Hematological changes in albino mice under sodium fluoride

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Received 13 October; accepted 24 November; published online 01 December; printed 16 December 2012

ABSTRACT

Hematology is defined as that branch of biology which deals with the morphology of blood and blood forming organs. The importance of hematological parameters in clinical biochemistry is well understood. The present investigation was aimed to examine the hematological changes of albino mice with oral administration of sodium fluoride for 15 days and 30 days with 48 hr intervals. The decrease in RBC count, Hb, PCV and WBC was observed in the present investigation. MCV, MCH and MCHC also showed significant decrease in all 15 days and 30 days in the present study. Fluoride resulted alteration in the haemogram of experimental animals and the change is highly significant in 30 days compared to 15 days and if high be due to the decrease in the rate of hemoglobin synthesis due to fluoride poisoning.

Keywords: sodium fluoride, albino mice, chronic exposure.

1. INTRODUCTION

Although an association between environmental exposure to fluoride and morbidity from Hematological diseases have been studied (Machoy, 1990; Rohholm, 1937). Several investigators reported the effect of heavy metals and fluoride on blood systems (Livesey et al., 1986). Decrease RBC and Hb in copper and zinc poisoned fish, Oreochromis mossambicus (Joshi and Patil, 1977). Fluoride has an adverse effect on haemopoietic system (Pillai and Mane, 1986; Pillai et al., 1988). The cells of the tissue of the body are in contract with body fluids which in turn are in equilibrium with the fluid portion of the blood. Blood is the most important body fluid that governs vital functions of the body like respiration, circulation, excretion. Osmotic balance and the transport of metabolic substances. Oxygen transport in blood is dependent on the iron compound, hemoglobin, which in turn is dependent on the number of erythrocytes present (Haratym-mag, 2002). Blood parameters are probably the more rapid and detectable variations under stress and are fuel in assessing the health. The present investigation was aimed to study the effect of sodium fluoride on the blood is determined in albino mice.

2. MATERIALS AND METHODS

2.1. Test chemical

Sodium fluoride (99%) was used as a toxicant supplied by BDH Chemical Division, Mumbai.

2.1.1. Animal model

Healthy adult male albino mice, of the same age group (60 ± 2 days) and weight (30 ± 5 g) were taken from parental stock obtained from veterinary college, Bangalore and maintained (25 ± 2°C and 12 hr light, 12 hr darkness) with food and water ad-libitum.

2.1.2. Experimental design

The animals were divided into three groups having ten animals each, the first groups of animals were treated as controls with de-ionized water, and the second group of animals was treated with 5 ppm sodium fluoride for 15 days. The third groups of animals were treated with 5 ppm sodium fluoride for 30 days.

2.2. Hematological studies

RBC (Red Blood corpuscle) count, estimation of hemoglobin concentration (Hb), estimation of packed cell volume (PCV), white blood corpuscles (WBC) count, MCV, MCH, MCHC were carried out.

2.2.1. Red blood corpuscle (RBC) count

RBC count was made with a Neubauer crystalline counting chamber as described by Davidson and Henry (1969). The blood was collected in a vial containing 2% ethylene diamine tetra acetic acid (EDTA) as an anticoagulant. The blood was drawn up to 0.5 marks in RBC pipette and immediately the diluting fluid was drawn up to the mark 101 (thus the dilution is 1:200). The solution was mixed well by shaking gently. It was allowed to stand for 2 or 3 minutes. The counting chamber and cover glass were cleansed and the cover glass was placed over the ruled area. Again the solution was mixed gently and stem full of solution was expelled and a drop of fluid was allowed to flow under the cover slip holding the pipette at an angle of 40°, it was allowed to stand for 2 to 3 minutes to allow RBC to settle. Then, the ruled area of the counting chamber was focused under the microscope and the number of RBC's were counted in five small squares of the RBC column under high power and the number of RBC per cu.mm were calculated accordingly.

Keywords: sodium fluoride, albino mice, chronic exposure.
3. RESULTS

In the present investigation marked variations in the hematological parameters were observed under sodium fluoride stress. Due to oral administration of sodium fluoride in experimental animals caused a gradual decline in RBC, Hb, PCV, WBC but increased mean MCV, MCH and MCHC were recorded in all the three generations and all the values are statistically significant (P<0.001) (Table 1).

4. DISCUSSION

In general anemia is known to result due to decreased production and/or increased loss or destruction of RBC (Harper, 2000). Fluoride has an adverse effect on haemopoietic system (Pillai and Mane, 1989; Pillai et al., 1988). A decrease in the hemoglobin content in 15 and 30 days compared to control, which might be due to decrease in the rate of hemoglobin synthesis due to fluoride poisoning (Whipple, 1942). Decrease in haematocrit is attributable to the reduction in RBC count caused either destruction or reduction in size. In support of this decrease in haematocrit and mean value of haemoglobin were observed (Suntuchi et al., 2003). In polioencephalomalacia affected calves Hb, PCV, total erythrocytes count (TEC) and lymphocyte count were reduced, while neutrophil count was elevated (Singh, 2000). Alternation in MCV, MCH, and MCHC values imply the macrocytic anemia which can lead to vary slow production of erythroblasts in bone marrow and Aa a result they grow over in size with shape and have fragile membranes called megaloblast which is characteristic of pernicious anaemia which can lead to megaloblast anemia. Increase in MCV, MCH and MCHC was reported in gerbils treated with rodenticide, brodifacoum (Tier, 1966). Increase in WBC in the present study probably indicates the presence of defence mechanism. The rise in WBC count suggests the increased defence mechanism against probable attack of toxic molecules during aldrin toxicosis. Aged and worn out cells release substances like leukopoietin that may promote the formation of granulocytes. The reduction in size and number of RBC, HB and PCV may have severe consequence which results in the dilution of blood caused by the fluid of cells from body stores (Sharma and Saxena, 1983).

5. CONCLUSION

Thus the hematological parameters in the present investigation showed a significant alternation under sodium fluoride exposure. But these changes are highly significant

<table>
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<tr>
<th>Parameters</th>
<th>Control</th>
<th>5 ppm sodium fluoride treated*</th>
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<tbody>
<tr>
<td></td>
<td>15 days</td>
<td>30 days</td>
</tr>
<tr>
<td>RBC (Cu.mm)</td>
<td>8.25 ± 1.03</td>
<td>6.77 ± 1.07 (-17.96)</td>
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<tr>
<td>Hb (g/100 ml)</td>
<td>10.02 ± 0.82</td>
<td>8.82 ± 0.46 (-11.90)</td>
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<tr>
<td>PCV (per cent)</td>
<td>38.55 ± 0.66</td>
<td>36.03 ± 0.77 (-5.64)</td>
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<tr>
<td>WBC (Cu.mm)</td>
<td>922.03 ± 37.20</td>
<td>6702.18 ± 34.37 (-3.17)</td>
</tr>
<tr>
<td>MCV (µg)</td>
<td>43.78 ± 1.27</td>
<td>45.83 ± 1.24 (4.68)</td>
</tr>
<tr>
<td>MCH (Pg)</td>
<td>10.43 ± 1.03</td>
<td>11.86 ± 0.91 (13.72)</td>
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<tr>
<td>MCHC (Per cent)</td>
<td>26.66 ± 1.12</td>
<td>27.18 ± 1.10 (1.94)</td>
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</table>

*All the values are mean ± SD of six individual observations
**SD-Standard Deviation PC-Percent Change over control
*All the values are significant at P< 0.05 and P < 0.01.

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Hematological changes in albino mice under sodium fluoride, Discovery Sci., 2012, 2(6), 100-102,
www.discovery.org.in/ds.htm
in 30 days treated animals than the 15 days treated animals.

ACKNOWLEDGMENTS
The authors gratefully acknowledge the support provided by the Staff of Toxicology Division, Department of Zoology, SV University, Tirupati.

REFERENCES