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Studies on haematological parameters in apparently healthy adult and sick geriatric dogs

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Abstract

The objective of this study was to evaluate haematological parameters in sick geriatric dogs (> 7 years) in comparison with apparently healthy adult dogs (4-6 years) and to determine the effects of age on haematological parameters. A total of 538 geriatric dogs of various breed and gender were subjected for hematological evaluation after a detailed clinical examination. The haematological alterations noticed in the sick geriatric dogs were significantly lower ($P < 0.05$) total erythrocyte count ($5.22 \pm 2.30 \times 10^6/\text{mm}^3$) and haemoglobin ($11.40 \pm 2.23 \text{g/dl}$) along with neutrophilic leucocytosis, lymphopenia and thrombocytopenia.

Keywords: geriatric dogs, hematology.

Introduction

Aging is the complex set of biological changes occurring in older individuals that result in a progressive reduction of the ability to maintain homeostasis when exposed to internal physiologic and external environmental stresses Goldston and Hoskins (1995) [1]. Senior life stage begins around 7 years of age for the average dog and several interrelated factors like size and individual genetics, affect the onset and rate of the progressive decline (Fortney, 2004) [2]. Factors such as nutrition, age, sex, breed and climate are known to affect biochemical and haematological parameters of clinically healthy dogs (Coles, 1986 [3]; Awah and Nottidge, 1998 [4]). The blood is a vitally important fluid for the body and is also an important medium in assessing the health status of animals. Both the physiological and pathological conditions of animals can be assessed by the evaluation of various hematological parameters. Though ample work has been done on establishing the baseline values of hematological parameters of dogs, there has been little work done on geriatric dogs. These variations have been thought to be due to the effect of nutrition, age, sex, breed, climate and sub clinical diseases.

Materials and Methods

Geriatric dogs that were presented to SVVU Super Speciality Veterinary Hospital, Visakhapatnam, with a history of going down in condition with generalised weakness, poor physical activity, chronic anorexia and fluid accumulation at various parts of the body and signs of respiratory distress, abnormal mucosa, lameness, edema of dependent parts, polyuria, polydypsia/oliguria, difficulty in sitting down and getting up, during the period from January 2016 to May 2019, were included in the present study. These cases were initially subjected for detailed history and physical examination. Blood was collected from cephalic or saphenous vein with the help of sterile disposable syringe and transferred into EDTA coated vials for whole blood. Complete blood analysis was carried out by hematology analyser supplied by M/S Horiba India Private Limited. The data were subjected to statistical analysis using standard statistical formulae as described by Snedecor and Cochran (1984) [5].

Results and discussion

The common clinical manifestations of sick geriatric dogs were anorexia, vomiting, diarrhoea, weight loss, obesity, lameness, greying of coat, loss of teeth, loss of vision, incoordination, weakness, lethargy, ascites, pedal edema, pale mucosa, icteric mucosa, exercise intolerance, dyspnoea, cough, insomnolense, oliguria, polyuria, hematuria, urinary incontinence, dehydration and mass/tumor. The mean and standard error of total erythrocyte count, haemoglobin and PCV of geriatric patients were $4.04 \pm 0.03 \times 10^6/\mu\text{m}^3$ and $7.21 \pm 0.07 \text{g/dl}$

and $23.12 \pm 0.08\%$ respectively, that were significantly lower ($P < 0.05$) when compared to apparently healthy adult dogs ($6.55 \pm 0.54 \times 10^6/\mu\text{m}^3$, $14.05 \pm 0.38\text{g/dl}$ and 44.50 ± 2.32) which indicates the geriatric dogs were anemic. Possible reason for anemia in geriatric dogs include dehydration, increased incidence of chronic renal failure, chronic hepatitis, neoplasia, and endocrinopathies (Metzger and Rebar, 2012) [6], impaired erythropoietin release, shortened erythrocyte survival time, and functional iron deficiency due to the effects of hepcidin (Maccio and Madeddu, 2012) [7], decreased capacity of bone marrow to produce RBC, splenomegaly, copper and zinc deficiency in old dogs, chronic kidney disease resulting in decreased erythropoietin production (Pati *et al.*, 2015 [8] and Lawrence *et al.*, 2013 [9]), iron deficiency, iron-restricted erythropoiesis, low grade chronic inflammation, blood loss due to gastrointestinal bleeding (Radakovich *et al.*, 2017) [10].

In the present study there was significant increase ($P < 0.05$) in the mean \pm SE values of total leukocyte count ($13.40 \pm 0.11 \times 10^3/\mu\text{m}^3$) and neutrophils ($84.55 \pm 0.15\%$) was noticed among sick geriatric dogs which indicates the geriatric dogs were leukocytic and neutrophilic compared to apparently healthy dogs ($74.10 \pm 0.58 \times 10^3/\mu\text{m}^3$ and $9.24 \pm 1.01 \times 10^6/\mu\text{m}^3$) with a significant decrease in the lymphocytes ($13.23 \pm 0.07\%$) when compared to apparently healthy dogs ($22.10 \pm 0.31\%$). Possible reason is due to inflammatory processes associated with underlying conditions like diabetes mellitus, hyperadrenocorticism, and neoplasia (Metzger and Rebar,

2012) [6] and due to secondary systemic infection (Pati *et al.*, 2015) [8]. In the present study there was significant reduction in the mean \pm SE values of lymphocytes which indicates the geriatric dogs were lymphopenic when compared to apparently adult healthy dogs. Possible reason is due to a loss of CD4+T cells with increasing age (Blount *et al.*, 2005) [11] and stress leukogram (Radakowitch *et al.*, 2017) [10].

There was significant decrease in the mean \pm SE values of platelet count ($258.49 \pm 1.99 \times 10^3/\text{mm}^3$) in sick geriatric dogs which indicates the geriatric dogs were thrombocytopenic when compared to apparently healthy dogs ($382.40 \pm 30.72 \times 10^3/\text{mm}^3$). Possible reason is due to neoplasia, severe inflammatory disease, immune mediated marrow disease, immunosuppressive therapy (Metzger and Rebar, 2012) [1] and sequestration of platelets in the spleen, increased peripheral use of platelets, peripheral destruction of platelets, or decreased platelet production (Rebar and Metzger, 2001) [12]. The details are given in table 1.

Conclusion

Routine hematological screening of geriatric dogs improves the identification of risk factors, decision to proceed for further diagnostic tests which helps in early detection of disease allowing early intervention and maintaining quality of life for geriatric patient and owner, and living longer and increasing the mean life-expectancy of the population as a whole.

Table 1: Mean \pm SE of hematological parameters in apparently healthy adult and geriatric dogs

Sl. No	Parameter	Apparently healthy dogs (n=10)	Geriatric dogs (n=538)
1	TEC ($10^6/\mu\text{m}^3$)	6.55 ± 0.54	$4.04 \pm 0.03^*$
2	Hb (g/dl)	14.05 ± 0.38	$7.21 \pm 0.07^*$
3	PCV (%)	44.50 ± 2.32	$23.12 \pm 0.08^*$
4	TLC ($10^3/\mu\text{m}^3$)	9.24 ± 1.01	$13.40 \pm 0.11^*$
5	N (%)	74.10 ± 0.58	$84.55 \pm 0.15^*$
6	L (%)	22.10 ± 0.31	$13.23 \pm 0.07^*$
7	E (%)	1.70 ± 0.36	$1.09 \pm 0.04^*$
8	M (%)	2.00 ± 0.36	1.75 ± 0.02
9	Platelets ($10^3/\text{mm}^3$)	382.40 ± 30.72	$258.49 \pm 1.99^*$

* Significant at ($P < 0.05$)

** Significant at ($P < 0.01$)

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