Cumulative Effect of Fluoride on Hematological Indices of Mice, *Mus Norvegicus albinus*

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**Abstract:** Mice were exposed to fluoride. Hematological indices (WBC, Hb, PCV, MCV, MCH, MCHC) were measured. The results suggested a clear relation between presence of fluoride in drinking water and blood of mice. Fluoride could cause hypochromic microcytic anemia. The effect is dependent on the levels of bioaccumulation of fluoride ions in the blood of mice.

**Key words:** Anemia · Bioaccumulation · Blood · Fluoride and Mice

**INTRODUCTION**

There is a close correlation exists between the distribution of fluoride bearing minerals and prevalence of endemic fluorosis [1]. Number of changes in blood parameters was reported in fluoride exposed mice [2] and camels [3] and Eren et al., [4] However, WBC, MCV, MCH and MCHC were not affected in rats [5]. However, the work on hematological parameters with bioaccumulation and fluoride levels in blood and the impact of fluoride accumulation levels is not available.

**MATERIALS AND METHODS**

Male Wister strain albino mice *Mus norvegicus* albinus of five weeks old with average weight of 25g were obtained from CFTRI, Mysore, India. The mice were acclimatized in the laboratory for a period of fifteen days. All animals were fed ad libitum with a standard diet in the form of pellets obtained from Hindustan Lever Ltd., Mumbai. The animals were divided into six groups of eight each. The first and second group served as controls (C1 and C2), the third group was dosed orally with 10 mg/Kg b.w. fluoride (F1). Fourth with 5 mg/Kg b.w. fluoride (F2) once a day for a period of 30 days. In the remaining two groups F1 and F2 were given the same dosage of fluoride as in the case of previous groups, but were maintained for a period of 60 days. The dosage was administered every day at 9 A.M. using a gastric intubation tube. These doses were 1/5 and 1/10 LD50 of fluoride of lethal dose LD50/24 hours 50.56 mg/kg body wt. [6]. After the treatment to the said period of exposure, the animals were sacrificed by decapitation. Whole blood was collected from the aorta for fluoride accumulation and hematological studies. Blood fluoride concentration was estimated using the fluoride ion electrode and calomel reference electrodes as described by Singer and Armstrong [7]. The hemoglobin concentration was estimated by acid haematin method [8], mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were estimated as per Barbara A. Brown [9]. Duncan’s multiple range test [10] was applied to check the difference between treated groups and controls and the significance was calculated at 5% level (P).

**RESULTS AND DISCUSSION**

The results presented in the Table 1 that a significant decrease in RBC, hemoglobin, PCV, MCH relative to the respective controls and with no change in WBC and MCHC. The decrease in the above parameters was dose and time dependent (thus it was greater in groups F1 and F2 than F3 and F4). Changes of these values in mice have been attributed to rate of bioaccumulation of fluoride in blood. On the whole mice exhibited hypochromic microcytic anemia and severity was more at the day 30 than at the day 60.

The decreased hematocrit levels may be attributed to a decrease in size of erythrocytes due to stressful conditions [11]. A significant decrease in hemoglobin concentration was observed which was reflective of the decrease in hematocrit and RBC counts and agrees with the results reported by Banupriya et al., [12].

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Table 1: Alterations in RBC, WBC, Hb, PCV, MCV, Mean Corpuscular Hemoglobin (MCH), Mean Corpuscular Hemoglobin concentration (MCHC) and Fluoride accumulation in the mouse, on exposure to different doses and periods of fluoride

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Group (Millions/cumm)</th>
<th>R.B.C. (x 10^12 µl)</th>
<th>WBC</th>
<th>PCV (%)</th>
<th>MCV (g/dl)</th>
<th>MCH (pg)</th>
<th>MCHC (%) (µg/ml)</th>
<th>Fluoride accumulation (µg/ml)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>30 days C&lt;sub&gt;1&lt;/sub&gt;</td>
<td>5.68b</td>
<td>6.81a</td>
<td>13.64c</td>
<td>28.59c</td>
<td>50.33c</td>
<td>24.01b</td>
<td>47.7a</td>
</tr>
<tr>
<td>2</td>
<td>30 days F&lt;sub&gt;1&lt;/sub&gt;</td>
<td>4.76a (16.1)</td>
<td>7.05a (3.5)</td>
<td>7.82a (-42.6)</td>
<td>16.49a (-42.3)</td>
<td>34.97a (-31.7)</td>
<td>16.42a (-31.6)</td>
<td>47.42a (-0.58)</td>
</tr>
<tr>
<td>3</td>
<td>30 days F&lt;sub&gt;2&lt;/sub&gt;</td>
<td>4.82a (-15.1)</td>
<td>7.14a (4.8)</td>
<td>9.29b (-31.8)</td>
<td>19.54b (-31.6)</td>
<td>40.53b (-19.4)</td>
<td>19.27a (-19.7)</td>
<td>47.54a (-0.33)</td>
</tr>
<tr>
<td>4</td>
<td>60 days C&lt;sub&gt;2&lt;/sub&gt;</td>
<td>5.72c</td>
<td>6.42a</td>
<td>13.72a</td>
<td>28.57b</td>
<td>50.12c</td>
<td>23.98c</td>
<td>47.85a</td>
</tr>
<tr>
<td>5</td>
<td>30 days F&lt;sub&gt;3&lt;/sub&gt;</td>
<td>4.42 a (-22.7)</td>
<td>6.54a (1.8)</td>
<td>6.54c (-52.3)</td>
<td>13.74a (-52.0)</td>
<td>31.08a (-37.9)</td>
<td>14.79a (-38.3)</td>
<td>47.59a (-6.54)</td>
</tr>
<tr>
<td>6</td>
<td>60 days F&lt;sub&gt;4&lt;/sub&gt;</td>
<td>4.96 b (-14.3)</td>
<td>6.60a (2.8)</td>
<td>8.34b (-37.2)</td>
<td>17.63b (-38.5)</td>
<td>35.97b (-28.2)</td>
<td>17.02b (-29.0)</td>
<td>47.3a (-1.14)</td>
</tr>
</tbody>
</table>

* Each value is a mean of eight estimations
** Percentage decrease/increase over control is given in parenthesis

Means within column followed by the same letter are not significantly different (P > 0.05) from each other according to Duncan’s multiple range test

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REFERENCES

6. Missing
7. Missing


