IJCRT.ORG ISSN : 2320-2882

INTERNATIONAL JOURNAL OF CREATIVE RESEARCH THOUGHTS (IJCRT)

An International Open Access, Peer-reviewed, Refereed Journal

NEGATIVE EFFECT OF FLUORIDE INTAKE ON RED BLOOD CELLS COUNT IN Mus musculus.

Aruni Madhu Lata[1] Atul Samiran[2] & Ashok Kumar Thakur[3]

Research Scholar[1 2] Professor[3]

University Department of Zoology, TMBU Bhagalpur [1 2 3]

According to epidemiological studies, fluoride falls into the same category as hazardous metals like lead, methyl mercury, arsenic and polychlorinated biphenyls as a human developmental neurotoxicant that lowers intelligence tests for children. The numerous red blood cells are an early and significant target of fluoride poisoning after fluoride is absorbed from the digestive system and enters the circulating blood. Free radicals, reactive species that cause redox imbalance, cytotoxicity and hematological damage are produced as a result of prolonged fluoride exposure. Fluoride enhances the generation of reactive oxygen and nitrogen species, oxidizes hemoglobin lowers antioxidant power and inhibits transmembrane electron transport in isolated human red blood cells. The present study has aimed to investigate the effect of fluoride on RBCs count. Mice were divided into two groups consisting of 10 animals in each group. The first group served as a control providing with normal water and food and the second group where treated with 2 ppm sodium fluoride in water with the help of gavage, for 30 days. The present study shows a significant decrease in the RBC count of Mus musculus.

Keywords: RBC, Sodium Fluoride, Mus musculus, Blood

INTRODUCTION

According to the researcher -Dr. Joshi, In terms of acute toxicity fluoride ranks just above the lead. In actuality, it is among the most bone-seeking substances known to humans. In India, groundwater has been found to have hazardous levels of fluoride. A scary scenario after 40 years of consuming just 2mg of fluoride every day could cause severe bone Fluorosis. Mainly illnesses are brought on by excessive fluoride, including thyroid issues, osteoporosis, brittle bones, cancer, infertility in humans, brain damage and Alzheimer's disease (www.downtoearth.org.in).

Passive diffusion allows fluoride to be absorbed from the duodenal stomach mucosa and enter the blood stream. Intestinal damage, sporadic diarrhea, anorexia, flatulence, stomach pain, Constipation, nausea, and loss of appetite are among the side effects of sodium fluoride, (Sondhi et, al. 1995; Shashi,1999; Shashi 2010; Waldbott, 1977; Susheela 2001; Gharzoulik and Senator 1994) Susheela showed that fluoride intoxication of the human produces anemia or erythrocyte death that is the life span of RBC's lowers due to membrane degradation that changes them into echinocytes (Agalakova and Gusev,2008; Zhan,2017). Hematologic abnormalities in people include hypochromic anemia, changes in erythrocyte size and shapes, the presence of Heinz bodies, eosinophilic leukocytosis, lymphopenia, a rise in methemoglobin levels and changes in hematocrit (Schenk 2008 and Braceland 2017).

Many experimental models have been successfully used to study the harmful effects of fluoride on blood (Kant, 2009; Khand et.al., 2000; Cetin, 2004; Eren, 2005; Karadeniz, 2008; Uslu, 1981; Choubisa S, 1996). Fluoride interferes with the development of hematopoietic cells, which produce blood, in bone marrow cavities and prevents the movement of K+ \Cl- ions (Choubisa, 1996 and Santoyo,2013). Moreover, it affects the neutrophil and results in decreased phagocytic activity (Elferink, 1981), lipid peroxidation in Polymorphonuclear leukocytes (Kessaabi 1985) and the production of superoxide radicals(O^{2-}).

Both consumption and inhalation of dust or aerosols of sodium fluorides are considered hazardous (Gharzoulik and Senator,1994). It has been proven to have an impact on the heart and circulatory system at high enough doses. The occupational exposure limits for exposure have been set at 2.5 mg per meter cube over an 8-hour time-weighted average by the National Institute for Occupational Safety and Health and the Occupational Safety and health administrations. Plane sodium fluoride in higher doses used to treat osteoporosis can result in leg pain and incomplete stress fractures when doses are too high. It also irritates the stomach, occasionally to the point of causing peptic ulcer disease. The side effects of sodium fluoride that are slow-release and enteric-coated are milder and less frequent in the digestive system (Agalakova and Gusev,2008). The metabolism of calcium and electron transport is both hampered by fluorides. Both preserving cardiac membrane potentials and controlling coagulation require calcium. Due to severe hypocalcemia excessive consumption of fluoride salts or hydrofluoric acid can cause deadly arrhythmias. Fluoride can irritate or corrode natural membranes, eyes and skin (Susheela A, 2001).

METHODS AND MATERIALS:

Experimental Animal

20 adult Mus musculus, 6 weeks old, weighing 30 ± 5 g were acquired from the Animal House of the univ. dept. of Zoology, Tilka Manjhi Bhagalpur University, Bhagalpur, Bihar. All mice were kept in climate-controlled spaces that were no warmer than 30 ± 5 degrees Celsius. The fundamentals of caring for experimental animals were applied to every animal. A regular meal and water were given to each mouse. After that, mice (n= 20), were separated into two groups at random; a control group(n= 10) and a group that received sodium fluoride(n= 10). During 30 days, the NaF powder group was gavaged as 10 mg/kg/body weight in dissolved form. Normal meals And pure water were given to the control group.

Estimation of R.B.C. Count :

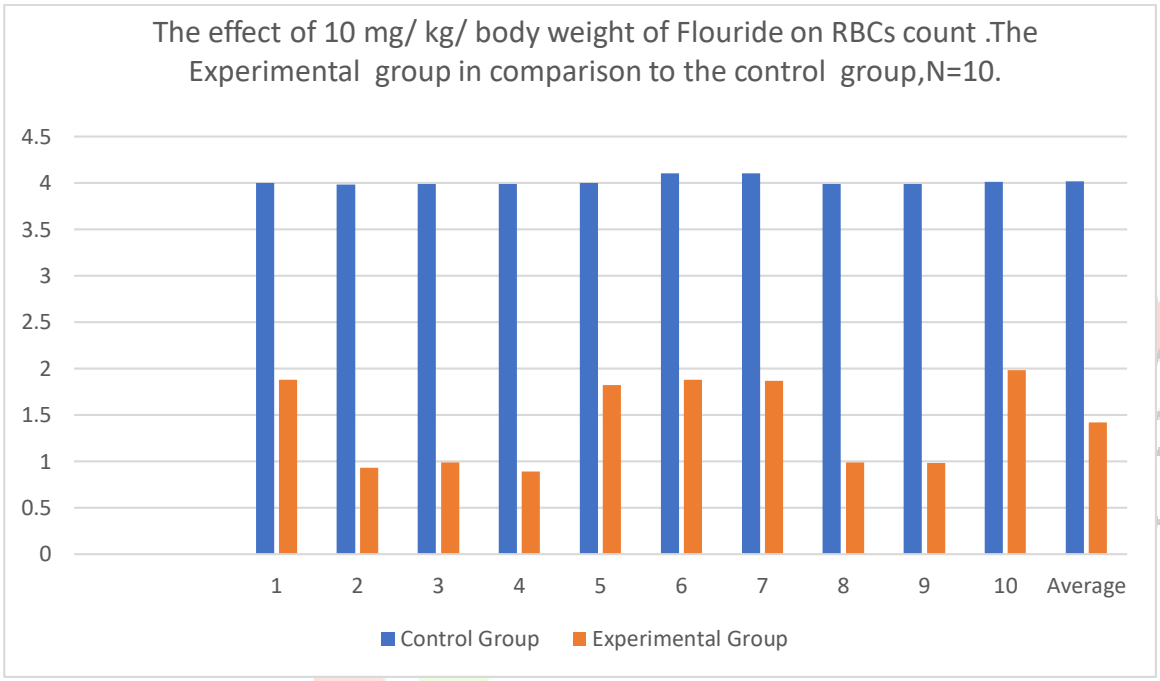
On the day 30,5 ml of blood sample was collected in washed and cleaned tube from each mice, which was taken out from the tail area for the measurement of RBC count, and estimation, According to the routine method. This was done using a Neubauer hemocytometer. (Davie and Lewis.,1975).

RESULT :

According to the results presented in Table 1, it is very clearly observed that there is a significant difference seen in RBC count between the two groups. The first group which is the control fed a normal diet and the second group which is fed with sodium fluoride at 10mg/ kg body weight for 30 days. It shows there is a significant decrease in the RBC count in experimental groups compared to control one. This shows the harmful effects of fluoride on mice's RBC count.

Sl. No.	Control Group RBC Count (Million/mm^3)	Experimental Group RBC Count (Million/ mm^3)
01	4.00	1.88
02	3.98	0.93
03	3.99	0.99
04	3.99	0.89
05	4.00	1.82
06	4.10	1.88
07	4.10	1.87
08	3.99	0.99
09	3.99	0.98
10	4.01	1.98
Average	4.015± 0.01	1.421± 0.15

Table.1: The effect of 10 mg/ kg/ body weight of Flouride on RBC count. The Experimental group in comparison to the control group N=10.



	Control Group Mean±SE	Experimental Group Mean±SE	t Value	Result
RBC Count in million/mm^3	4.015 ± 0.01	1.421 ± 0.15	16.58246	The result shows the SF dosage significantly decreases the no of RBCs in the experimental group

Table 2: Table shows the mean value of RBC count in both the group and the significance of the data.

DISCUSSION:

Fluoride, the most harmful environmental toxin disrupts an organism's normal metabolic pathway at high concentrations 3435. This study was mainly conducted to examine the blood cell count after giving fluoride intoxications for 30 days to the experimental Mus musculus.

10 mg/kg/body weight of Sodium fluoride was administered to experimental groups of mice to start the investigation. According to the study's findings, it was observed a significant decrease in the red blood cell count as given in Figure 1. As blood is too sensitive, it can reveal a wide range of metabolic abnormalities. While comparing the RBC count with experimental groups and control groups, Our current studies and findings were able to explain the considerable reduction in the number of RBCs. According to certain research, fluoride altered blood parameters (Agha,2012; Khan,2013, Dubey et al., 2012) and progenitor. Fluoride poisoning has been linked to human hematopoietic progenitor damage (Machalinski,2000 and Machalinska 2002). The interactions of hazardous compounds with red blood cells and their ability to carry hemoglobin, which could diminish hemoglobin concentration. According to earlier research, a slight increase in WBC and MCHC values (Oda et al.,1980). The body's capacity to fight infections is compromised by a deficiency in fighting infection by the efficiency of WBC. Packed cell volume measurements are crucial for assessing the impact of stress on an animal's health and seem as a gauge of the ability of the blood to deliver oxygen (Larsson, 1985).

A drop in hemoglobin % following sodium fluoride treatment was also noted in certain rat experiments. Similar studies' light microscopy results showed that fluoride-treated groups had higher erythrocyte damage than control groups due to the presence of macrophages in the spleen. This shows that fluoride causes an increase in phagocytosis in macrophage located in the spleen, which ultimately causes the development of anemia (Kahl et al., 1973; Danilov and Kasyanova,1975).

CONCLUSION

From the obtained result it can be concluded that the administration of 10 mg/kg body weight Sodium fluoride per day to Mus musculus, significantly decreased the RBC count. This indicates that sodium fluoride is toxic, like other toxic chemicals. It could result in hematological changes brought on by its toxicity which can include problems like anemia.

REFERENCES:

Agalakova N.I., Gusev G. Diverse effects of fluoride on Na+ and K+ transport across the rat erythrocyte membrane. Fluoride. 2008;41(1):28–39.

Agha F.E. Role of vitamin E in combination with methionine and L-carnosine against sodium fluoride-induced hematological: biochemical, DNA damage, histological and immunohistochemical changes in pancreas of albino rats. Life Sci. J. 2012;9(2):1260–1275.

Braceland M. Technical pre-analytical effects on the clinical biochemistry of Atlantic salmon (Salmo salar L.) J. Fish Dis. 2017;40(1):29–40.

Cetin N. Effect of fluoride application on some blood parameters in rabbits. EU J. Health Sci. 2004;13:46–50.

Choubisa S. Prevalence of fluorosis in some villages of Dungarpur district of Santoyo-Sanchez M.P. Effects of acute sodium fluoride exposure on kidney function: water homeostasis, and renal handling of calcium and inorganic phosphate. Biol. Trace Elem. Res. 2013;152(3):367–372.

Dacie J V & Lewis S.M. (1975) Practical hematology, 435pp 5th ed. Churchill libinstone edinberg.

Danilov V., Kasyanova V. Experimental data on the effect of hydrofluoric acid on embryogenesis of white rats. Gig. Tr. Prof. Zabol. 1975;1:57–58.

Dubey N., Raina R., Khan A.M. Toxic effects of deltamethrin and fluoride on antioxidant parameters in rats. Fluoride. 2012;45(3 Pt 2):242–246.

Elferink J.G. Fluoride-induced superoxide production in rabbit polymorphonuclear leukocytes. Biochem. Pharmacol. 1981;30(14)

Eren E. Fluorosis and its hematological effects. Toxicol. Ind. Health. 2005;21(9):255–258.

Gharzouli K., Senator A. Fluoride absorption in vitro by the gastrointestinal tract of the rat. Fluoride. 1994;27(4):185–188.

Kahl S., Wojcik K., Ewy Z. Effect of fluoride on some hematological indices and 59Fe distribution in the blood and iron-storing tissues in rats. Bulletin Serie des sciences biologiques. 1973.

Kant V. Haematological profile of subacute oral toxicity of fluoride and ameliorative efficacy of aluminium sulphate in goats. Toxicol. Int. 2009:31.

Karadeniz A., Altintas L. Effects of panax ginseng on fluoride-induced haematological pattern changes in mice. Fluoride. 2008;41(1):67.

Kessabi M. Experimental acute sodium fluoride poisoning in sheep: renal, hepatic, and metabolic effects. Fundam. Appl. Toxicol. 1985;5(6):1025–1033.

Khan A.M. Toxic effects of deltamethrin and fluoride on hematological parameters in rats. Fluoride. 2013;46(1):34–38.

Khandare A.L., Kumar P.U., Lakshmaiah N. Beneficial effect of tamarind ingestion on fluoride toxicity in dogs. Fluoride. 2000;33(1):33–38.

Larsson Å., Haux C., Sjöbeck M.-L. Fish physiology and metal pollution: results and experiences from laboratory and field studies. Ecotoxicol. Environ. Saf. 1985;9(3):250–281.

Machalinska A. In vivo effects of sodium fluoride on bone marrow transplantation in lethally irradiated mice. Fluoride. 2002;35(2):81–89

Machalinski B. The influence of sodium fluoride on the clonogenecity of human hematopoietic progenitor cells: preliminary report. Fluoride. 2000;33(4):168–173.

Oda H., Nogami H., Nakajima T. Reaction of hemoglobin with nitric oxide and nitrogen dioxide in mice. J. Toxicol. Environ. Health. 1980;6(3):673–678.

Schenk G. Crystal structures of a purple acid phosphatase, representing different steps of this enzyme's catalytic cycle. BMC Struct. Biol. 2008;8(1):1.

Shashi A. Gastric lesions in experimental fluorosis. Asian J. Microbiol. Biotech. Environ. Sci. 1999;1:171–175.

Shashi A., Sharma N., Bhardwaj M. Pathological evaluation of pancreatic exocrine glands in experimental fluorosis. Asian Pac. J. Trop. Med. 2010;3(1):36–40.

Sondhi H., Gupta M., Gupta G. Intestinal effects of sodium fluoride in Swiss albino mice. Fluoride. 1995;28(1):21–24.

Susheela A. Fluorosis Research and Rural Development Foundation; 2001. Fluorosis Indian Scienario: A Treatise on Fluorosis.

Uslu B. Effect of fluoride on hemoglobin and hematocrit. Fluoride. 1981;14(1):38–41.

Waldbott, G., gastric-ulcer and fluoride, 1977, int soc fluoride research 216 atkinson rd, titirangi, auckland 7, new zealand.

www.downtoearth.org.in

Zhan Y. The role of platelets in inflammatory immune responses in generalized