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Scientific Article

Hematological and serum biochemistry profiles of collared peccaries (*Pecari tajacu* Linnaeus, 1758) from the semi-arid brazilian northeast

Perfil hematológico e bioquímica sérica de catetos (*Pecari tajacu* Linnaeus, 1758) no semiárido do nordeste brasileiro

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ABSTRACT - Hematological and biochemical analyses are paramount in assessing the health of different populations and their habitats, and knowledge on the specific values of each species is necessary, due to influence of several factors. In this context, this study aimed to determine the hematological and biochemical parameters of collared peccaries raised in captivity in the semi-arid Brazilian northeast associated to morphometric blood cell analyses. A total of 30 adult animals were investigated, divided into two groups (15 females and 15 males), averaging 20 kg and between 2 and 2.5 years old. Blood and serum samples were collected in the morning for hematological, serum biochemistry and cellular morphometry analyses. Data normality was determined by the Shapiro-Wilk test, and homoscedasticity, by Levene's test. Concerning statistical differences between sexes, parametric data were analyzed by the t test for independent measurements and non-parametric data, by the Mann-Whitney test. Sex did not influence most of the studied variables, except for calcium, total proteins and urea and relative eosinophil counts. The environment and containment manner can influence collared peccary hematological and biochemical parameters, and blood cell morphometry and morphology data are similar to those of domestic cattle and carnivores.

Keywords: Erythrogram. Hematology. Hematimetric indices. Wild animals.

RESUMO - Análises hematológicas e bioquímicas possuem grande importância na avaliação da saúde das populações e de seus habitats e, por estarem sujeitas a influências de diversos fatores, tornam-se necessários conhecer os valores próprios de cada espécie. Neste estudo objetivou-se determinar os parâmetros hematológicos e bioquímicos, assim como a análise morfométrica das células sanguíneas de catetos criados em cativeiro no semiárido do nordeste brasileiro. Utilizou-se 30 animais adultos divididos em 2 grupos (15 fêmeas e 15 machos), com peso médio de 20kg e idade entre 2 e 2.5 anos. Foram coletadas amostras de sangue e soro, no período da manhã, para realizar as análises hematológicas, bioquímica sérica e morfometria celular. Os dados foram analisados estatisticamente quanto à normalidade, pelo teste de Shapiro-Wilk, e homocedasticidade, por Levene. Quando a diferença estatística entre sexos os dados foram paramétricos, utilizando o teste t para medidas independentes e Mann-Whitney quando não paramétricos. Os resultados mostraram que o sexo não possui influência na maioria das variáveis estudadas, excetuando as análises bioquímicas cálcio, proteínas totais e ureia e a contagem relativa dos eosinófilos. Notou-se que o ambiente e o modo de contenção podem influenciar os parâmetros hematológicos e bioquímicos e que a morfometria e a morfologia das células sanguinas do cateto tem semelhança com as de bovinos e carnívoros domésticos.

Palavras-chave: Eritrograma. Hematologia. Índices hematimétricos. Animais Silvestres.

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INTRODUCTION

Hematological and serum biochemistry assessments, in addition to being useful in disease diagnoses, are paramount in evaluating physiological states, allowing for the monitoring of hematopoietic tissue responses, nutritional status, stress conditions, parasite exposure, trauma and habitat quality, of both wildlife and captive animals (CROOKS et al., 2000; GUERCI, 1985; LOCHMILLER; GRANT, 1984; SEAL; MECH; VAN BALLENBERGUE,1975). The determination of hematological patterns in wild animals is crucial for the establishment of normal values, and essential in interpreting changes observed following procedures under different clinical contexts (MADELLA et al., 2006).

Studies describing the hematology and biochemistry of collared peccaries maintained in zoos were first published in the 1970s in North America (WALLACH; RUSSELL; HERMAN, 1971; SCHALM; JAIN; CARROL, 1975). In 1984 and 1985, more detailed studies were carried out on the hematology of these animals, also assessing serum biochemistry values and factors associated to behavioral aspects, chemical or physical containment methods, as well as their influence on hematological physiology (LOCHMILLER; GRANT, 1984; LOCHMILLER; VARNER; GRANT, 1985).

Some studies have been carried out to determine the hematological values of captive peccaries, such as in the municipality of Ilhéus in southern Bahia, Brazil (ALMEIDA et al., 2011), and in the eastern Amazon, encompassing hematological indices and biochemical profiles in relation to sex and age (JORGE

et al., 2015). However, no data regarding the hematology of these animals in the semi-arid Brazilian Northeast, a low rainfall and high temperature area, are available. In this region, collared peccaries have adapted both *in situ* and *ex situ*, making it interesting to investigate these parameters with the aim of establishing more precise average hematological and biochemical values for this species.

As appropriate hematological analyses require the use of reference values adjusted to geographic conditions, management, breed, nutrition and even laboratory specifications (GONZÁLEZ et al., 2001), and given the adversities of this biome, this study aimed to determine hematological and biochemical parameters, as well as the blood cell morphometry of collared peccaries bred in captivity for scientific purposes in the semiarid Brazilian northeast.

MATERIAL AND METHODS

The samples were obtained from the Wild Animal Multiplication Center belonging to the Federal Rural Semi-Árid University of (CEMAS/UFERSA), located in the city of Mossoró, RN and registered at IBAMA as a scientific breeding facility (Registration no. 478912)/ This facility occupies a 20 ha area, geographically located at 5°12'49.4"S and 37°18'36.7"W Gr and 16 m above sea level. The average annual temperature is of about 27.4°C, but can reach 36°C at certain times of the day, with a relative humidity of around 70%. (COSTA SARAIVA; VALE; ZANELLA, 2017).

A total of 30 healthy adult peccaries, averaging 20 kg, aged between 2 and 2.5 years old, were divided into two groups (G1= 15 females and G2= 15 males), housed in different pens measuring 20 m x 25 m and fed commercial pig feed, in addition to tubers, fruits, grains and water *ad libitum*, according to the CEMAS feeding protocol. Samplings and analyses were authorized by SISBIO (31712-1) and the UFERSA ethics committee (CEUA nº 34/2011).

The animals were subjected to solid fasting for 12 hours, and a physical restraint was applied with a handheld net. Samplings were carried out in the morning, at 6 am, to avoid thermal stress. After being restrained, a venipuncture of the cephalic or saphenous vein was performed, and the blood was collected in sterile tubes containing 10% EDTA (5 mL) and containing no anticoagulant (5 mL). The samples were stored in Styrofoam containing ice and taken to the UFERSA Veterinary Hospital Clinical Pathology laboratory.

Four smears were prepared from each animal for the blood cell morphometric analyses, fixed in absolute alcohol and stained by the Leishman method (TOLOSA et al., 2003) and analyzed and photographed under an Olympus BX 51microscope (Olympus Optical Co. Japan) equipped with a DP72 CCD camera. The obtained images were analyzed using the Image J software, where 30 specimens of each cell type were identified and measured for each animal, totaling 900 measurements per cell type.

Hematimetry and global leukometry assessment were performed by Neubauer chamber counting, while hematocrit, hemoglobin concentration and hematimetric indices – mean corpuscular volume (MCV) and mean corpuscular hemoglobin concentration (MCHC) – were obtained according to Carvalho (1999). Differential leukocyte counts were performed using blood smears stained by the rapid Panoptic technique (New-Prov®) and analyzed under a light microscope.

Concerning serum biochemistry, AST (aspartate aminotransferase, ALT (alanine aminotransferase), FAL (alkaline phosphatase), urea and creatinine were analyzed by an optimized kinetic UV method (KATAL Biotecnológica Indústria e Comércio Ltda®), uric acid and triglycerides, by a colorimetric enzymatic method (KATAL Biotecnológica Indústria e Comércio Ltda®), total proteins and albumin, by a colorimetric method (KATAL Biotecnológica Indústria e Comércio Ltda®), plasma glucose, by the glucose oxidase method (KATAL Biotecnológica Indústria e Comércio Ltda®), cholesterol, by the cholesterol oxidase-esterase method (KATAL Biotecnológica Indústria e Comércio Ltda®), all employing a out in specific biochemical apparatus (BIOPLUS 2000®). Potassium, phosphorus and ionized calcium were also evaluated, employing the selective ion method (Iselab Drake®).

The data were statistically analyzed and expressed as means ± standard deviations as well as minimum, maximum and coefficient of variation (CV%) values and evaluated using the Sigma Plot for Windows (Sigma Plot; Systat Software Inc®) version 12.0 statistical program. Data normalisty was first assessed by the Shapiro-Wilk test, and homoscedasticity, by Levene's test. Concerning statistical differences between sexes, parametric data were analyzed by the t test for independent measurements and non-parametric data, by the Mann-Whitney test. $p<0.05$ were considered significant.

RESULTS AND DISCUSSION

Blood samplings were carried out uniformly in the early hours of the morning, reducing thermal stress effects, as the stress caused by physical restraining alongside thermal stress caused by high environmental temperatures result in a pathological clinical condition in these animals compatible with stress syndrome. This is characterized by increased heart and respiratory rates and rectal temperatures, in addition to myopathy and physicochemical meat changes (BATISTA et al., 2009).

Collared peccary hematological parameters are depicted in Table 1. The mean values were correlated between male and females, although significant differences between sexes were not verified. However, when values are analyzed separately, females exhibited mostly higher values compared to males, except for red blood cells and hemoglobin values.

Hematimetry data (erythrocytes/mm3 and hematocrit and hemoglobin concentrations) of collared peccaries bred in the Brazilian semi-arid region were similar to those described for the same species reared in intensive and semi-intensive systems in southern Bahia (ALMEIDA et al., 2011), and dissimilar from captive peccaries bred in Paraguay (PALACIOS et al., 2020), explained by the use of sedatives in that study to capture the animals. Statistically significant differences between male and female peccaries were, on the other hand, noted in animals bred in Texas (LOCHMILLER; VARNER; GRANT, 1985). Furthermore, the findings of the study carried out in Texas were lower than those determined herein, which may be associated with the use of ketamine during chemical restraint.

Table 1. Average hematological values, defined for collared peccaries (*Pecari tajacu*), bred in captivity, according to sex.

Variables	Groups	Means ± DP	Min.	Max.	CV%	p value
Red cells (x10^6/µL)	G1	9.39 ± 1.19	7.00	11.0	12.67	0.533
	G2	9.14 ± 0.90	7.50	10.9	9.86	
Hematocrit (%)	G1	54.07 ± 3.49	48.0	60.0	6.46	0.586
	G2	54.80 ± 3.78	44.0	59.0	6.90	
Hemoglobin (g/dL)	G1	17.25 ± 1.19	15.0	19.0	6.90	0.975
	G2	17.27 ± 1.39	14.0	20.0	8.03	
MCV (fL)	G1	58.33 ± 7.57	48.0	72.0	12.97	0.547
	G2	59.33 ± 5.30	8.93	70.0	8.93	
MCHC (g/dL)	G1	32.00 ± 0.00	32.0	32.0	0.00	0.351
	G2	32.13 ± 0.52	32.0	34.0	1.61	
Leucocytes (x10^3/µL)	G1	11.99 ± 2.89	7.60	17.40	24.08	0.852
	G2	12.18 ± 2.73	7.00	17.80	22.43	

G1= males; G2= females; SD = Standard Deviation; Min = Minimum; Max = Maximum; CV = coefficient of variation. * indicates statistical difference ($p< 0.05$).

Ketamine can lead to reduced erythrocytes, hemoglobin concentrations, and total leukocyte and lymphocyte counts, attributed to a reversal of the "alarm reaction", *i.e.* causing an opposite effect to that commonly observed in stress situations, which may result in an approximate 8% decrease in the number of circulating erythrocytes (BENNETT et al., 1992; KIM et al., 2005; WEISS; WARDROP, 2010).

Concerning hematimetric indices (MCV and MCHC), which ranged from 58.33 fL to 59.33 fL and from 32 g/dL to 32.13 g/dL for males and females, respectively, especially regarding mean corpuscular volume, the semi-arid climate seems to more markedly influence this variable, as the results for peccaries bred in this region were closer to those described in the study carried out in Texas, for both males (59 fL) and females (61.8 fL) (LOCHMILLER; VARNER; GRANT, 1985), where the climate resembles the semi-arid northeast. The semi-arid region MCHC results were higher when compared to a humid climate, which exhibited an average of 50 fL (ALMEIDA et al., 2011).

Regarding leukocyte counts, four cell types were detected, namely segmented neutrophils, lymphocytes, eosinophils and monocytes (Figure 1). Rods and basophils were not observed. Absolute leukocyte values were not significantly different between males and females for any of the determined cell types (Table 2), although a predominance of segmented neutrophils and lymphocytes and lower frequencies for monocytes and eosinophils were identified. Concerning the relative values of these same cell types, females exhibited a significantly ($P<0.05$) higher number of eosinophils than males, indicating that the sex of the animal directly influences the percentage of this leukocyte cell type (Table 3).

With regard to global leukocyte counts, a mean value of 11.99 leukocytes/µL was verified for males and 12.18 leukocytes/µL for females, with no statistical differences. These results, mainly for males, are lower than those previously reported for peccaries, of 15.7x103 leukocytes/µL for males and 13.50 x103 leukocytes/µL for females (LOCHMILLER; VARNER; GRANT, 1985), significantly different. A lower number of leukocytes, however, is contradictory considering the chemical restraint used by the authors of that study and its depressant leukocyte count effect.

Regarding leukocyte cells a higher number of neutrophils was observed, unlike the results reported for peccaries raised in southern Bahia, Brazil (ALMEIDA et al., 2011) where lymphocytes were cited as the most common type of leukocyte. However, no differences were observed between males and females for any cell type nor higher amounts of lymphocytes in females as described by Lochmiller, Varner and Grant (1985).

The Texas study observed statistical differences between male and female peccary neutrophils and lymphocytes, with higher amounts of neutrophils in males and of lymphocytes in females (LOCHMILLER; VARNER; GRANT, 1985). However, no significant differences were observed concerning eosinophils. Higher eosinophil counts, especially in females, can be attributed to parasitic loads in females, not detected *in situ*, or to allergic processes in these animals, as these cells usually act specifically in these conditions (BASSETTO et al., 2009; SPINELLI et al., 2012).

The determined biochemical variables (Table 4) indicated no inter-sex differences. Total proteins, urea and calcium, however, differed statistically between males and females, with calcium being more variable and only urea higher in males compared to females.

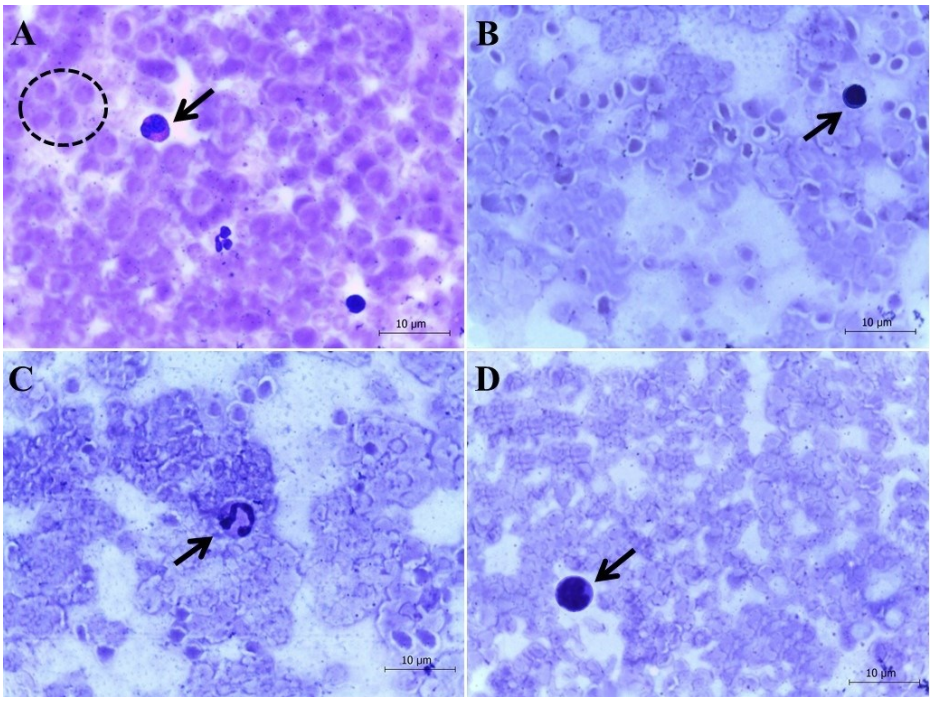

Figure 1. Photomicrograph of a collared peccary (*Pecari tajacu*) blood smear. A: Eosinophil (arrow) and RBCs (circle); B: Lymphocyte (arrow); C: Neutrophil (arrow); D: Monocyte (arrow). Coloring: Fast panoptic.

Table 2. Mean absolute differential leukocyte values (x10^3/mL) in collared peccaries (*Pecari tajacu*) bred in captivity according to sex.

Variables	Groups	Means ± SD	Min.	Max.	CV%	p value
Neutrophiles (x10^3/mL)	G1	7.27 ± 2.07	4.86	10.96	28.45	0.57
	G2	6.87 ± 1.68	3.71	9.22	24.41	
Lymphocytes (x10^3/mL)	G1	3.90 ± 1.28	2.36	6.96	32.76	0.19
	G2	4.69 ± 1.77	2.40	8.37	37.68	
Eosinophiles (x10^3/mL)	G1	0.38 ± 0.23	0.08	0.90	60.40	0.07
	G2	0.54 ± 0.26	0.14	1.27	48.87	
Monocytes (x10^3/mL)	G1	0.45 ± 0.27	0.12	1.22	59.46	0.97
	G2	0.43 ± 0.20	0.10	0.73	47.33	

G1= males; G2= females; SD = Standard Deviation; Min = Minimum; Max = Maximum; CV = coefficient of variation. * Indicates statistical difference ($p < 0.05$).

Table 3. Mean relative differential leukocyte values (%) in collared peccaries (*Pecari tajacu*) bred in captivity according to sex.

Variables	Groups	Means ± SD	Min.	Max.	CV%	p value
Eosinophiles (%)	G1	3.13 ± 1.80	1	7	57.68	0.04*
	G2	4.33 ± 1.83	2	8	42.43	
Lymphocytes (%)	G1	32.6 ± 6.84	22	44	20.99	0.10
	G2	37.2 ± 7.30	24	47	19.62	
Monocytes (%)	G1	3.66 ± 1.63	1	7	44.53	0.60
	G2	3.53 ± 1.42	1	5	41.24	
Neutrophiles (%)	G1	60.53 ± 8.01	47	74	13.24	0.07
	G2	54.93 ± 5.89	47	68	10.73	

G1= males; G2= females; SD = Standard Deviation; Min = Minimum; Max = Maximum; CV = coefficient of variation. * Indicates statistical difference ($p < 0.05$).

Table 4. Mean blood biochemical variables of collared peccaries (*Pecari tajacu*) bred in captivity according to sex.

Variables	Groups	Means ± SD	Min.	Max.	CV%	p value
Urea (mg/dL)	G1	37.67 ± 9.86	20.00	56.00	26.18	0.012*
	G2	29.81 ± 5.62	22.70	40.00	18.87	
Creatinine (mg/dL)	G1	1.32 ± 0.70	0.600	2.400	53.17	0.220
	G2	1.11 ± 0.76	0.300	2.500	68.24	
ALT (UI/L)	G1	43.39 ± 21.21	19.00	94.20	48.89	0.507
	G2	39.35 ± 19.36	20.00	82.00	49.22	
AST (UI/L)	G1	40.52 ± 19.72	20.00	87.20	48.67	0.372
	G2	33.62 ± 12.98	16.00	62.80	36.82	
FAL (UI/dL)	G1	31.53 ± 22.00	10.00	99.00	69.79	0.158
	G2	37.13 ± 15.10	13.00	66.00	40.67	
Albumin (UI/dL)	G1	4.96 ± 0.77	3.300	5.930	15.58	0.667
	G2	5.10 ± 0.95	3.300	7.500	18.66	
Calcium (mmol/L)	G1	1.17 ± 0.10	0.980	1.320	8.56	0.007*
	G2	1.28 ± 0.11	1.000	1.450	8.27	
Potassium (mmol/L)	G1	6.19 ± 1.12	4.800	8.100	18.11	0.422
	G2	5.88 ± 0.98	4.800	8.600	16.64	
Sodium (mmol/L)	G1	149.67 ± 3.42	146.0	156.0	2.28	0.215
	G2	151.07 ± 3.13	147.0	158.0	2.07	
Cholesterol (mg/dL)	G1	86.27 ± 24.44	56.00	156.0	28.33	0.339
	G2	85.40 ± 10.84	62.00	97.00	12.70	
Triglycerides (mg/dL)	G1	70.70 ± 40.64	30.00	189.0	57.46	0.494
	G2	71.40 ± 31.32	20.00	146.0	43.87	
Uric acid (mg/dL)	G1	2.01 ± 0.97	0.500	3.900	48.46	0.221
	G2	1.66 ± 0.96	0.700	4.100	57.75	
Glucose (mg/dL)	G1	64.33 ± 13.17	43.00	97.00	20.48	0.262
	G2	73.87 ± 32.85	23.00	155.0	44.47	
Globulin (g/dL)	G1	2.66 ± 1.01	0.27	3.87	38.17	0.074
	G2	3.35 ± 1.59	0.47	5.87	47.69	
Total proteins (g/dL)	G1	7.62 ± 1.02	5.94	9.14	13.34	0.028*
	G2	8.45 ± 0.93	7.06	9.90	11.00	

G1= males; G2= females; SD = Standard Deviation; Min = Minimum; Max = Maximum; CV = coefficient of variation. * Indicates statistical difference ($p < 0.05$).

ALT and AST results are similar to results reported in other studies conducted in arid climates. For FAL, however, values obtained for peccaries from southern Texas were higher than those observed herein (LOCHMILLER; GRANT, 1984), while lower AST and ALT values have been reported for peccaries from humid climates variables (SCHETTINI et al., 2005). This indicates that climate and potentially dietary habits may influence these variables in peccaries from different regions, as well as low seasonal variations in semi-arid climate regions in relation to other climates, as winter and spring tend to reduce serum variable levels (MORAIS et al., 2000). No statistical differences between males and females for these variables were observed, in contrast with biochemical studies carried out on peccaries from southern Texas. (LOCHMILLER; GRANT, 1984), especially for AST.

Concerning total proteins, values are similar to those described by Lochmiller and Grant (1984), for males, although not for females. In contrast, our research reports significant differences between males and females, with higher means in females compared to males. This also differs from Bahia collared peccary reports, which indicate a significantly higher mean value for males (8.97 g/dL) compared to females (8.20 g/dL) (ALMEIDA et al., 2011). In relation to albumin, our findings as similar to those reported by Almeida et al. (2011) while globulins were different and relatively lower. This may have been influenced by the immune status of the animals, since increased globulins are noted in infectious processes (HERZ; HOD, 1969), although health parameters were verified prior to sampling in the animals analyzed herein.

Urea values considerably higher compared to those observed in peccaries from Texas (LOCHMILLER; GRANT, 1984), with a mean value of 8.94 mg/dL for females and 8.50 mg/dL for males, not statistically different. Concerning creatinine, no major differences were noted between the values reported herein compared to other studies

(LOCHMILLER; GRANT, 1984). In turn, studies with peccary in the Peruvian Amazon (SCHETTINI et al., 2005), indicated higher urea and creatinine means than those reported herein, indicating possible climatic interference regarding these variables, as that study is the only one carried out in an equatorial forest region. A statistical difference was also observed between males and females regarding urea, which was not reported by any other study on collared peccaries. However, dietary needs may vary according to sex, and feeding was conducted in the same way for both males and females. Further studies are required in this regard.

Mean glucose was of 68.55 mg/dL, wlower than in other studies, which usually average over 100 mg/dL (LOCHMILLER; GRANT, 1984; LOCHMILLER; VARNER; GRANT, 1985). Some factors, such as fasting and chemical restraints can alter these values, while physical restraint leads to hyperglycemia in peccaries (BATISTA et al., 2009).

Mean cholesterol levels in males (85.40 mg/dL) and females (86.27 mg/dL) were lower than those reported in other studies, of 96 mg/dL and 113 mg/dL in males (LOCHMILLER; GRANT, 1984). Concerning triglycerides, our findings were higher than those obtained in other assessments (LOCHMILLER; GRANT, 1984), of 54 mg/dL for females and 41 mg/dL for males. On the other hand, a study on serum variables of pregnant collared peccaries observed a considerable drop in triglycerides, reaching 17.6 mg/dL (LOCHMILLER et al., 1984).

Calcium averaged 1,172 mmol/L in males and 1,281 mmol/L in females, similar to those described in other studies (LOCHMILLER et al., 1984; LOCHMILLER; GRANT, 1984), with significantly higher values determined in females, similar to that noted for pigs (JARDIM et al., 1987).

Regarding blood cell morphology, five morphologically distinct cell types were identified, erythrocytes, neutrophils, lymphocytes, eosinophils and monocytes (Table 5). Morphometric red cell measurements differed from those observed in rabbits, of 6.33 µm (POLJIČAK-MILAS et al., 2009), in capybaras, of 8.75 µm (AROUCA et al., 2000), and in hoary foxes (*Lycalopex vetulus*) (SILVA; LIMA; SANCHEZ, 2004), which exhibit erythrocytes measuring, on average, 7.98 µm, while erythrocytes in peccaries averaged 5.77 µm for males and 6.98 µm for females.

Table 5. Morphometric red cell measurements of collared peccaries (*Pecari tajacu*) bred in captivity according to sex.

Variables	Groups	[a]Means ± SD	[a]Min.	[a]Max.	CV%	p value
Erythrocytes	G1	5.77 ± 8.45	4.51	6.94	14.64	0.261
	G2	6.98 ± 2.54	5.40	7.07	8.72	
Eosinophiles	G1	14.22 ± 17.54	10.49	16.76	12.33	0.902
	G2	14.29 ± 12.58	11.14	15.88	8.80	
Lymphocytes	G1	10.31 ± 18.40	7.35	13.06	17.84	0.299
	G2	10.87 ± 17.02	6.83	12.62	15.66	
Monocytes	G1	15.82 ± 16.12	13.52	18.76	10.19	0.367
	G2	15.62 ± 15.95	12.47	17.97	10.21	
Neutrophils	G1	15.42 ± 21.05	12.28	20.59	13.64	0.413
	G2	15.58 ± 18.57	12.44	18.48	11.92	

[a]Average of the largest diameter, expressed as micrometers (µm); G1= males; G2=females; SD = Standard Deviation; Min = Minimum; Max = Maximum; CV = coefficient of variation. *Degree of significance (p≤ 0.05).

As for neutrophils, average diameters were 15.42 µm for males and 15.58 µm for females with no significant difference between sex (p≤ 0.8). These values are higher than those reported for ground rats (Calomys callosus) (SILVA; BOLETTI; FERRO, 2003), agoutis (CONDE JÚNIOR et al., 2012) and other peccaries (ALMEIDA et al., 2011).

Lymphocytes were spherical in shape, with scant and basophilic cytoplasm, a round and central nucleus, loose chromatin and small areas of condensed chromatin, consistent with descriptions for agoutis (CONDE JÚNIOR et al., 2012) and capybaras (VIEIRA et al., 2021), except for intracytoplasmic glycoprotein material inclusions (Kurloff corpuscles), which were not detected in peccaries. Values are also similar to those reported for rabbits (POLJIČAK-MILAS et al., 2009) and hoary foxes (SILVA; LIMA; SANCHEZ, 2004). Averaging 10.34 µm, lymphocytes did not differ significantly between males and females, similar to other studies on the same species(ALMEIDA et al., 2011), but higher than values reported for wood rats (9.67 µm) (SILVA; BOLETTI; FERRO, 2003) and hoary foxes (8.91µm) (SILVA; LIMA; SANCHEZ, 2004), while agouti lymphocytes are reported as considerably larger than peccary lymphocytes, at 13.2 µm (CONDE JÚNIOR et al., 2012).

Peccary eosinophils are spherical, with a cytoplasm full of well-defined and easily visible eosinophilic granules. In capybaras, a superposition of these granules in relation to the nucleus has been reported (AROUCA et al., 2000), as well as in agoutis (CONDE JÚNIOR et al., 2012), which was not observed in peccaries. The nucleus in peccarie, is lobed and presents condensed chromatin, resembling other species, such as agoutis (CONDE JÚNIOR et al., 2012) and rabbits (POLJIČAK-MILAS et al., 2009). Eosinophils were not significantly different when comparing males and females and their general average was 14.36 µm, similar to peccaries and agoutis (ALMEIDA et al., 2011; CONDE JÚNIOR et al., 2012), and higher than large vesper mice (*Calomys callosus*) and hoary foxes (SILVA; BOLETTI; FERRO, 2003; SILVA; LIMA; SANCHEZ, 2004).

Peccary monocytes presented a central and reniform nucleus, abundant and slightly basophilic cytoplasm, similar to rabbits (POLJIČAK-MILAS et al., 2009), hoary foxes (SILVA; LIMA; SANCHEZ, 2004), agoutis (CONDE JÚNIOR et al., 2012), and capybaras (AROUCA et al., 2000). Monocytes were the largest blood cells found in collared peccaries, averaging 15.82 µm for males and 15.62 µm for females, although smaller than in other collared peccary studies, as well as agoutis (ALMEIDA et al., 2011; CONDE JÚNIOR et al., 2012), but larger in large vesper mice and hoary foxes (SILVA; BOLETTI; FERRO, 2003; SILVA; LIMA; SANCHEZ, 2004).

CONCLUSION

The peripheral blood cell pattern of collared peccaries is similar to that described for other mammals, such as cattle and domestic carnivores, with no intersex differences with regard to morphometric patterns. The hematological and biochemical variables analyzed in peccaries raised in the semiarid northeastern region are mostly not influenced by sex, except for calcium, total proteins, urea, and eosinophilic values determined in the differential leukocyte count. These data will support result interpretations concerning diagnoses and prognoses in the clinical-outpatient routines of animals from semi-arid regions.

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