

## Haematology of Rottweiler Dog in a Tropical Environment

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**Abstract:** This present study was carried out to investigate the haematological values of Rottweilers in a tropical environment with respect to sex, age, and breed. There were no significant ( $p > 0.05$ ) breed-related differences in the values of red blood cell counts (RBC), packed cell volume (PCV), haemoglobin (Hb) concentration, mean corpuscular haemoglobin concentration (MCHC), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), total and differential white blood cell counts (WBC) of the Rottweiler dog and the Nigerian local breed. There were also no age and sex related statistically significant difference in the haematological parameters of the Rottweiler in Nigeria. This study revealed that there was no gender, breed or age differences in the erythrocyte values of the Rottweiler dog. These considerations are especially critical in the establishment of reference ranges of blood parameters for this breed of dogs in the tropics.

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### 1. Introduction

Dog is a domestic animal which is a faithful companion to man in rural or urban areas. The Rottweiler breed originated from Germany. It was introduced by individuals in Nigeria for the purpose of guarding. It is also used by the Nigerian police for tracking criminals, detecting and holding of suspects, detection of narcotics and explosives. They achieve this work by their keen sense of smell.

Blood is an important index of physiological and pathological changes in an organism (Bush, 1991). It consists of plasma, blood cells (leukocytes and erythrocytes) and platelets. It serves as a transport medium for oxygen and carbon-dioxide. It carries nutrients from the digestive, the end products of metabolism from the cell to the organ of excretion, oxygen from the lungs to the tissue and the secretion of the endocrine gland throughout the body.

The blood also helps to regulate body temperature, maintain a constant concentration of water and electrolytes in the cells regulates the body's hydrogen ion concentration and defend against micro-organism. Both the cells of the blood and its fluid component assist in these functions.

Haematological profiles have been extensively used in veterinary medicine for evaluation of clinical status, nutritional balance, deficit condition, treatment monitoring and prognostics in individual animal as well as populations (Talebi *et al.*, 2005). However, blood metabolites may vary within the same species due to many factors, mainly, feeding, age, environmental temperature and physiological status (Walton, 2001). Few studies in Nigeria have documented the variations in blood profile of healthy

dogs. The knowledge of variations on blood profiles in specific populations of dogs will contribute to better interpretation of clinical haematology data (Awah and Nottidge, 1998). In our previous study, Olayemi and Ighagbon (2009), it was observed that the haematological parameters of the German shepherd dog in the tropical environment were similar to those of the Nigerian local dogs. In continuation of the study, the present work was designed to observe the influence of the tropical environment on the haematology of the Rottweiler breeds of dogs.

### 2. Material and Methods

#### Experimental Animals

The research was carried out at the department of veterinary Physiology, Biochemistry and Pharmacology, University of Ibadan, Ibadan, Nigeria. The sample population was made up of two groups; twenty Rottweilers and twenty local breed of dogs; the dogs were of both sexes and involved juvenile and adult dogs, with ages between 8 weeks to 5 years. Their diet was mainly rice with stew and meat/ fish; they were also fed with ready-made dog food. All the experimental dogs were apparently healthy with no clinical manifestation of disease before sampling.

#### Blood Collection

Blood samples of dogs were obtained from cephalic vein (adult dogs) or jugular vein (juvenile dogs) into a sample bottle containing ethylene diamine tetra acetic acid (2mg/ml), as anticoagulant. From the blood samples, the packed cell volume (PCV) was determined by microhaematocrit method. Red blood cells (RBC) and white blood cells (WBC)

were counted using the haemocytometer method. Haemoglobin concentration (Hb) was determined by the cyanmethaemoglobin method. The mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH) and mean corpuscular haemoglobin concentration (MCHC) were calculated from the PCV, RBC and Hb values (Jain, 1986). Fresh smear of each blood sample was fixed with methanol and stained with Giemsa for differential leucocyte count.

### Statistical analysis

Results were analysed using the statistical package GraphPad prism version 5.01 (San Diego, USA). Data were subjected to one-way ANOVA and subsequently to the Bonferroni post-test to perform

multiple comparisons in order to assess statistical significance of differences between all possible pairs of groups. The level of statistical significance was  $P < 0.05$ .

### 3. Results

The haematology values of adult and young Nigerian local and Rottweiler breeds of dogs showed slight variations, but the variations were not statistically significant ( $P > 0.05$ ) as shown in Table 1. The effect of sex on the haematology values of the Rottweiler dogs showed slightly higher PCV, MCV, lymphocytes and neutrophil values in the males when compared with the females, but these differences are not statistically significant ( $P > 0.05$ ) (Table 2).

Table 1: Haematology values (mean  $\pm$  SD) of adult Nigerian and Rottweiler dogs

Parameter	Nigerian local breed		Rottweiler breed	
	Adult (n=15)	Young (n=5)	Adult (n=13)	Young (n=9)
PCV (%)	35.2 $\pm$ 5.9	35.0 $\pm$ 4.8	37.9 $\pm$ 3.9	36.8 $\pm$ 3.6
Hb Conc. (g/dl)	11.6 $\pm$ 1.9	10.2 $\pm$ 1.5	12.1 $\pm$ 1.5	11.3 $\pm$ 1.4
RBC Count ( $\times 10^6 / \mu\text{l}$ )	5.9 $\pm$ 1.0	5.6 $\pm$ 0.7	6.1 $\pm$ 0.9	6.4 $\pm$ 0.8
MCV (fl)	61.9 $\pm$ 7.2	65.5 $\pm$ 9.7	63.3 $\pm$ 9.1	57.9 $\pm$ 7.4
MCH (pg)	19.5 $\pm$ 1.7	18.0 $\pm$ 2.4	16.2 $\pm$ 5.1	17.8 $\pm$ 2.2
MCHC (g/dl)	32.2 $\pm$ 2.7	29.4 $\pm$ 4.9	32 $\pm$ 2.9	30.9 $\pm$ 3.4
WBC Count ( $/ \mu\text{l}$ )	8140 $\pm$ 2783	7940 $\pm$ 640	7592 $\pm$ 2324	10094 $\pm$ 2392
Platelet Count ( $/ \mu\text{l}$ )	142333 $\pm$ 46546	126200 $\pm$ 11234	145000 $\pm$ 50567	170822 $\pm$ 75543
Lymphocytes ( $/ \mu\text{l}$ )	4349 $\pm$ 2090	3583 $\pm$ 1215	3456 $\pm$ 1728	5169 $\pm$ 571
Neutrophils ( $/ \mu\text{l}$ )	3593 $\pm$ 2250	3997 $\pm$ 1535	3689 $\pm$ 2246	4577 $\pm$ 2178
Monocytes ( $/ \mu\text{l}$ )	203 $\pm$ 129	264 $\pm$ 100	255 $\pm$ 119	203 $\pm$ 123
Eosinophils ( $/ \mu\text{l}$ )	267 $\pm$ 423	177 $\pm$ 265	306 $\pm$ 247	124 $\pm$ 246

n= number of dogs Mean  $\pm$  S.D (Standard Deviation); Means with different superscripts within rows are significantly different at  $p \leq 0.05$ ; values in parenthesis indicate absolute value; PCV: Packed cell volume; Hb: haemoglobin; WBC: white blood cell; RBC: red blood cell; MCV: mean corpuscular volume; MCH: mean corpuscular Hb; MCHC: mean corpuscular Hb concentration

Table 2: Haematology values (mean  $\pm$  SD) of male and female Rottweiler dogs

Parameter	Male Adult Rottweiler Breed (n=6)	Female Adult Rottweiler Breed (n=8)
PCV (%)	39.0 $\pm$ 4.15	37.0 $\pm$ 3.74
Hb Conc. (g/dl)	12.0 $\pm$ 2.02	12.3 $\pm$ 1.15
RBC Count ( $\times 10^6 / \mu\text{l}$ )	5.87 $\pm$ 1.03	6.25 $\pm$ 0.78
MCV (fl)	67.8 $\pm$ 12.1	59.4 $\pm$ 2.30
MCH (pg)	20.5 $\pm$ 2.52	28.3 $\pm$ 6.96
MCHC (g/dl)	30.7 $\pm$ 3.90	33.2 $\pm$ 1.06
WBC Count ( $/ \mu\text{l}$ )	7208 $\pm$ 2302	7921 $\pm$ 2471
Platelet Count ( $/ \mu\text{l}$ )	135 333 $\pm$ 42 646	152 286 $\pm$ 58 523
Lymphocytes ( $/ \mu\text{l}$ )	4048 $\pm$ 2260	2949 $\pm$ 1034
Neutrophils ( $/ \mu\text{l}$ )	2514 $\pm$ 1045	4696 $\pm$ 2572
Monocytes ( $/ \mu\text{l}$ )	284 $\pm$ 141	231 $\pm$ 102
Eosinophils ( $/ \mu\text{l}$ )	363 $\pm$ 316	257 $\pm$ 181

n= number of dogs Mean  $\pm$  S.D (Standard Deviation); Means with different superscripts within rows are significantly different at  $p \leq 0.05$ ; values in parenthesis indicate absolute value; PCV: Packed cell volume; Hb: haemoglobin; WBC: white blood cell; RBC: red blood cell; MCV: mean corpuscular volume; MCH: mean corpuscular Hb; MCHC: mean corpuscular Hb concentration

#### 4. Discussion

The importance of determining haematological parameters of domestic animals has been well documented (Obi and Anosa 1980; Kaneko *et al.*, 2000) and changes in these parameters have been studied in different animals (Vihan & Rai 1987, Tambuwal *et al.*, 2002).

Ariyibi *et al.*, (2002) reported a variation in the haematological parameters in Alsatian and local breeds of dogs as it relates to sex, age and environment. Consequently, it may be difficult to formulate a universal reference value. These differences have further underlined the need to establish appropriate physiological baseline values for various breeds of dogs in Nigeria, which could help in realistic evaluation of the management practice, nutrition and diagnosis of health condition. In Nigeria dogs are kept primarily for security purposes (Ayedun & Olugasa, 2012) and this has led to an increase in importation of breeds such as the Rottweiler from the temperate region in recent times.

##### Breed Differences

The present study revealed that the erythrocyte values: PCV, RBC count, HB conc. MCV, MCH and MCHC are similar for both the Nigerian local dog and the German Rottweiler. (Table 1) this agrees with the studies of Ariyibi *et al.* (2002) and Olayemi and Ighagbon (2009) who reported similar PCV, Hb and MCHC values in Alsatian and Nigerian local dogs. It has also been reported by Jain (1986) that there was no significant breed difference in the RBC, PCV, Hb, MCV, MCH, and MCHC values in swine. However, this disagrees with earlier reports by Olayemi and Ighagbon (2009) who observed higher WBC, lymphocytes, and neutrophil values of the Nigerian local dog compared to the Alsatian breed. The values obtained for the Rottweiler dogs in this study are slightly lower than values reported for temperate dogs (Coles, 1986). These results may suggest that Rottweiler dogs have acclimatized to the tropical environment which is reflected in the similar RBC values with the indigenous Nigerian dogs especially when both were raised under the tropical climate.

##### Sex Differences

There was no statistical significant difference ( $p \geq 0.05$ ) in the values of PCV, HB, RBC, MCV, MCH and other hematological parameters measured in the male and females Rottweiler (Table 2).

The results in this study however disagree with the findings of Bobade *et al.* (1985) who observed a significantly higher PCV and Hb values in the female than male Nigerian local dog. It also disagrees with Olayemi *et al.* (2009) who observed the male Alsatian had a significantly higher PCV, Hb and MCH values than the female Alsatian dogs. These finding are similar to the findings of Oduye (1978) who observed

no sexual dimorphism in the erythrocytes parameters of the Nigerian local dogs. Some investigators have reported no observable differences between the hematological values in sexes of dog breeds (Michaelson *et al.*, 1987; Awah and Nottidge, 1998; Olayemi and Ighagbon, 2009). The lack of sexual differences in the erythrocyte values in the N'dama cattle (Olayemi, 2007) and the pangolin (Oyewale *et al.* 1997) have also been reported. So, the observation of no statistical significant difference in male and female dogs of both Nigerian local and Rottweiler breeds is in line with these reported findings, as the animals of in this study were of the same breed, of comparable age and weight, fed the same diet, kept under similar environmental conditions and leading the same life style.

##### Age Differences

In the present studies, the findings show no significant differences between the adult and the young of the Rottweiler (Table 3). Konrad (1980) had earlier reported no significant difference in RBC, WBC, Hb, MCV, MCH, MCHC and differential leucocytes counts between German Shepherds adults and puppies. This finding is in consonance with the observations in the Nigerian local guinea pigs (Oluwaniyi *et al.* 2001); rats, rabbits, temperate guinea pigs (Jain, 1986); Nigerian local cats (Nottidge *et al.*, 1999) and the Cameroun goats (Pospisil *et al.* 1987) where no age variations were reported.

This study disagrees with previous study that showed that the RBC, Hb, PCV MCV, MCH and MCHC values were significantly higher in the adult Alsatian and Nigerian local dogs than the young Alsatian and Nigerian local dogs (Olayemi and Ighagbon, 2009). The findings also disagree with observations of higher erythrocyte values in the adult than the young mammalian species such as the Mongrel breed of dogs (Coles, 1986; Jain, 1986), Friesian cattle (Penny *et al.* 1966), temperate cat (Weiser and Kociba, 1983), and pig (Jain, 1986).

##### Conclusion

This study has revealed that there were no significant differences in haematological parameters associated with breed differences in the Nigerian local dog and the Rottweiler in the tropical region. This suggests that breed did not affect the haematological values of the Rottweiler dog in the tropical environment. The haematological parameters were also not influenced by sexual dimorphism in the Nigerian local breed and the Rottweiler. Similarly, ages of the Nigerian local dog and the German Rottweiler in the tropical region did not affect the haematological values.

It is hoped that veterinary clinicians in tropical regions will take this findings into cognizance when

interpreting the haematological parameters of the Rottweiler dog in the tropical environment.

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