



P-ISSN: 2349-8528
 E-ISSN: 2321-4902
 IJCS 2017; 5(2): 135-137
 © 2017 JEZS
 Received: 01-01-2017
 Accepted: 02-02-2017

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Analysis of baseline value and age-related changes in hematology of Doom pigs of Assam

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Abstract

Numerous studies have provided pig blood biochemistry but there have been no hematology and biochemical study on Doom pigs of Assam. Doom pig are an indigenous pig of Assam. The hematology of Doom pigs of Assam was analyzed to understand their normal physiology. The aim of the study is to generate baseline data on the hematological profile of local pig of Mizoram at different age groups. A total of eighteen clinically healthy Doom pigs of different ages from Livestock Research Station, Mandira, Assam Agricultural University was considered for the study. Group I consisted of 2 months old piglets (weaning stage) and group II consisted of 5 months old pigs (growing stage) and group III consisted of 8 months (reproductive stage) and above old pigs. Hematological parameters were estimated in Automatic hematology cell counter, HD-Consortium. From the study it was observed that most of the hematological parameters showed a significant difference ($P<0.01$) among the different groups. Thus it can be concluded that this baseline data will support the baseline data for interpretation of findings in clinical Biochemistry.

Keywords: Age, hematology, Doom pigs, Assam

1. Introduction

In the recent past, preservation and conservation of the local germ plasma has gained priority and attempts are being made to improvise the indigenous pig breeds due to their production potential. Doom pigs are the indigenous pigs of Assam. They are known to be very small in size and are non-descript. The farmers rear these animals under 'zero input' traditional scavenging system. The hematology of Doom pigs of Assam was analysed to understand their normal physiology the importance of hematological indices in animal husbandry is well acknowledged in different livestock [1]. The study of blood constituents can provide valuable information about the general health of an animal and therefore, can be used for evaluating the health status of the animal. Observation of a deviation of certain blood parameters from their normal limits could be a guide for diagnosis or differential diagnosis of a disease condition [2] Hematology profile being very important in evaluation of the health status of animals and clinical interpretation of laboratory data, is a prerequisite for diagnosis of several pathophysiological and infectious disorders in cattle [3-5]. The complete blood count (CBC) is an important and powerful diagnostic tool as a component of a minimum database. It can be used to monitor response to therapy, to gage the severity of an illness or as a starting point for formulating a list of differential diagnosis. Integration of the data is important for the highest diagnostic yield [6]. Blood examination is also performed as a screening procedure to assess general health [7,8]. Hematological values are also indicators of stress and welfare of animals [9]. The present investigation was therefore undertaken in order to find out the normal baseline data on hematological parameters since this pig had never been investigated earlier for its hematological profile. The presented data could be utilized as reference values for examination of Zovawk pig as well as in diagnosis of diseases which will ultimately facilitate in management systems and averting the economic losses.

Ethical approval

The prior approval from the Institutional Animal Ethical Committee was obtained for collection of the blood samples from animals used for the present study. Experiments should be carried out in accordance with the Guidelines laid down by the International Animal Ethics Committee or Institutional ethics committee and in accordance with local laws and regulations.

2. Materials and methods

2.1 Experimental Animal

A total of eighteen clinically healthy Doom pigs of different ages of either sex were randomly selected for the study from Livestock Research Station, Mandira, Assam Agricultural University and were divided into three groups. Group I consisted of 2 months old piglets (weaning stage) and group II consisted of pigs of 5 months old pigs (growing stage) and group III consisted of 8 months and above pigs (reproductive stage). The experiment commenced from November to February. The animals were given ad libitum access to balanced full ration feed in compliance with the production standards.

2.2 Collection of sample

Adequate care and necessary steps were taken up to prevent any untoward stress to the animals. Blood was collected by venipuncture of the anterior vena cava from 2, 5 and 8 months old piglets and from ear vein from adult pigs using a 18 gauge hypodermic needle fitted to a Vacumtainer-Luer adapter and evacuated tubes. Whole blood was collected into 5ml Vacumtainer tube containing (EDTA) as the anti-coagulant for estimation of hematological study. Blood was kept on crushed ice until returned to the laboratory (within 3 hr). The blood samples were analyzed immediately after the collection for the hematological parameters Total erythrocyte count (TEC), Hemoglobin (Hb), Thrombocyte, Hemocrit, Total leukocyte count (TLC), Packed cell volume (PCV), Mean corpuscular volume (MCV) and Mean corpuscular hemoglobin (MCH), Mean corpuscular hemoglobin concentration (MCHC), lymphocyte count, neutrophil count, monocyte count, eosinophil count and basophil count by using Automatic hematology cell counter, HD-Consortium.

2.3 Statistical analysis

The obtained results were analysed statistically and characterised with arithmetical mean \pm S.E as per analysis as per Snedecor and Cochran (1994).

3. Results and Discussion

Mean \pm S.E. and Minimum – Maximum values of erythrocyte and leukocyte pictures in different age groups of Doom pigs are presented in Table-1 and Table-2 respectively.

Erythrocyte picture: The TEC ranged from 2.090-4.221, 5.200-7.200 and 7.820-8.610 $10^6/\mu\text{l}$ in pre weaning, growers and adult pigs respectively. The TEC increased significantly ($P<0.05$) with age with highest values in the adults. Doom pigs in the present study were found to have Hb range from 8.500-10.230, 14.500-18.200 and 12.800-22.600 gm % in weaning, growers and adult pigs respectively. The Hb value also TEC increased significantly ($P<0.05$) with age. The hemocrit value ranged from 17.272-20.787, 26.586-40.986 and 31.488-58.794 in group I, II and III respectively. The thrombocyte concentration in group I, II and III were 320-750, 350-419 and 108-125 respectively. The hemocrits increased significantly ($P<0.05$) with age while the thrombocyte values decreased with age. The thrombocyte value was found to be significantly ($P<0.05$) decreased in group III as compared with group I and II. The MCV values ranged from 40.919-97.711, 45.061-74.521 and 38.571-68.333 fL in group I, II and III. The MCH values were 33.700-48.086, 17.797-33.091 and 15.679-39.286 pg in group I, II and III. The MCHC values were 46.543-53.098, 39.494-44.803 and 35.982-45.987% in weaning, grower and adult pigs respectively. The MCV, MCH and MCHC showed a decreasing trend with age and was significant ($P<0.05$) only in MCV.

The leucocyte picture: The TLC increased significantly ($p<0.05$) from the pre-weaning stage to grower stage and to adult. The lymphocyte count was not influenced by age. In the present study, granulocyte count was highest in the adult animals. The count increased significantly ($p<0.05$) from the weaning stage to grower and the count remained stable in adult pigs and there was no significance increase. The monocyte count was found to be significantly ($p<0.05$) higher in grower and adult as compared to weaning pigs. The plateletcrit increased significantly ($p<0.05$) from pre-weaning to adult pigs.

Table 1: Baseline values and age-related changes in erythrocyte picture of Doom pigs of Assam

| Parameter | Group I | | Group II | | Group III | |
|-------------------------------|---------------------------------|---------------|----------------------------------|---------------|-----------------------------------|---------------|
| | Mean | Range | Mean | Range | Mean | Range |
| RBC X $10^6/\mu\text{l}$ | 2.750 \pm 0.319 ^a | 2.090-4.221 | 5.851 \pm 0.285 ^b | 5.200-7.200 | 8.171 \pm 0.104 ^b | 7.820-8.610 |
| Hb gm % | 9.247 \pm 0.300 ^a | 8.500-10.230 | 15.400 \pm 1.129 ^b | 14.500-18.200 | 18.966 \pm 1.984 ^c | 12.800-22.600 |
| Hemocrit (%) | 18.789 \pm 0.610 ^a | 17.272-20.787 | 35.605 \pm 2.039 ^b | 26.586-40.986 | 46.658 \pm 4.882 ^c | 31.488-58.794 |
| Thrombocyte X $10^9/\text{L}$ | 450.5 \pm 64.177 ^a | 320-750 | 377.500 \pm 9.440 ^a | 350-419 | 128.666 \pm 14.689 ^b | 108-125 |
| MCV(fL) | 72.462 \pm 7.575 ^a | 40.919-97.711 | 61.629 \pm 5.151 ^b | 45.061-74.521 | 57.251 \pm 6.980 ^{bc} | 38.571-68.333 |
| MCH (pg) | 35.660 \pm 2.987 | 33.700-48.086 | 26.629 \pm 4.920 | 17.797-33.091 | 23.273 \pm 5.092 | 15.679-39.286 |
| MCHC (%) | 49.488 \pm 4.091 | 46.543-53.098 | 43.040 \pm 5.143 | 39.494-44.803 | 40.850 \pm 3.175 | 35.982-45.987 |

Mean values marked with different superscript are statistically significantly different at $P<0.5$ between rows.

Table 2: Baseline values and age-related changes in leucocyte picture of Doom pigs of Assam

| Parameter | Group I | | Group II | | Group III | |
|-------------------------|---------------------------------|---------------|---------------------------------|---------------|---------------------------------|---------------|
| | Mean | Range | Mean | Range | Mean | Range |
| Lymphocyte (%) | 77.66 \pm 3.706 | 68.100-89.260 | 71.083 \pm 5.359 | 51.200-91.200 | 72.375 \pm 4.565 | 50.320-78.500 |
| Monocyte (%) | 4.85 \pm 0.468 ^a | 2.900-5.800 | 2.850 \pm 0.350 ^b | 2.000-4.100 | 4.400 \pm 0.247 ^a | 4.000-5.600 |
| Granulocyte (%) | 17.421 \pm 1.794 ^a | 12.360-25.030 | 26.300 \pm 3.467 ^b | 20.100-42.200 | 22.750 \pm 3.630 ^b | 15.800-40.200 |
| WBCx $10^3/\mu\text{l}$ | 8.245 \pm 1.009 ^a | 6.020-11.860 | 14.399 \pm 1.013 ^b | 12.340-19.023 | 15.760 \pm 0.863 ^c | 12.680-18.610 |
| Plateletcrit (%) | 0.560 \pm 0.079 ^a | 0.400-0.934 | 0.480 \pm 0.011 ^a | 0.446-0.533 | 0.144 \pm 0.016 ^b | 0.121-0.140 |

Mean values marked with different superscript are statistically significantly different at $P<0.5$ between rows.

Since there is no literature available on the hematological profile of Doom pig, the findings of the present investigation are compared and discussed in relation to the data available for Zovawk pigs, a local pig of Mizoram. In our study the TEC and Hb was increased significantly ($P<0.05$) with age. This is in parallel with the works of previous workers [10]. The Zovawk pigs were found to have higher ranges of TEC than that of Doom pigs of Assam. The thrombocyte value or the platelet count had a significant ($P<0.05$) decrease with age. MCH and MCVC did not show such differences between the groups with age. The MCV in Doom was significantly influenced by age ($p<0.05$). Like in other pig breeds, MCV decreased significantly ($P<0.05$) from the pre-weaning pigs to grower pigs and in the adult pigs. But some workers reported MCV decreased from the pre-weaning pigs to grower pigs and increased in the adult pigs [11]. The lymphocyte and monocyte count showed a decreasing value with age while granulocyte and WBC increased with age and same result was reported by earlier workers [10].

4. Conclusion

Hematology and serum biochemistry represent the functioning of organs or systems and related data could be used to determine health status and from the study it can be concluded that the normal values for blood hematology are age-dependent.

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