قسم: طب الحيوان
كلية الطب البيطري - جامعة أسوان.
رئيس القسم: د. إبراهيم حسن سكر.

أنيميا الدم في الماعز بعد التسمم الصناعي بالفلورين

محمد كرم، أحمد عمار، حيدى إبراهيم

أختبر مصنع منفاد السوبر فوسفات بمحافظة أسيوط لا جودة البحث، للدراسة تأثير التسمم بغاز الفلورين على التركيب الهيستولوجي للدم بالماعز التي ترعى في المناطق المحيطة بالمصنع.

وقد تمت هذه الدراسة بفحص 200 رأس متقاربة الاعمار منذ كأنثى الماعز البليدة موزعة بين المناطق المحيطة بالمصنع ومنها 21 رأس من منطقة أبينو وهى بعيدة تماما عن تأثير التلوث بمخلفات المصانع كضوابط التجربة.

وكانت نتائج البحث: انخفاض في العدد الكلي للخلايا الحمراء، وكمية الهيموجلوبين مع زيادة معدل الترسيب (4 ساعات) وزيادة نسبة خلايا الليمفوسيل واللثبيت في دم الحيوانات التي ظهرت عليها أمراض التسمم مع انخفاض محتوى الحديد والنحاس في سرم الحيوانات المختبرة.
Dept. of Vet. Medicine,
Faculty of Vet. Med., Assiut University,
Head of Dept. Prof. Dr. I.H. Sokkar.

APLASTIC ANAEMIA IN CAPRINE FLUOROSIS
(With 3 Tables & 13 Figs.)

By
M.H. KARRAM; A.A. AMER and H.A. IBRAHIM
(Received at 14/12/1983)

SUMMARY

The present work aimed to study the picture of anemia following caprine fluorosis. The relation of such anemia to iron and copper levels was also discussed.

INTRODUCTION

Unfortunately, still data concerning the effect of industrial fluorosis on blood and serum constituents of ruminants, including goats, are scarcely available especially under Egyptian circumstances.

BURNS and ALLCROFT (1976) mentioned that among types of fluoride intoxication, systemic fluorosis which occurs when fluorine intake is high enough to result in depression of appetite, stunted growth, loss of condition and reduced milk yield in non-lame animals was included.

HOOGSTRATTEN et al. (1965) stated that eosinophilia may be an early manifestation of fluoride toxicity. HILLMAN et al. (1978) observed the development of anemia in cattle affected with fluorosis. The authors proved that the number of red blood cells per unit volume of blood, haemoglobin, haematocrit, and mean corpuscular volume were low in fluorotic herds.

Iron is essential to normal functioning of Hb, cytochrome system, myoglobin and many other oxidation reduction enzymes. Inadequate iron in animals leads to iron deficiency anaemia (BREAZILE 1971).

Copper plays a vital role in normal erythrocyte formation, iron utilization and conversion of dietary iron to haemoglobin (OSER, 1979). Copper deficiency have deleterious effects on animal health. Its deficiency in livestock leads to defects in the process of pigmentation, keratinization of wool, bone formation, reproduction, cardiac function and defects of growth in addition to haemopoiesis (SONNENWIRTH and JARRET 1980).

The aim of the present work is to study the erythrocytic and white cell picture following caprine industrial fluorosis.

MATERIAL and METHODS

A total number of 200 Balady goats showed clinical signs of chronic industrial fluorosis. These clinical signs are summarized as loss of appetite, dryness of skin, decreased weight gain, emaciation, and anemia. Dental lesions varied from light staining of incisors to complete attrition (Fig. 2). Animals were chosen at different localities from Manqabad Superyphosphate Factory, Assiut Province (Fig. 1). Samples were collected as follows:

Sample (A): Whole anticoagulated blood for haematological picture.
Sample (B): Blood for serum separation.

Methods:

- Whole anticoagulated blood samples were used for erythrocytic picture, which included:
  - Total erythrocytic count.
  - Hb content (gm%).
  - Differential leucocytic count.
  - Packed cell volume.
  - Erythrocyte Sedimentation Rate (ESR) per 24 hours.
  - Mean corpuscular volume (M.C.V), mean corpuscular haemoglobin (M.C.H) as well as mean corpuscular haemoglobin concentration (M.C.H.C) was calculated mathematically. Standards methods of COLES 1967, were applied.

Samples were used for:

- Serum iron (ug %) was estimated colorimetrically after TRINDER (1956).
- Serum copper (ug %) was estimated by the method described by ZAK (1958). Test kits supplied by Boehringer Mannheim GmbH Diagnostica (West Germany), were chosen.

Data obtained from the previous study were statistically analysed. Mean of results, standard deviations, and standard error were calculated according to KALTON, (1967).

RESULTS

Results were summarized in tables 1, 2 and 3 and figures 3 : 13.

DISCUSSION

Anemia which was previously detected clinically in goats at examined localities was ascertained by haematological examination. Significant decrease (P/ 0.05) in TECs (10^5/mm^3), Hb content (g/100 ml) and PCV (%) appeared in examined sample depending upon the distance of grazing from the factory (Fig. 3:5). Consequently ESR was accelerated (Fig. 6). Animals at Gaz. El-Akrad (adjacent to the factory) showed the lowest values for RBCs (10.79 ± 1.20), Hb content (6.91 ± 0.94) and highest rate of sedimentation (8.49 ± 1.51) per 24 hours, while animals grazing at Manqabad recorded the lowest PCV (24.19 ± 2.17). The other values were insignificantly affected.

Checking the correlation between the erythrocytic picture, tooth and bone involvement confirmed the exposure of such animals to fluorosis.

Anemia was among the clinical signs in cattle herds affected with fluorosis (RAND and SCHMIDT 1952). The authors stated that anemia may result from reduced synthesis of vit B12. HOOOSTRATEN et al. (1965) attributed anemia in cattle fluorosis to lower blood folate acid. In this respect SUTTLE et al. (1972) and HILLMAN et al. (1978) reported that the number of red blood cells per unit volume of blood, Hb, haematocrit, and mean corpuscular volume were low in fluorotic herds. It is of interest here to mention that the obtained results for Hb content disagree with those of SUTTLE and FALTIN (1973). These authors recorded normal values (10 g/100 ml of blood) for Hb content in cattle even under deleterious effects of fluorine ingestion. Such variations could be attributed to method, degree and time of exposure of animals to fluorine intoxication.

A highly significant decrease (P/ 0.01) in serum iron concentration (ug %) among all groups of tested goats rather than the animals of control ones was evident (Fig. 7). Serum iron values for intoxicated animals ranged from 38.43 ± 26.14 to 99.41 ± 25.50 ug %, while...
Aplastic anaemia in caprine fluorosis

for controls it was 137.69 ± 20.34 µg %. Lower values for serum iron in fluorotic goats may be attributed to the damaged effect of fluorine on iron metabolism in bone marrow. Depending up on recorded results one can say safely that fluorosis inhibits heme synthesis in bone marrow reticulocytes and causes an anemia that is morphologically similar to anemia of iron deficiency.

In the present work, with exception of animals at El-Gazira, serum copper values were lower than that of controls. The recorded values a ranged from 80.00 ± 17.78 to 171.28 ± 46.10 µg % (Fig. 8).

A field study of IBRAHIM (1980) in goats grazing nearby the Superphosphate Factory revealed a lower serum copper (138 µg %) than for animals at control area (160 µg %). The author interpreted that the lower serum copper was due to precipitation of copper in the gut by sulphur compounds and more excretion of copper with urine. It is interesting to mention that our data confirmed the opinion of IBRAHIM (1980). On the other hand the results were contradicted with those of GRIFFITH (1977) who recorded normal serum copper level in dairy cattle whose diet contained excess fluorine.

Results of total leucocyte count (TLCs X 10³/mm³) in the present study were variable irrespective of examined localities. Thus TLC ranged from 6.99 ± 3.06 and 11.76 ± 3.65/mm³ (Fig. 9). Data on differential leucocyte count in examined animals revealed that animals with high serum fluoride level behaved lymphocytosis, monocyteis, and eosinophilia (Fig. 10: 13). This goes hand by hand with the findings of HOOGSTRATTEN (1965) in bovine fluorosis. Eosinophilia was inter preted by the author, to be an early indication of fluoride toxicity.

REFERENCES


Table (1)

**MCV (cubic microns) in tested goat blood**

<table>
<thead>
<tr>
<th>Areas</th>
<th>Average mean</th>
<th>Males</th>
<th>Females</th>
</tr>
</thead>
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<tr>
<td></td>
<td></td>
<td></td>
<td>Total</td>
</tr>
<tr>
<td>Ez-Mohamed</td>
<td>18.48±4.18</td>
<td>18.21±4.21</td>
<td>18.53±4.47</td>
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<tr>
<td>El-Tawabiya</td>
<td>15.94±2.46</td>
<td>14.14±5.33</td>
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<td>Manqabad</td>
<td>19.79±2.29</td>
<td>15.15±3.52</td>
<td>20.10±2.07</td>
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<tr>
<td>Elwan</td>
<td>20.12±2.94</td>
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<td>20.12±2.94</td>
</tr>
<tr>
<td>El-Willidiya</td>
<td>17.60±3.49</td>
<td>17.51±4.81</td>
<td>17.63±3.12</td>
</tr>
<tr>
<td>Abnoub</td>
<td>18.39±4.15</td>
<td>18.12±3.79</td>
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Table (2)

**MCH (M. micrograms) in examined goats**

<table>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>El-Tawabiya</td>
<td>4.47±0.65</td>
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<td>Manqabad</td>
<td>5.96±0.83</td>
<td>5.21±0.73</td>
<td>6.01±0.83</td>
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<tr>
<td>Elwan</td>
<td>6.45±1.98</td>
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<td>6.45±1.98</td>
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<tr>
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<td>5.16±0.81</td>
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<tr>
<td>Abnoub</td>
<td>5.55±1.56</td>
<td>5.67±0.88</td>
<td>5.58±1.78</td>
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### Table (3)
MCHC (%) in the blood of goats

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<th>Mean</th>
<th>Females</th>
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<td>Total</td>
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<td>30.98±3.53</td>
<td>31.60±1.67</td>
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<td>El-Tawabiya</td>
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<td>Manqabad</td>
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<td>29.85±2.78</td>
<td>30.68±2.79</td>
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<tr>
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<td></td>
<td>30.50±3.21</td>
<td>27.70±2.56</td>
<td>31.44±2.95</td>
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<td>29.39±5.64</td>
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<td>Abnoub</td>
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<td>29.00±2.32</td>
<td>27.65±6.35</td>
<td>27.40±10.71</td>
<td>27.40±3.85</td>
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Fig. 1: Topographical Map of the factory and the places of collection.

Fig. (2): Dental Lesion