# STUDIES ON HAEMATOLOGICAL TRAITS IN DIFFERENT BREEDS OF DOG

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**ABSTRACT :** The present study was conducted on dog during the period of June-September, 2009 at the Department of Animal Genetics and Breeding of West Bengal University of Animal and Fishery Sciences , Belgachia, Kolkata , West Bengal, India. This study comprised of a total of 58 dogs belonging to the 7 different breeds namely Spitz : 21, German shepherd : 6, Labrador : 9, Mongrel : 8, Golden Retriever : 5, Dalmatian : 4, Cockerspaniel : 5. The overall mean value of haemoglobin concentration( g/dl) , erythrocyte diameter( $\mu$) and SARBC ($\mu2$) were estimated as $14.586 \pm 0.103$, $7.086 \pm 0.256$ and $39.453 \pm 0.296$. The mean HbC in g/dl was observed to be the highest in the Dalmatian breed ($15.40 \pm 0.14$). The lowest value for haemoglobin concentration was found to be in German Shepherd breed ($13.70 \pm 0.12$). The mean erythrocyte diameter was observed to be highest in the Golden Retriever breed ($7.19 \pm 0.03$) and the lowest was in German Shepherd breed ( $6.99 \pm 0.03$). The mean erythrocytic area (SARBC ) in $\mu2$ was found to be highest in Golden Retriever breed of dog whereas the lowest mean erythrocytic area was in cockerspaniel breed of dog. The respective estimates were accounted for $40.645 \pm 0.336$ and $38.129 \pm 0.336$ $\mu2$. The present study indicated highly significant ($P<0.01$) differences between breeds for three haematological traits. It was observed that Haemoglobin concentration has highly significant association with erythrocyte diameter and Erythrocyte surface area. The estimated values were 0.344 and 0.347, respectively. It was also observed that erythrocyte diameter and SARBC had cent percent association.

**Key Words :** Dog,Haematological traits, Haemoglobin , Erythrocyte diameter, Erythrocyte surface area,

### INTRODUCTION :

Haemoglobin is a complex metalloprotein, iron containing pigment of erythrocytes. It plays an important role in oxygen transport. Hb represents approximately 95% of the blood protein content of erythrocyte and 35% of their masses (Qystein et al., 2003). The hemoglobin molecule is an assembly of four globular protein subunits. It has a molecular weight of 68,000 daltons. Haemoglobin concentration in the blood, in health, is directly proportional to the property of the animal for sustained muscular activity or ability to meet demands for sudden burst of speed. The study of haemoglobin concentration and erythrocyte surface area is interested from the stand point of the respiratory or gas transport function of the blood. Keeping in view the above aspects, the present study was conducted on haematological traits in different breeds of dog.

### MATERIALS AND METHODS:

The present study was conducted at West Bengal University of Animal and Fishery Sciences, Belgachia, Kolkata-37, West Bengal, India. A total

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of 58 dogs belonging to 7 different breeds of the adjacent area of West Bengal University of animal and fishery sciences campus, Belgachia, Kolkata was used for the present investigation. The different number of dogs used for this research purpose was Spitz : 21, German Shepherd : 6, Labrador : 9, Mongrel : 8, Golden Retriever : 5, Dalmatian : 4 and Cocker Spaniel : 5. The different haematological traits namely Haemoglobin concentration, Erythrocyte diameter and Erythrocyte surface area of dog 's RBC was considered for this present investigation. The Haemoglobin concentration(gm/dl) of the collected blood samples were estimated by Sahli's method.Erythrocyte dimention: Four thin smears were made from the collected blood sample of each animal in clean grease free slides. The slides were then air dried and fixed with methyl alcohol for 3 minutes. The blood samples were stored at 40c and utilized the same day. The blood smears were used for measuring the following erythrocytic dimensions($\mu$m) . i). Erythrocyte diameter ii). Erythrocyte surface area (SARBC). SARBC was measured using RBC diameter according to the method described by Misra and Mukherjee (1980).

The estimated data on different Haematological traits namely Haemoglobin concentration, Erythrocyte dimention and Erythrocyte surface area were subjected to statistical analysis. The data were analysed with the help of computer system available at this farm Complex of West Bengal University of Animal and Fishery Sciences. All statistical analysis were done by using the SPSS package available at this University. The effect of different breeds of dog on different Haematological traits were analyzed by Least Square Analysis of Variance Technique. The mean and standard error of the different economic traits under the study were calculated and all tests for significance were done by following standard methods described by Snedecor and Cochran (1994). In order to the effect of breeds on different Haematological traits, the following linear model was applied:

$$Y_{ij} = u + B_i + e_{ij}$$

Where,

$Y_{ij}$ = data pertaining to jth individual in the ith type Breed.
$\mu$ = Over all mean
$B_i$ = Effect of ith type Breed.
$e_{ij}$ = Random error associated with all observations distributed with NID(0, ?e2).

To find out the association among the different Haematological traits namely Haemoglobin concentration, Erythrocyte dimention and Erythrocyte surface area , data were subjected to Pearson Correlation as described by Snedecor and Cochran (1994). The correlation was adjudged for significance by using table A.10 value Snedecor and Cochran (1994).

### RESULTS AND DISCUSSION :
### HAEMOGLOBIN CONCENTRATION : (gm/dl)

The mean HbC in g/dl was observed to be the highest in the Dalmatian breed (15.40 ± 0.14). The lowest value for haemoglobin concentration was found to be in German Shepherd breed (13.70 ± 0.12). The haemoglobin concentration in the analyzed breeds in ascending order were observed as German Shepherd (13.70 ± 0.12), Spitz (14.12 ± 0.06), Labrador (14.50 ± 0.09), Mongrel (14.53 ±0.11), Cockerspaniel (14.63 ± 0.13), Golden Retriever (15.23 ± 0.13) and Dalmatian were (15.40 ± 0.14), respectively. It is observed that there is no significant difference between Dalmatian and Golden Retriever in respect to Haemoglobin concentration. To estimate the effect of breed on erythrocytic diameter the analysis of variance ( ANOVA ) was conducted. The present study indicated highly significant (P<0.01) differences between breeds for haemoglobin concentration. The mean haemoglobin concentration of dogs found to be similar with Bhattacharya (2005).

Table No. 1: Mean along with standard error of different traits of investigated different breeds.

| BREED | Haemoglobin concentration (gm/dl) | Erythrocyte diameter (µm) | SARBC (µ²) |
|---|---|---|---|
| Spitz | 14.114±0.062[d] | 7.073±0.015[cd] | 39.307±0.163[cd] |
| Labrador | 14.495±0.093[c] | 7.168±0.022[ab] | 40.357±0.247[ab] |
| German Shepherd | 13.700±0.121[d] | 6.988±0.029[de] | 38.367±0.319[de] |
| Mongrel | 14.533±0.114[b] | 7.044±0.027[be] | 38.981±0.301[be] |
| Cocker spaniel | 14.633±0.127[be] | 6.965±0.031[e] | 38.129±0.336[e] |
| Dalmatian | 15.400±0.139[a] | 7.173a±0.033[ab] | 40.386±0.368[ab] |
| Golden Retriever | 15.233±0.127[a] | 7.193±0.031[a] | 40.645±0.336[a] |
| Overall | 14.586 ± 0.103 | 7.086 ± 0.256 | 39.453 ± 0.296 |
| Significant | ** P<0.01 | ** P<0.01 | ** P<0.01 |

Different super scripts differ significantly at ** P<0.01 according to Duncan's Multiple Range Test.

**ERYTHROCYTE DIAMETER (µm).:-**

The mean RBC diameter in µm was analyzed and observed to be highest in the Golden Retriever breed (7.19 ± 0.03). The lowest was observed in German Shepherd breed and the estimated value was 6.99 ± 0.03. The erythrocytic diameter of the analyzed breeds in ascending order was observed as German Shepherd breed (6.99 ± 0.03), Cocker spaniel (6.97 ± 0.03), Mongrel (7.04 ± 0.03), Spitz (7.073 ± 0.015), Labrador (7.168 ± 0.022), Dalmatian (7.173 ± 0.033), Golden Retriever were (7.193 ± 0.031), respectively. It was observed that no significant difference between Golden Retriever, Dalmatian and labrador was found in respect to erythrocyte diameter. To estimate the effect of breed on erythrocytic diameter the analysis of variance ( ANOVA ) was conducted . Highly significant (P<0.01) differences between breeds for erythrocyte diameter were found. The mean RBC diameter found in the present work for dogs are similar to the findings of Rebar et al. (2001), Bernard and Schalm ( 2000 ) and Jain (1993) .

**ERYTHROCYTE SURFACE AREA (SARBC) (µ2)**

The mean erythrocytic area (SARBC ) in µ2 was analyzed in different breeds and was found to be highest in Golden Retriever breed (40.645 ± 0.336) of dog. The lowest mean erythrocytic area was observed in cocker spaniel breed (38.129 ± 0.336) of dog. The mean SARBC were 40.386 ± 0.386, 40.357±0.247, 38.981±0.301, 38.367±0.319, 39.307 ± 0.163 for Dalmatian, Labrador, Mongrel, German Shepherd and Spitz, respectively. It is observed that there is no significant difference between breeds Labrador and Dalmatian in respect to erythrocyte surface area. To estimate the effect of breed on erythrocytic diameter the analysis of

variance ( ANOVA ) was conducted . Highly significant (P<0.01) differences between breeds for SARBC were found. No information on erythrocyte surface area of dog is available in published scientific research articles.

**ASSOCIATION OF ERYTHROCYTE DIMENSION WITH HAEMOGLOBIN CONCENT OF BLOOD.**

To find out the association among the investigated haematological traits the Pearsons correlation was done. It was observed that Haemoglobin concentration has highly significant association with erythrocyte diameter and Erythrocyte surface area. The estimated values were 0.344 and 0.347, respectively. This indicates that an individual with larger diameter will have more haemoglobin concentration in blood. It is known that the distribution of Haemoglobin in a greater number result in an increase in the surface area of the erythrocytic mass thereby enhancing the exchange of gases (Bernard 2000). It was also observed that erythrocyte diameter and SARBC had cent percent association. Information regarding relationship of erythrocyte dimension with Haemoglobin content of blood is not available in the published scientific literature.

**CONCLUSION :** It is suggested that more extensive study based on a large number of observations be taken up in future on this trait to draw a definite conclusion and its implication in terms of genetic improvement in performance of dogs.

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**Table No. 2 : Association of different  Haematological traits.**

| TRAITS | Estimated value |
|---|---|
| Haemoglobin Concentration  and Erythrocyte Diameter | 0.344** |
| Haemoglobin Concentration  and SARBC | 0.347** |
| Erythrocyte Diameter and  SARBC | 1.000** |

**\* P<0.005    \*\* P<0.001**