

## Communication

[Comunicação]

### Hematological profile of healthy Pantaneiro horses

[Valores do hemograma em cavalos sadios da raça Pantaneiro]

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Pantaneiro horse is small in size (averaging= 137.7cm), docile, and rustic, having characteristics developed over the course of four centuries of natural selection in the Pantanal region of Mato Grosso, Brazil (Beck, 1985; Santos et al., 1995; Miserani et al., 2002). They are descendents of Andalusian and Lusitano horses of the Iberian peninsula (Cothran et al., 1998). The characteristics of Pantaneiro horses differ from those of other breeds due the need to adapt to the Pantanal environment. During its evolution, the Pantaneiro horse lost its aesthetic beauty and took advantage of zootechnical characteristics targeted for function. It developed a straight and tall frame, similar to that of a mule, conferring a tolerance to immersion in water for prolonged periods. Historically, this breed is used for working (e.g., cattle handling); however, currently, it is also being used for sporting due to notable physical capacity (Beck, 1985; Santos et al., 1995).

There is a vast literature with regard to hematological normal values for horses. Most of these are adult and athletic and whose physical conditioning and nutritional and hygienic management differ from the majority of the equine population, mainly with respect to the Pantaneiro breed (Lumsden et al., 1980; Tyler et al., 1987; Rose and Rodgson, 1994; Noronha et al., 2000; Feldman et al., 2000; Cunha et al., 2008).

Riding long distances, a type of endurance test that submits the animal to exercise of low intensity and long duration, has become a popular form of equestrian activity in the Pantanal region of Mato Grosso, Brazil (Ribeiro et al., 2004). Therefore, the knowledge of reference values for the hematological profile of healthy Pantaneiro breed horses, both males and females, of different ages, has become of extreme importance.

This study included 187 Pantaneiro horses bred in the Pantanal region of Mato Grosso, Brazil. They were clinically healthy and negative for infectious equine anemia after examination. The horses were reared in ranches and farms that furnished satisfactory nutritional and sanitary conditions. Feed management involved the use of native pastures consisting of *Axonopus purpusii*, *Reimarochloa brasiliensis*, *Hymenachne amplexicaulis*, *Setaria geniculata*, and *Pontederia cordata* and cultivated pastures of mainly *Panicum maximum* var. Tanzânia, *Andropogon gayanus kunth*, and *Hyparrhenia rufa* with water *ad libitum*. Those animals were kept in large-area pastures and were periodically submitted to sanitary management (e.g., worming, vaccination, and blood sampled for serological tests for infectious equine anemia) or kept in paddocks close to the center of the property, especially the pregnant mares, foals, stallions, and castrated males that were used in daily work and sport activities.

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### Hematological profile of healthy...

The horses were distributed into six experimental groups as follows: group I - 30 animals, males and females, aged up to eight months; group II - 30 males aged from nine to 24 months; group III - 28 females aged from nine to 24 months; group IV - 36 pregnant females; group V - 33 non-castrated adult males (stallions); group VI - 30 castrated adult males (geldings).

A single 10ml blood sample was collected from the animals after a routine physical examination to confirm their healthy state (Speirs, 1997). They were obtained from the jugular vein, using tubes with EDTA<sup>1</sup>. A differential cell count was performed on slides of blood smears after staining - Diff-Quick® (Feldman et al., 2000).

Erythrocyte and leukocyte counts were carried out using a Neubauer chamber (SPEIRS, 1997). Hemoglobin concentration was determined by the cyanomethemoglobin method, with spectrophotometric readings at 540nm<sup>2</sup>. Packed cell volume was determined by the microhematocrit method. RBC indexes, mean

corpuscular volume (MCV), and mean corpuscular hemoglobin concentration (MCHC) were calculated according to standard formulas (Feldman et al., 2000).

The obtained values were submitted to statistical analysis using the SAS program (User's..., 1985), which determined the means, standard deviations, coefficients of variation, and extreme limits and performed an analysis of variance. Tukey's test was employed at a level of significance of  $P \leq 0.05$  to compare the differences between the means.

Table 1 presents the results of the red blood cell count, packed cell volume, hemoglobin concentration, the RBC indices MCV and MCHC, leukocyte count, numbers of segmented neutrophils, band neutrophils, lymphocytes, eosinophils, monocytes and basophils. Because of the wide variation in the obtained values for eosinophils, monocytes, and basophils, the means and minimum and maximum values are listed in Table 1.

Table 1. Means standard deviations of hematological profile of Pantaneiro breed horses according to experimental group

Parameter	Group	Foals to 8 months	Foals 9 to 24 months	Fillies 9 to 24 months	Pregnant mares	Stallions	Geldings
RBC/ $\mu\text{l}$ ( $\times 10^6$ )		7,82 $\pm$ 1,53b	8,63 $\pm$ 1,37a	8,87 $\pm$ 2,32a	7,09 $\pm$ 2,06bc	7,94 $\pm$ 1,58 ab	6,20 $\pm$ 1,20 c
PCV (%)		35,17 $\pm$ 4,26ab	36,56 $\pm$ 4,04ab	37,00 $\pm$ 2,76a	35,11 $\pm$ 3,94bc	35,93 $\pm$ 4,44 ab	32,03 $\pm$ 4,02 c
Hb (g/dl)		11,50 $\pm$ 1,03b	12,54 $\pm$ 2,80ab	12,66 $\pm$ 1,38a	11,64 $\pm$ 2,20b	12,75 $\pm$ 1,55 a	11,93 $\pm$ 1,17 b
MCV (fl)		42,53 $\pm$ 6,34c	42,07 $\pm$ 6,15c	44,67 $\pm$ 13,12c	55,90 $\pm$ 13,48a	48,31 $\pm$ 10,66 b	52,97 $\pm$ 8,79 ab
MCHC (g/dl)		32,41 $\pm$ 4,87c	34,01 $\pm$ 2,60c	34,64 $\pm$ 1,13b	34,08 $\pm$ 7,90bc	35,15 $\pm$ 3,89 ab	37,66 $\pm$ 4,88 a
WBC / $\mu\text{l}$ ( $\times 10^3$ )		15,54 $\pm$ 4,71ab	14,19 $\pm$ 3,37bc	16,97 $\pm$ 2,80a	11,02 $\pm$ 3,18d	12,15 $\pm$ 4,22 cd	11,37 $\pm$ 3,78 d
Segs / $\mu\text{l}$ ( $\times 10^3$ )		7,25 $\pm$ 2,71a	5,48 $\pm$ 1,89b	7,54 $\pm$ 1,52a	4,89 $\pm$ 1,77b	5,65 $\pm$ 1,86 b	5,18 $\pm$ 1,93 b
Bands / $\mu\text{l}$ ( $\times 10^3$ )		0,24 $\pm$ 0,26a	0,12 $\pm$ 0,17ab	0,09 $\pm$ 0,15bc	0,04 $\pm$ 0,08c	0,14 $\pm$ 0,23 ab	0,10 $\pm$ 0,15 b
Lymphocytes / $\mu\text{l}$ ( $\times 10^3$ )		7,03 $\pm$ 2,60b	7,18 $\pm$ 2,80ab	8,61 $\pm$ 2,04a	5,40 $\pm$ 2,18c	5,69 $\pm$ 2,77 bc	5,19 $\pm$ 2,04 c
Eosinophils / $\mu\text{l}$ *		717(0-2.160)a	323(0-1.311)a	434(0-870)bcd	480(0-1.202)bc	375 (0 - 1.607) cd	602 (0 - 1.603) ab
Monocytes / $\mu\text{l}$ *		284(0-1026)a	261(0-1.311)a	253(0-654)a	235(0-875)a	259 (0 - 689) a	280 (0 - 918) a
Basophils / $\mu\text{l}$ *		11(0-204)a	6(0-176)a	0(0-0)a	8(0-145)a	9 (0 - 175) a	0 (0 - 0) a

Means followed by different letters in the same row indicate statistical at  $P < 0.05$ .

RBC: red blood cell count; WBC: white blood cell count; PCV: packed cell volume; Hb: hemoglobin concentration; MCV: mean corpuscular volume; MCHC: mean corpuscular hemoglobin concentration; Seg: segmented neutrophils; Band: band neutrophils. \* Mean (minimum – maximum).

It was noted that at 25-months-old, values were lower for RBC count and PVC and higher for MCV in castrated horses (group VI) in comparison with the other groups, regardless of gender. Castrated horses (group VI) were employed in daily work and were maintained on the same nutritional regimen as the other groups, which suggests a possible nutritional deficiency and/or higher energy demand in this group of animals.

According to the findings described in the literature for other breeds, the obtained erythrocyte parameters were lower (Lumsden et al., 1980; Noronha et al., 2000). However, the present data are similar to the values described in sequential studies that showed a broad review of the published works, establishing reference values for hematological parameters for English Thoroughbred, Arabian, and Quarter-horse breeds, among others (Mullen and Hopes, 1979; Rose and Rodgson, 1994; Feldman et al., 2000).

The WBC and segmented neutrophils of foals younger than eight-month-old (Group I) showed

higher values than those found in animals older than 25-month-old. WBC diminished as age advanced; however, gender had no influence. Some factors can be postulated as causes of such occurrence, among these, subclinical parasitism. The obtained WBC indexes were higher than those described in the literature for other breeds (Mullen and Hopes, 1979; Lumsden et al., 1980; Rose and Rodgson, 1994; Feldman et al., 2000). However, it should be noted that hematological parameters are influenced by various factors, including the time of sampling, diet, temperament of the horse, and conditioning and physical activities as well (Rose e Rodgson, 1994).

Under the imposed experimental conditions, it was noted that the mean values of the RBC indexes increased with age up to 24 months, and then declined. The values of the WBC indexes decreased as the animals became older. Gender did not influence on the examined parameters.

Keywords: horses, Pantaneiro breed, hematological profile

## RESUMO

*Determinaram-se os valores do hemograma de 187 eqüinos sadios da raça Pantaneira. Para a composição de seis grupos experimentais consideraram-se a faixa etária e o sexo. Verificaram-se  $6,2 \pm 1,2$  a  $8,9 \pm 2,3$  hemácias/ $\mu\text{l}$  ( $\times 10^6$ ),  $32,0 \pm 4,0$  a  $37,0 \pm 2,8\%$  de volume globular (VG),  $11,5 \pm 1,0$  a  $12,8 \pm 1,6$ g de teor de hemoglobina/dl,  $11,0 \pm 3,2$  a  $17,0 \pm 2,8$  leucócitos/ $\mu\text{l}$  ( $\times 10^3$ ),  $4,9 \pm 1,8$  a  $7,5 \pm 1,5$  neutrófilos segmentados/ $\mu\text{l}$  ( $\times 10^3$ ) e  $5,2 \pm 2,0$  a  $8,6 \pm 2,0$  linfócitos/ $\mu\text{l}$  ( $\times 10^3$ ). Observaram-se valores mais baixos na contagem de hemácias, e VG e valores mais altos do volume globular médio (VGM) em cavalos castrados (acima de 25 meses de idade). As contagens de leucócitos e neutrófilos segmentados em potros com até oito meses de idade apresentaram valores mais elevados que os encontrados em animais acima dos 25 meses de idade. Constatou-se que não houve influência do sexo nos parâmetros analisados.*

*Palavras-chave: eqüino, raça Pantaneira, hemograma*

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