

Blood Platelet Indices and Parallel Red Cell Parameters in the Arabian Mountain Gazelle (*Gazella gazella*)

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Abstract: Total Platelet count (PLT), Mean Platelet Volume (MPV), Plateletcrit (PCT) and Platelet Distribution Width (PDW) were determined, along with hematological parameters, in blood samples from 8 captive mountain gazelles (*Gazella gazella*). The mean values of PLT, PCT, MPV and PDW were: $288.75 \pm 168.8 (\times 10^3 \mu\text{L}^{-1})$, $0.20 \pm 0.13\%$, 7.24 ± 0.84 (fl) and $34.84 \pm 2.36\%$, respectively. The corresponding values for parallel red cell variables were $13.48 \pm 1.17 (10^{12} \text{L}^{-1})$ for Red Blood Cell count (RBC), 52.70 ± 5.45 (fl) for Hematocrit (HCT), 39.00 ± 1.07 for Mean Corpuscular Volume (MCV) and $19.86 \pm 0.32\%$ for Red cell Distribution Width (RDW). Correlation analysis revealed highly significant correlations for PCT with PLT ($p < 0.0001$), PCT with HCT ($p < 0.001$) and PDW with MCV ($p < 0.001$). This study is the first record of platelet counts and platelet indices in mountain gazelles.

Key words: Mountain gazelle, platelet indices, platelet count, Mean Platelet Volume (MPV), Plateletcrit (PCT), Platelet Dimension Width (PDW), red cell variables

INTRODUCTION

Hematological reference values have been reported for different species of the genus *Gazella* including Grant's gazelle, *Gazella granti* (Drevemo *et al.*, 1974; Seal and Schobert, 1976; Sleeman and Widdowson, 1993), Dorcas gazelle, *Gazella dorcas* (Bush *et al.*, 1981; Pienado *et al.*, 1990), cuvieri gazelle, *Gazella cuvieri* (Casado *et al.*, 1991; Abaigar, 1993), dama gazelle, *Gazella dama* (Casado *et al.*, 1991; Abaigar, 1993), mountain gazelle, *Gazella gazella* (Rietkerk *et al.*, 1994), Thomson's gazelle *Gazella thomsonii* (Slessman and Widdowson, 1993), goitered gazelle *Gazella subgutturosa* (Yaralioglu *et al.*, 2008) and Speke's gazelle, *Gazella spekei* (Travis and Eby, 2006).

However, very sparse information is found on platelet counts in gazelles (Yaralioglu *et al.*, 2008; Travis and Eby, 2006), while no information exists on platelet indices in any of these species, nor indeed in any wild ungulate. Several platelet indices are known including Mean Platelet Volume (MPV), Plateletcrit (PCT), Platelet Distribution Width (PDW), Mean Platelet Component (MPC) and Platelet-Large Cell Ratio (P-LCR). The physiological, diagnostic and prognostic relevance of these relatively

new indices is becoming increasingly recognized in human (Wiwanitkit, 2004; Kaito *et al.*, 2005) and veterinary (Segura *et al.*, 2007; Yilmaz *et al.*, 2008) medicine. Hence, they are being determined as part of routine blood counts in many laboratories (Harold *et al.*, 2008). The most important of these indices are the MPV, PCT and PDW (Wiwanitkit, 2004), which serve as markers of platelet size, function and reactivity and can therefore, be useful additional measurements in the diagnosis, differentiation and follow up of platelet-related disorders in man and animals (Bath and Butterworth, 1996; Amin *et al.*, 2004; Kim *et al.*, 2007; Harold *et al.*, 2008; Nalbant *et al.*, 2008). The following study was undertaken to provide preliminary information on the normal Platelet counts (PLT), MPV, PCT and PDW in captive mountain gazelles. Correlations between these indices and corresponding hematological variables are also provided.

MATERIALS AND METHODS

Eight adult, Arabian mountain gazelles (*Gazella gazella*) aged 3-5 years and weighing 18-20 kg were investigated. The animals comprised 5 non-pregnant females and 3 males, born and kept in captivity at King

Khalid Wildlife Research Center near Riyadh, Saudi Arabia. They were fed on a ration of dried lucerne and commercial concentrate (crude protein 16%), with free access to water, routinely vaccinated against infectious diseases and given coccidiostats and anthelmintic drenches as necessary. All the gazelles were clinically normal at the time of sampling. About 10 mL blood samples were collected from each gazelle by jugular venipuncture into clean vacutainer tubes (Becton, Dickinson and Co., USA) containing EDTA-K₂, while the animal was manually restrained. Each tube was inverted 2-3 times to ensure thorough mixing and analyzed within 2 h in the laboratory using an automated hematology analyzer (VetScan HM2; Abaxis Veterinary Diagnostics). Each sample was analyzed for PLT, PCT, MPV and PDW, as well as RBC, Hematocrit (HCT), Hemoglobin (Hb), Mean Corpuscular Volume (MCV), Mean Corpuscular Hemoglobin (MCH) and Mean Corpuscular Hemoglobin Concentration (MCHC).

The data were statistically analyzed using SAS 8.1 program for Windows. The Shapiro-Wilk normality test was used to check all parameters and most of the parameters were distributed normality. Therefore, Pearson correlations were used in the analysis of correlations between PLT, PCT, MPV and PDW and parallel red cell indices, namely RBC, HCT, MCV and RDW (Schork and Remington, 2000).

RESULTS AND DISCUSSION

Means, standard deviations, variance and 95% ranges of expected values for the platelet and red cell parameters are presented in Table 1. There were no obvious discrepancies between these parameters in male and female gazelles and the data for both sexes are therefore combined. None of the platelet variables was previously known in the mountain gazelle and with the exception of the Platelets number (PLT), none of these variables was reported in other species of gazelle. The mean PLT in the mountain gazelle was $\sim 290 (\times 10^3 \mu\text{L}^{-1})$, which compares well to that reported in goitered (Yaralioglu *et al.*, 2008) and Speke's gazelles (Travis and Eby, 2006) as well as humans (Kim *et al.*, 1986) but is lower than that reported in cattle, sheep and goats and higher than that in equines (Jain, 1993). In common with these various species, however, the PLT of the mountain gazelle exhibited a wide range of variation ($117-601 \times 10^3 \mu\text{L}^{-1}$). The MPV also appears to vary with species. While, the mean value presently recorded in the mountain gazelle ($7.2 \pm 0.83 \text{fl}$) was lower than that recorded in humans (Wiwanitkit, 2004), it exceeded that reported in cattle,

sheep, goats and equines (Watson and Authi, 1996) as well as camels (unpublished data). On the other hand, the PCT in the mountain gazelle averaged 0.2%, which is higher than that reported in sheep (Abdelhamid *et al.*, 2007) but less than half of that reported in cattle (Yilmaz and Yesilbag, 2008) and only slightly lower than humans (Tohgi *et al.*, 1991). By contrast, the PDW in the mountain gazelle, averaging $\sim 35\%$, was twice as high as that reported in bovines (Yilmaz and Yesilbag, 2008). The corresponding mean value of PDW in normal adult humans was variably given as $15.66 \pm 0.52\%$ by Kim *et al.* (1986) and $46.79 \pm 2.7\%$ by Wiwanitkit (2004).

The mean Hb, MCV, MCH and MCHC values in the mountain gazelles were comparable to while, the mean RBC and HCT values were higher than, those previously reported in this species (Rietkerk *et al.*, 1994). The present values also fell within the normal ranges for Dorcas, Grant's and Thomson's gazelles reviewed by Bush *et al.* (1981). Mean Hb, PCV, MCH and MCHC values in the mountain gazelles were also comparable with those reported in goitered gazelles (Yaralioglu *et al.*, 2008), while RBC was lower and MCV higher in the latter species compared to the mountain gazelle. The RDW is a measure of variability of red blood cell size and its value may change in various clinical conditions associated with abnormalities in red cell production. As shown in Table 1, normal RDW in mountain gazelles averaged $\sim 20\%$ (19.4-20.5%). This value is somewhat higher than that reported in humans (Wiwanitkit, 2004) cattle (Yilmaz *et al.*, 2008), sheep (Abdelhamid *et al.*, 2007) and equines (Thrall *et al.*, 2004).

Correlations between PLT, MPV, PCT and PWD and between these indices and their parallel red cell parameters in the mountain gazelles are presented in Table 2 and 3, respectively. Significant correlations were recorded for PCT with PLT ($p < 0.0001$), PCT with MCV ($p < 0.005$) and PLT with MCV ($p < 0.005$), while no significant correlations were found between PCT and HCT and between MPV and MCV. These findings agree with those reported in humans (Wiwanitkit, 2004).

The latter author suggested that the absence of significant correlations between PCT and HCT and between MPV and MCV indicated that the sizes of red blood cells and blood platelets were independent of each other. On the other hand, in contrast to humans (Wiwanitkit, 2004) there was no significant correlation between PWD and RWD in the mountain gazelles. Also, no significant correlation between PLT and RBC was found in the present animals, suggesting that the numbers of red cells and platelets may also be independent of each other.

Table 1: Descriptive statistics of platelet indices and hematological parameters in mountain Gazelle

Parameters	Mean	SD	Min.	Max.	CV	Expected value (95% CL)
Platelet parameters						
PLT ($\times 10^3 \mu\text{L}^{-1}$)	288.75	168.80	117.00	601.00	58.47	147.59-429.80
PCT (%)	0.20	0.13	0.06	0.44	66.71	0.09-0.31.00
MPV (fl)	7.24	0.84	6.00	8.50	11.61	6.54-7.94.00
PDW (%)	34.84	2.36	31.20	36.90	6.79	32.86-36.8100
Red blood cell parameters						
RBC ($\times 10^{12} \text{L}^{-1}$)	13.48	1.17	11.89	15.04	8.65	12.50-14.4500
Hb (g dL^{-1})	17.59	1.48	15.80	19.80	3.47	16.34-18.2100
HCT (%)	52.70	5.45	46.22	57.53	10.34	48.14-54.2500
MCV (fl)	39.00	1.07	38.00	41.00	2.74	38.11-39.8900
MCH (pg)	13.36	0.36	12.90	14.00	2.71	13.06-13.6700
MCHC (%)	34.21	0.75	32.80	35.50	2.20	33.58-34.8400
RDW (%)	19.86	0.32	19.40	20.50	1.59	19.60-20.1300

Table 2: Correlation coefficients between platelet indices in mountain Gazelles

Parameters	PLT ($\times 10^3 \mu\text{L}^{-1}$)	PCT (%)	MPV	PDW (%)
PLT ($\times 10^3 \mu\text{L}^{-1}$)	1	0.98***	-0.13	0.53
PCT (%)	0.98***	1	-0.13	0.59
MPV (fl)	-0.13	-0.13	1	0.63
PDW (%)	0.53	0.59	0.63	1

***p<0.0001

Table 3: Correlation coefficients between platelet indices and parallel red blood cell indices in mountain Gazelles

Parameters	PCT (%)	MPV (fl)	PDW (%)	PLT ($\times 10^3 \text{L}^{-1}$)
RBC ($\times 10^9$)	0.09	0.06	0.06	0.01
HCT (%)	0.33	0.03	0.20	0.24
MCV (fl)	0.89**	-0.13	0.51	0.86**
RDW (%)	-0.25	-0.31	-0.45	-0.25

**p<0.005

The present study provides hitherto unknown data on the platelet indices in mountain gazelles. Further studies should be undertaken to investigate these variables in more detail, including their clinical significance in gazelles.

CONCLUSION

The number of platelets in the Arabian mountain gazelle (*Gazella gazella*) ranges between 147.6-430 $\times 10^3 \mu\text{L}^{-1}$ (mean 288.75 \pm 168.8 $\times 10^3 \mu\text{L}^{-1}$). Other platelet index values range between 0.09-0.31% for PCT, 6.54-7.94 fL for MPV and 32.86-36.81% for PDW, with corresponding mean values of 0.2 \pm 0.13%, 7.24 \pm 0.84 fl and 34.84 \pm 2.36%, respectively. A significant correlation exists between PCT and platelet number, PCT and MCV and MPV and PDW. The results of this study provide baseline information for studies dealing with the physiological and clinical significance of platelet parameters in the mountain gazelle.

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