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A Preliminary Study on the Iron Content in the Soil of a Residential Area Near by an Iron Workshop in Ernakulam (Dist), Kerala with an Aim to make the Public Aware on the Ill Effects of Iron Overload Problems like Hemochromatosis

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Abstract: **Iron overload in human body causes damages to our internal organs and can be fatal if untreated. To make aware of this ill effect to the public living nearby an Iron Workshop in residential area of Ernakulam District in Kerala, a study on the iron concentrations in soil samples collected within a distance of 200 meters around a Iron Workshop was done. It was found that the iron content as Fe (II) was higher than that of the normal value expected within in this area. During the raining season, this excess iron may leach out into the nearby wells. People drinking this well water may have a chance of getting iron overload. Based on our studies we have given awareness to the public regarding the symptoms of iron overload and precautions to be taken.**

Keywords**: Iron Overload, Colourimetry, 2,2'-Biphenyl, Hemochromatosis.**

I. INTRODUCTION

Iron overload is a condition in which excess iron accumulates in the vital organs due to the absorption of iron in an uncontrolled rate in the human body. [1,2] Chronic fatigue, skin color changes (bronze, ashen-gray green), abdominal pain are some of the primary symptoms of iron overload. Iron over load increases chances of getting liver diseases, diabetic problems, heart problems like heart attack and gland related Problems.[3] Several endocrine disorders like hypogonadism [3,5] are also widely reported. It may also initiate the worsening of neurogendrative diseases.[3,5] There are two types of iron overloads namely genetically(hereditary) induced and non-genetically induced . Genetic disorders include Primiary Hemochromatosis[6-10] and Juvenile hemochromatosis.[11] Secondary hemochromatosis are those caused by blood transfusions or by taking large amount of iron rich supplements.[6-10] Besides this thalassemia[12], sickle cell disease, enzyme deficiencies and abnormal protein transports disorders like atransferrinema[13] are also examples for non-genetic iron overload problems. Another non genetic, hemochromatosis found in new born babies is Neonatal hemochromatosis.[14]

Iron reduction therapy is a widely used method to treat Iron Overload. In this therapy, the patient's blood is removed by Phlebotomy (Venisection) with the permission of a Physician.[3] If the hemoglobin level of a patient is sufficient, the doctor advises the patient to donate his /her blood routinely. If the hemoglobin level of a patient is low, the doctor advises chelation therapy using iron chelating agent desferrioxamine.[15] Sometimes both therapies are used simultaneously for the effective removal of excess iron.

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People with iron overload genetic disorders have a large tendency to develop hemochromatosis, if their surroundings are contaminated with excess iron. Keeping this fact in mind, in this paper we have determined colourimetrically the amount iron contents in various soil samples collected from about 50 and 100 meters and 150 meters and 200 from the Iron Workshop. We have also done an awareness programme for the residents in the area about the precautions to avoid Iron Overload problems.

II. MATERIALS AND METHODS

Soil samples were collected from different resident areas around the Iron Workshop. All Chemicals were purchased from Merck India Ltd and used as such. SL 159 ELICO UV-Visible spectrophotometer was used for the absorption studies.

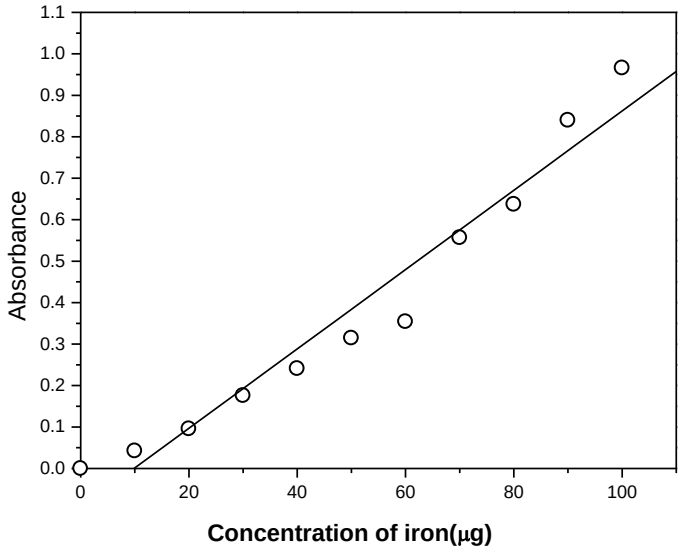
III. RESULTS AND DISCUSSION

The total iron concentration in the soil samples were determined in the form of Fe(II) by colourimetrically by the method adopted Jankeiwicz*et. al.*[16]. Table 1 shows the spectrophotometric absorbances of various working standard solutions of iron as Fe(II).

Table 1: Spectrophotometric absorbance for working standard solutions of with varying concentration of iron, Fe(II)

Sl No.	Concentration of iron (µg)	Absorbance
1	0	0
2	10	0.042
3	20	0.095
4	30	0.175
5	40	0.240
6	50	0.314
7	60	0.354
8	70	0.556
9	80	0.637
10	90	0.840
11	100	0.965

A standard calibration Graph 1, is plotted by taking absorbance values in the y-axis and concentration of Fe(II) solutions in x-axis.



Graph 1: Calibration graph for the spectrophotometric determination iron. The concentration of working standard Fe(II) solutions varied from 0 to 100µg.

As reported by Jankewic *et. al*., the iron content in various soil samples was determined and the spectrophotometrical method and the experimental data are detailed in Table 2. It shows absorbance of the iron complex of 2,2'-bipyridine present in the soil and the corresponding concentration of iron obtained from the standard calibration Graph 1. Soil samples obtained from 16 plots (4 samples from each category) within 50 meters, 100 meters, 150 meters and 200 meters around the Iron Workshop were used for the study. They were classified as S1- S4, S5- S8, S9-S12 and S13-S16 respectively.

Table 2: Shows in absorbance and the corresponding concentration of iron for various soils samples.

Sl No.	Soil Samples	Absorbance	Concentration of iron, Fe(II) in µg/10g of soil
1	S1	0.907	104.9
2	S2	0.899	103.5
3	S3	0.878	101.5
4	S4	0.900	104.5
5	S5	0.864	100.5
6	S6	0.856	99.53
7	S7	0.822	96.15
8	S8	0.834	97.17
9	S9	0.110	21.55
10	S10	0.116	22.22
11	S11	0.120	22.56
12	S12	0.107	21.55
13	S13	0.050	15.47
14	S14	0.055	16.10
15	S15	0.046	15.14
16	S16	0.042	14.46

The average amount of iron present in soil samples varied from 103.5, 98.34, 21.97,15.28 µg/10 gof the soil was obtained for S1-S4, S5-S8, S9-S12 and S13-S16 respectively. Even though the iron content in the soil varies from soil to soil, a range of 20,000 to 550,000 mg/kg of soil is taken as the standard data for the studies.[17] In microgram scale this value varies as 0.2µg to 5.5 µg/10 g of the soil. When we compare the concentration of iron obtained for the soil samples with that of the standard value, the iron content in the soil samples were3 to 18 % higher than that of the standard value. In other words the soil with the 200 meters around the Iron Workshop is polluted with excess iron. So in rainy seasons, this excess iron may leach in to the water bodies and pollutes the drinking water. The constant use of this polluted water may make the initiation of iron over load problems to the public. So based on our studies we conducted an awareness programme to be public on the precautions to be taken to avoid the problems with iron overload and also to have routine medical check-up. We also suggested conducting regular analysis of the well water.

IV. CONCLUSION

The iron content within the distance 200 meters surrounding the Iron Workshop is measured colourimetrically. It was found that the iron concentration was varied from 103.5, 98.34, 21.97, 15.28 µg/10 g as a function of distance from the Iron Workshop. All these values were much above than that of the reported standard values. Since this area is highly populated, there is a chance of iron toxicity to the public. Based on our studies, we suggested the importance of being cautious about their health with regular medical check-up.

REFERENCES

[1] https://en.wikipedia.org/wiki/Iron_overload

[2] https://www.sciencedirect.com/topics/biochemistry-genetics-and-molecular-biology/iron-overload

[3] http://www.irondisorders.org/iron-overload

[4] https://en.wikipedia.org/wiki/Hypogonadism

[5] https://en.wikipedia.org/wiki/Neurodegeneration

[6] https://www.nejm.org/doi/pdf/10.1056/NEJMra1004967

[7] https://onlinelibrary.wiley.com/doi/pdf/10.1111/j.1365-2036.2012.05051.x

[8] https://www.hopkinsmedicine.org/gastroenterology_hepatology/_pdfs/liver/hemochromatosis.pdf

[9] https://www.healthline.com/health/hemochromatosis

[10] https://www.webmd.com/a-to-z-guides/what-is-hemochromatosis#1

[11] https://rarediseases.org/rare-diseases/juvenile-hemochromatosis/

[12] https://en.wikipedia.org/wiki/Thalassemia

[13] https://en.wikipedia.org/wiki/Atransferrinemia

[14] https://rarediseases.org/rare-diseases/neonatal-hemochromatosis/

[15] http://www.irondisorders.org/chelation-therapy

[16] B. Jankiewicz, B. Patszynski, A. Turek," Spectrophotometric Determination of Iron (II) in the Soil of Selected Allotment Gardens in Lódz", *Polish Journal of Environmental Studies* Vol. 11(6),**2002,** 745-749

[17] https://rais.ornl.gov/documents/eco-ssl_iron.pdf