–99.

The study conducted above revealed the following information:

Temperature: It has profound influence on the life of men and animals. The temperature of the surface layer was found higher than that of the bottom layer. This was due to solar heating. The temperature is directly related to bacterial activity.

Turbidity: Turbidity is responsible for odour, colour and to some extent taste of drinking water. It was observed low in winter.

Iron: It is the fourth most abundant element on the earth with an average concentration of 5% by weight. The concentration of Fe in water sediments in two Panchayats of Manihari Block, namely Mahishpur and Miyanpur of Katihar district, Bihar was found in the range of 0.12 to 0.14 ppm, respectively. Which is less than the permissible value of 0.3 ppm (I.S. Code). Except some visible characteristics of iron contamination in water, *e.g.*, colouring of utensils, floors, clothes and laundry, and in the yellowish brown colour associated with change of taste of water, tea, coffee and other beverages, the water of the two Panchayats of Manihari Block of Katihar district is said to be potable and not hazardous to health.

Thus the water of Manihari Block is fit for consumption and does not pose any serious threat to human health.

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