International Journal of Chemical Studies

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Effect of aging on hematological profile of obese dogs

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Abstract
Fifteen obese Labrador dogs were selected from the animals brought to Madras Veterinary College Teaching Hospital. The animals of either sex were categorized according to their age groups, *viz.,* 3-5 years, 5-8 years and above 8 years. The animals were given complete physical examination and whole blood samples were collected and analysed for the hematological parameters including hemoglobin, hematocrit, RBC count, platelet count, WBC and differential count. The values were compared with the reference range, and the results of our study revealed the normal concentration of hematological parameters and found no statistical significance between the age groups. Though the mean corpuscular hemoglobin and mean corpuscular hemoglobin concentration deviated from the normal range, the age did not influence the other blood parameters.

Keywords: Obesity, canine, hematology, RBC, WBC, aging

1. Introduction
Obesity, a metabolic disorder has become a major health issue in companion animals and is regarded as an imbalance in the energy intake and energy expenditure. Obesity can predispose to several clinical conditions and is associated with a number of adverse outcomes. A high prevalence of 25 to 52% has been reported in the developed countries (Robertson, 2003; McGreevy *et al.,* 2005; Colliard *et al.,* 2006; Gossellin *et al.,* 2007) [19, 15, 5, 8]. The accumulated white adipose tissue secrete 'adipokinins", which are biologically active and are responsible for chronic low grade inflammation in obese dogs (Athyros *et al*., 2010) [2]. Chen *et al.* (2013) [3] reviewed that the hematological parameters including erythrocytes, leucocytes and platelets were affected by the chronic inflammation of the obesity. Hematology tests are useful in assessing the health status of the animal and their values are altered as age advances. It is reported that parameters like hemoglobin increases (Anderson and Schalm, 1970) [1] and Packed Cell Volume (PCV) decreases (Dougherty and Rosenblatt, 1965) with increasing age. Hence, the present study aimed to study the changes in the hematological profile caused by obesity and aging.

2. Materials and Methods
This study included fifteen obese Labrador dogs, which were selected among the animals brought to Madras Veterinary College Teaching Hospital, Chennai and were categorized according to their age i.e., 3-5 years, 5-8 years and above 8 years. There were 10 females and 5 males in that group. The animals were given a complete physical examination and the detailed diet history of the animals was collected. The Body Condition Score (BCS) was used to assess the obesity of the animals using a 5-point scale. The whole blood samples were collected to compare the hematology of the obese animals according to their age groups with normal reference values.

2.1 Haematology Analysis
Whole blood of about 1 ml was collected in a vacuutainer containing Ethylene Diamine Tetra Acetate (EDTA) for estimating hemoglobin concentration (Hb), Packed Cell Volume (PCV), Red Blood Cells Count (RBC), White Blood Cells Count, Platelets Count, Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH), and Mean Corpuscular Hemoglobin

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Concentration (MCHC). The samples were analyzed using automated hematology Analyser (Mindray BC-2800 vet). Peripheral blood smears were made for examination of blood parasites, blood picture and differential counts of those animals. The data collected were analysed using IBM SPSS software 20.

3. Results and Discussion

The obtained hematological results according to their age groups are given in table 1.The established reference interval was obtained from Kaneko (1989) [11], Lumsden (1998) [13], Rizzi et al. (2010) [18].

In the present study, there was no significant difference in the hematological parameters among the age groups of obese dogs. The results were in collaboration with Lowseth et al. (1990) [12], who reported no significant age-related differences in the hematology parameters.

Obesity, as it is characterized with a state of chronic inflammation, results in higher hemoglobin levels and increased WBC counts (Vuong et al., 2014) [21]. But Hb and WBC counts were unaltered in our study. Similarly, Harishankar et al. (2011) [9] demonstrated no relationship between obesity and Hb concentration in rodents. Rafaj et al. (2016) [17] also conlcuded that the RBC count was not impaired by excess of weight. In contrast to our results, many researchers concluded in their study that, obesity asssocited with higher values of hemoglobin and hematocrit values (Ornelas et al., 2011) [20]. But then, Chikazawa et al. (2013) [4] demonstrated anemia caused by inflammation but not elucidated the underlying mechanism completely. The obese dogs showed normal hematology regarding RBC count and MCV. The MCH concentrations were increased and MCHC concentrations were decreased slightly from the reference range. But found to have no significance between the age groups.

Table 1: Hematological profile of obese dogs based on age groups (Mean±SE)[NS]

S. No.	Parameters	Mean ± SE			Reference Range
		Group 1 (3-5 yrs)	Group 2 (5-8 yrs)	Group 3 (>8 yrs)	
1.	HB (g/dl)	15.18±1.27	13.96±0.50	15.42 ±0.77	12-18
2.	PCV (%)	39.88 ±3.61	35.10±1.70	39.48±2.76	37-55
3.	RBC ($\times 10^6$/µl)	06.42 ±0.66	5.99±0.31	06.65±0.27	5.5-8.5
4.	WBC ($\times 10^3$/µl)	14.62 ±0.90	14.24±2.03	11.92 ±0.30	06-17
5.	Platelets ($\times 10^4$/µl)	27.50 ±4.81	23.80±2.95	28.04±2.53	20-30
6.	MCV (Fl)	62.37 ±3.93	59.07±2.40	59.13±1.50	60-77
7.	MCH (pg)	23.85 ±1.01	23.49±1.31	23.18 ±0.86	32-36
8.	MCHC (g/dl)	38.22±1.39	39.96±1.22	39.27 ±0.98	20-24
9.	Neutrophils (%)	73.60±0.97	72.80±2.15	73.60±1.20	60-77
10.	Lymphocytes (%)	21.80±0.91	20.80±1.80	20.80±0.86	12-30
11.	Monocytes (%)	3.60±0.50	4.01 ±0.44	3.40 ±0.74	3-10
12.	Eosinophils (%)	1.01±0.31	2.01±0.63	2.20±0.20	2-10

(Each value is a mean of five observations.)

The WBC counts which are reported to be increased in obesity due to inflammatory cytokinins are found to be within the normal range in this study. This result coincides with the earlier findings of Piantedosi et al. (2016) [16] that chronic inflammatory state is not always evident in obesity. So there was no significant difference between WBC counts and differential count of the obese animals between the age groups and were within the normal reference values. Jaso-Friedmann et al. (2008) [10] compared the hematological profile of obese and lean cats and observed no differenece in the WBC count and the percentage of neutrophils and lymphocytes between them. On the other hand, Mahassni and Sebba (2012) [14] found that the neutrophils, lymphocytes and the total WBC count were increased in obese individuals. The neutrophils correlated positively with the increased visceral fat in humans. Another study by Drechsler et al. (2010) [7] asserted that the increased neutrophilic count in obese dogs was due to hypercholesterolemia.

4. Conclusion

The hematological parameters studied in the obese dogs were not affected as age advances.

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