Haematological Changes in Guinea Fowls
(Numida meleagris galeata, Pallas) Following Haemorrhage

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Abstract: Haematological changes associated with haemorrhage were determined in the guinea fowl (Numida meleagris galeata, Pallas). The red blood cell, packed cell volume and mean corpuscular haemoglobin decreased significantly (p<0.05) at 4 h post- haemorrhage and returned to normalcy one week after hemorrhage. After 4 h of hemorrhage, the haemoglobin concentration also fell significantly (p<0.05). The fall persisted through the first week post-haemorrhage, it returned to normal value after 4 weeks of haemorrhage. The mean corpuscular volume was not affected for the first week after haemorrhage, but it fell significantly (p<0.05) at the fourth week of haemorrhage. The mean corpuscular haemoglobin was not altered by hemorrhage. This study showed that guinea fowls withstood 30% loss of blood and the haematological values were fully restored by the fourth week after haemorrhage.

Key words: Haematology, guinea fowls, haemorrhage

INTRODUCTION
There are numerous studies on the effects of hemorrhage on the haematological values and the response of various domestic animals to blood loss. The changes observed after hemorrhage have been reported for rat (Davis et al., 1954), rabbit (Critt and Merrick, 1959), dog (Jain, 1983), horse (Torten and Schalm, 1964), cow (Schnappau et al., 1957), monkey (Krise and Wald, 1959) and West African goat (Oyewale et al., 1997a). However, there have been little studies on the haematological responses of birds to haemorrhage. These include the study of Palmer et al. (1979) on the haematological changes after haemorrhage in wild pigeons, the haematological response of the Japanese quail to haemorrhagic stress which was studied by Gildersleeve et al. (1985) and the description of the effect of hemorrhage on the haematology of the Nigerian domestic fowl (Oyewale et al., 1997b).
A lot of attention is currently being focused on the guinea fowl (Numida meleagris galeata, Pallas) and there are on-going attempts to domesticate them. There are some reports on the haematology of these birds that are ubiquitous in the northern part Nigeria (Oyewale, 1988; Durotoye and Oyewale, 1988; Oyewale, 1990; Oyewale, 1991). There has not been any report on the haematological responses of these birds to haemorrhage. This study has assumed great importance due to the fact that these birds are constantly being transported from the northern to the southern part of Nigeria, where the greater numbers of consumers of these birds reside. And in the course of transportation many of these birds suffer varying degrees of injury and with the consequent blood loss. The knowledge of the response of these birds to hemorrhage is therefore very important, and that is why the haematological response of guinea fowls to hemorrhage is therefore presented in this manuscript.

MATERIALS AND METHODS
Eight adult guinea fowls with average body weight (± SD) of 1.22±0.13 kg were bought from a local market at Ibadan, Nigeria and then transferred to the Animal House of the Department of Veterinary Physiology, Biochemistry and Pharmacology, University of Ibadan, Ibadan, Nigeria. They were fed commercially prepared grower's mash (14.5% protein, 4.8% fat, 7.2% fiber, 0.8% calcium, produced by Bendel feeds and flour mill Ltd., Benin, Edo State, Nigeria). Water was supplied ad libitum. They were treated against nematodes with piperazine hydrochloride (Wormazine®, Alfansen International BV 3440AB woerden, Holland) at 1 g/liter of water. The birds were acclimatized to the new environment for 21 days before the commencement of this study.

Thirty percent (30%) of the calculated blood volume (Bond and Gilbert, 1958) was removed through the jugular vein of each bird, this is with a view of inducing haemorrhage. The average (±SD) volume of blood removed from the jugular vein of the bird was 29.78±2.32 ml/kg. The first 2 ml blood sample served as the control or pre haemorrhage sample, while that obtained at the end of blood withdrawal served as the 0 h sample (2 ml). Two ml blood sample was also collected 1 h, 4 h, 1 wk and 4 wk post-haemorrhage. All samples were collected into bottles containing ethylene diamine tetraacetic acid (EDTA) (2 mg/ml of blood). Red Blood Cells (RBC) were counted with haemocytometers. Packed Cell Volume (PCV) was determined using the
RESULTS

Red Blood Cells (RBC): The RBC counts before haemorrhage was 2.20±0.78 x 10^12/L. The count was not significantly altered after bleeding (1.77±0.71 x 10^12/L). However, the value obtained 4 h post-haemorrhage (1.60±0.33 x 10^12/L) was significantly lower (p<0.05) than the pre-haemorrhage value. The RBC count of 2.24±0.39 x 10^12/L at one week was similar to pre-haemorrhage value, while RBC value at 4 weeks was significantly higher than pre-haemorrhage value.

Packed Cell Volume (PCV): The mean PCV (±SD) of the Guinea fowl before haemorrhage (45.50±9.02%) and at the end of bleeding (38.13±10.16%) did not differ significantly from pre-haemorrhage value. The value however decreased significantly (p<0.05) after 4h. The PCV values of 38.75±2.97% and 43.06±4.10% obtained after one and four weeks respectively were similar to the pre-haemorrhage value.

Haemoglobin (Hb): The Hb concentration of 13.61±2.02 g/dl obtained for the guinea fowl before bleeding was similar to the value of 11.10±2.86 g/dl obtained at the end of bleeding. The Hb concentration (5.40±0.82 g/dl) decreased significantly (p<0.05) at the end of 4 h. The Hb value at 1 week remained significantly lower (p<0.05) than the pre-haemorrhage value. The Hb value of 14.18±2.16 g/dl was however similar to the pre-haemorrhage value.

MCV, MCH and MCHC: The MCH exhibited no significant change from the pre-haemorrhage value; at the end of blood withdrawal, 4 h, 1 week and 4 weeks after haemorrhage in the guinea fowl. The MCHC at the beginning and end of blood withdrawal were similar, however there was a significant fall (p<0.05) in the MCHC value at 4 h post-haemorrhage. The MCHC of one and four week post-haemorrhage were similar to the pre-haemorrhage value. The MCV value at pre-haemorrhage was similar to was similar to 0 h, 4 h and 1 week post-haemorrhage. However, the MCV value at 4 weeks was significantly (p<0.05) lower than the pre-haemorrhage value.

DISCUSSION

The haematological values earlier obtained for the adult guinea fowl by Oyewale (1991) were similar to the pre-haemorrhage values for the same species of bird in the present study. The present study revealed that the haematocrit value dropped significantly 4 h post-haemorrhage. Similar observations were observed 1.5 h post-haemorrhage in the pigeon (Palmer et al., 1979) and the Nigerian domestic fowl (Oyewale et al., 1997a,b). This fall in PCV may be due to haemodilution which was caused by decreased capillary blood pressure especially in the muscles (Ojojosugito et al., 1988). The drop in PCV, RBC and Hb values at 4 h post-haemorrhage may also have been due to rapid movement of intestinal fluid into the vascular system and from compensatory re-absorption of water by kidney to replace the fluid volume lost through hemorrhage (Sturkie, 1976).

Gildersleeve et al. (1985) reported that in the Japanese quails there was an initial shift post-haemorrhage towards greater numbers of more mature erythrocytes and fewer circulating reticulocytes. Reticulocytosis was however indicated 48-72 h post-haemorrhage. In the present study the reticulocyte were not count but the fact that the MCV was not altered shortly after haemorrhage is also an indication that there might also have been an initial shift towards greater numbers of more mature erythrocytes in the present study. Haematological values were also not taken 48-72 h post-haemorrhage in the present study; probably that was why there were no sharp increase in MCV (an indication of reticulocytosis). It might be necessary to determine the post-haemorrhage reticulocyte count of the guinea fowl in future studies.

The RBC was significantly higher at 4 weeks than the pre-haemorrhage value (Table 1), however a contrary observation of significant decrease in the RBC count at 4 weeks was made in the Nigerian domestic fowl (Oyewale et al., 1997b). Furthermore, Oyewale et al.

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Pre (n = 8)</th>
<th>0 h (n=8)</th>
<th>4 h (n = 8)</th>
<th>1 wk (n = 8)</th>
<th>4 wk (n = 8)</th>
</tr>
</thead>
<tbody>
<tr>
<td>RBC (x10^12/L)</td>
<td>2.20±0.78</td>
<td>1.77±0.71</td>
<td>1.60±0.33</td>
<td>2.24±0.39</td>
<td>2.62±0.71</td>
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<tr>
<td>PCV (%)</td>
<td>45.50±9.02</td>
<td>38.13±10.16</td>
<td>30.33±7.57</td>
<td>39.75±2.87</td>
<td>43.06±4.10</td>
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<tr>
<td>Hb (g/dl)</td>
<td>13.61±2.02</td>
<td>11.10±2.86</td>
<td>5.40±0.82</td>
<td>11.03±2.40</td>
<td>14.18±2.16</td>
</tr>
<tr>
<td>MCH (pg)</td>
<td>60.8±23.62</td>
<td>47.48±14.96</td>
<td>39.94±14.26</td>
<td>52.7±15.49</td>
<td>49.18±9.57</td>
</tr>
<tr>
<td>MCHC (g/dl)</td>
<td>28.04±9.88</td>
<td>26.67±3.19</td>
<td>16.95±4.60</td>
<td>27.96±5.13</td>
<td>32.38±4.56</td>
</tr>
<tr>
<td>MCV (fl)</td>
<td>235.9±104.13</td>
<td>231.39±60.05</td>
<td>187.14±10.28</td>
<td>194.6±47.77</td>
<td>103.8±53.42</td>
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*Value significantly different from pre-haemorrhage values at *p*<0.05
(1997b) reported a significant decrease in the PCV and Hb values at 4 weeks post-haemorrhage, however the present study revealed similar PCV and Hb value at the pre-haemorrhage and 4 weeks post-haemorrhage. The implication of this on our finding is that the guinea fowl recovered faster than the Nigerian domestic fowl from haemorrhage.

REFERENCES