

# Approach to some hematological variables of healthy captive “yaguareté” (*Panthera onca*) from Northeast Argentina

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## Abstract

**Mussart, N.B.; Koza, G.A.; Solis, G.; Coppo, J.A.:** *Approach to some hematological variables of healthy captive “yaguareté” (Panthera onca) from Northeast Argentina.* *Rev. vet. 20: 1, 50–53, 2009.* Samples of three healthy *Panthera onca* from a Northeast Argentina reserve were analyzed through spectrophotometry, electrophoresis, densitometry, and microscopy in order to obtain hematological and biochemical reference values. Means and standard deviation for hematocrit, hemoglobin, red and white blood cells, leukocyte differential count, total protein, albumin, globulins, glucose, total cholesterol, lipoproteins, calcium, inorganic phosphorus, urea, creatinine and some enzymatic activities, were obtained. Usefulness of studied parameters to evaluate sanitary and nutritional state on captive *P. onca*, is emphasized.

**Key words:** *Panthera onca*, hematology, biochemical serum values.

## Resumen

**Mussart, N.B.; Koza, G.A.; Solis, G.; Coppo, J.A.:** *Aproximación a algunas variables hematológicas de “yaguaretés” (Panthera onca) cautivos en el nordeste argentino.* *Rev. vet. 20: 1, 50–53, 2009.* Muestras de tres ejemplares clínicamente sanos de *Panthera onca* alojados en una reserva del nordeste argentino, fueron analizadas por espectrofotometría, electroforesis, densitometría y microscopía para establecer intervalos de referencia hematológicos y bioquímicos. Se obtienen valores para hematocrito, hemoglobina, glóbulos rojos y blancos, fórmula leucocitaria, proteínas totales, albúmina, globulinas, glucosa, colesterol total, lipoproteínas, calcio, fósforo inorgánico, urea, creatinina y algunas actividades enzimáticas. Se enfatiza la utilidad de los parámetros estudiados para evaluar el estado sanitario y nutricional de *P. onca* en cautiverio.

**Palabras claves:** *Panthera onca*, hematología, valores bioquímicos séricos.

## INTRODUCTION

“Yaguareté” (*Panthera onca*, *Leo onca palustris*, Linné 1758, Felidae: Pantherinae) is the biggest feline of Argentina (Figure 1). It inhabits wild sectors of Misiones, Formosa, Chaco, Salta, and Jujuy. This feline shows intense and athletic characteristics. The males can reach up to 2.5 m long and 0.8 m in height, weighing up to 150 kg. Their coat is yellow–orange, sprinkled with black spots. *P. onca* is a solitary hunter and prefers environments such as dense forests, specially near water (fluvial costs and tidelands). The pregnancy period has a duration about 100 days. The female gives birth to 1–4 puppies. They remain under the mother care until approximately 2 years old. At 3–4 years they reach the mature size and are also sexually developed<sup>3</sup>.



**Figure 1.** “Yaguareté” (*Panthera onca*).

*P. onca* is hunted because of its threat to human beings and cattle, as well for the value of its leather. One to this and the alteration of its natural environment, their population density has declined severely. This species exemplifies the tragedy of the natural environment destruction and the Argentinean wild life extinction. The problem increases due to the scarce natural “yaguareté” reserves in Northeast Argentina. Research shows that *P. onca* is able to prolong its life in captivity until 20–22 years old, when adequate feeding, sanity, and handling techniques have been applied<sup>7,10</sup>.

Hematological and biochemical studies can enhance the diagnosis for illnesses and/or the nutritional state of *P. onca*. This fact will be possible only when patient values can be compared with their corresponding reference values<sup>5</sup>. The purpose of this trial was to obtain normal values for the main blood parameters with diagnostic utility in healthy specimens of *P. onca* from a Northeast Argentina reserve.

## MATERIAL AND METHODS

**Sampling.** Three clinically healthy adult “yaguaretés” (4 years old, one male and two females), were subjected for experiments. They lived in captivity as a private reserve in Montecarlo City (Misiones Province, Argentina), fed on bovine meat periodically supplemented with minerals and vitamins. Blood samples were taken using a syringe and needle by coccygean venepuncture. During the sampling, animals were restrained using recommended technique for big felines<sup>17</sup>. One blood sample was treated with anticoagulant (EDTA) and the other was used to obtain serum.

**Laboratory techniques.** Packed cell volume (PCV, hematocrit), red blood cells concentration (RBC), white blood cells concentration (WBC), hemoglobin (Hb), mean corpuscular volume (MCV), mean corpuscular hemoglobin (MCH), and MCH concentration (MCHC), were determined in an electronic automated hematology analyzer Sequoia–Turner Cell–Dyn 400. Leukocytary formula was carried out by differential recount on blood smears stained by May Grünwald–Giemsa.

Serum determinations of glucose (oxydase–peroxydase method, measured at 505 nm), total cholesterol (oxydase–peroxydase, 505 nm), urea (urease, 570 nm), creatinine (alkaline picrate, 520 nm), total protein (biuret, 540 nm), calcium (cresolphthaleincomplexone, 570 nm), inorganic phosphorus (phosphomolybdate, 620 nm), alkaline phosphatase (ALP, phenylphosphate aminoantipyrine, 520 nm), alanine aminotransferase (ALT, alanineketoglutarate, 505 nm), aspartate aminotransferase (AST, aspartateketoglutarate, 505 nm), and lactate dehydrogenase (LDH, NAD lactate, 505

**Table 1.** Hemogram.

parameter	#1	#2	#3	$\bar{x} \pm SD$	V
PCV (%)	40.0	34.0	35.0	36.3 $\pm$ 3.21	10.3
RBC (T/l)	8.81	6.93	7.20	7.65 $\pm$ 1.02	1.03
Hb (g/dl)	12.3	9.40	10.6	10.8 $\pm$ 1.46	2.12
MCV (fl)	45.4	49.1	48.6	47.7 $\pm$ 2.01	4.03
MCH (pg)	13.9	13.5	14.7	14.0 $\pm$ 0.61	0.37
MCHC (%)	30.7	27.6	30.3	29.5 $\pm$ 1.69	2.84
WBC (G/l)	19.9	18.2	13.6	17.2 $\pm$ 3.26	10.6
Ne (G/l)	16.5	11.8	11.4	13.2 $\pm$ 2.83	8.04
Ly (G/l)	1.39	3.28	1.09	1.92 $\pm$ 1.19	1.41
Mo (G/l)	0	0.73	0.27	0.33 $\pm$ 0.36	0.14
Eo (G/l)	1.99	2.37	0.82	1.73 $\pm$ 0.81	0.65
Ba (G/l)	0	0	0	–	–

#1: male, #2 and 3: females,  $\bar{x}$ : arithmetic mean, SD: standard deviation, V: variance, PCV: packed cell volume, RBC: red blood cells, Hb: hemoglobin, MCV: mean corpuscular volume, MCH: mean corpuscular hemoglobin, MCHC: MCH concentration, WBC: white blood cells, Ne: neutrophils, Ly: lymphocytes, Mo: monocytes, Eo: eosinophils, Ba: basophils.

nm) were performed in a L.Mannheim 4010 UV–visible spectrophotometer, using Wiener Lab reagents.

Protein and lipoprotein fractions were respectively separated by electrophoresis on cellulose acetate and agarose gel with veronal buffer, and quantified in an automated Citocon CT–440 densitometer. Biochemical assays were tested by a quality control system, using liophilized comparison patterns (Standatrol).

**Statistical analysis.** Parametric statistics included measures from central tendency (arithmetic mean,  $\bar{X}$ ) and dispersion (standard deviation, SD). Variance was used as a measure of global variability.

## RESULTS AND DISCUSSION

Results are showed in Tables 1 and 2. Some variables of the red series obtained in this trial for *P. onca* are something lower than those reported for their phylogenetic relative, the domestic cat *Felis catus*, which shows higher values of PCV (38–42%) and Hb (11–13 g/dl)<sup>5</sup>. On the other hand, other parameters were similar to those of *F. catus*, as the cases of RBC (6.9–8.5 T/l), MCV (42–53 fl), MCH (14–16 pg) and MCHC (28–33%)<sup>5</sup>. For indian *P. onca* (n = 6), values reported for PCV (37%), RBC (8.27 T/l) and Hb (13.7 g/dl)<sup>12</sup> were also higher than those found in this investigation. Leopards from India (*P. pardus*) revealed higher values of PCV (38.2%), Hb (12.9 g/dl), MCV (54.5 fl), MCH (18.5 pg) and MCHC (33.9%), but lower quantity of RBC (7.06 T/l)<sup>15</sup>. Decrease of red series parameters from our experimental subjects maybe keeps relationship to its feeding system efficiency, because such parameters are suitable indicators of nutritional state<sup>5</sup>.

WBC obtained here from *P. onca* was surprisingly higher than those encountered in domestic cat (9–13 G/l)<sup>5</sup> and those published for *Panthera sp.* from other

countries: 15.1 G/l<sup>12</sup> and 13.1 G/l<sup>15</sup>. Neutrophil and eosinophil rates were also higher than those communicated for *F. catus* and *P. pardus*: 56–62% and 69% respectively<sup>5, 15</sup>. Consequently, lymphocyte counts were lower than those precedently reported in the mentioned species, 30–34%<sup>5</sup> and 25%<sup>15</sup>. Monocyte and basophil concentrations were similar to those of *F. catus* and *P. pardus*. Neutrophil and eosinophil variations perhaps should be attributed to distress and/or intestinal parasites<sup>5</sup>.

Certain cat's biochemical parameters such as glucemia (0.75–1.03 g/l), calcemia (8.2–10.7 mg/dl) and phosphatemia (3.9–6.1 mg/dl)<sup>5</sup> were similar to the parameters found in *P. onca*. Alpha lipoproteins were lower and beta lipoproteins were higher than those reported for domestic carnivorous (84–90% and 10–16% respectively)<sup>5</sup>. Serum total cholesterol of *P. onca* exhibited a higher level than those published for cats (0.92–1.45 g/l)<sup>5</sup>, however the number was quite similar to that of the *Panthera sp.* (1.9 ± 0.15 g/l); in this species HDL-cholesterol is higher than LDL-cholesterol (1.2 vs 0.35 g/l respectively)<sup>6</sup>.

The remaining values cannot be compared to those of the *P. onca* living in other countries because no information was found. Some fractions of the *P. onca* serum proteinogram were similar to those from *F. catus*, specially the total protein (6.2–7.8 g/dl), albumin (2.8–3.6 g/dl) and gamma globulins (1.3–1.7 g/dl)<sup>5</sup>. In cats, alpha globulins are lower (0.5–0.7 g/dl) and beta globulins are higher (1.4–1.9 g/dl)<sup>5</sup>.

The concentration for serum urea in the *P. onca* was similar to that from domestic cats (0.35–0.47 g/l). However, creatinine levels were higher than those reported in dogs (9–17 mg/l)<sup>5</sup>. All serum enzymatic activities of the *P. onca* were lower than those reported for domestic cats (ALT: 23 UI/l, AST: 22 UI/l, LDH: 100 UI/l and ALP: 70 UI/l)<sup>5</sup>. Due to the fact that ALP activity is rapidly cleared by the renal emunctory, it possesses scarce diagnostic value to reveals colestasis in domestic felines<sup>5</sup>.

In conclusion, it is expected that the obtained values can be useful to evaluate the nutritional state as well as to diagnose illnesses of the *P. onca*. It has been reported that big felines can suffer pancreatic dysfunction<sup>4</sup>, hyperlipidemia<sup>1</sup>, immunodeficiency<sup>2</sup>, diabetes mellitus<sup>13, 16</sup>, thyroid abnormalities<sup>14</sup>, stress and suprarenal disturbances<sup>11</sup>, anemia, hypercalcemia and uremia<sup>8, 9</sup>.

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**Table 2.** Biochemical serum panel.

parameter	#1	#2	#3	$\bar{x} \pm SD$	V
TP (g/dl)	6.56	6.74	6.71	6.67±0.10	0.03
alb. (g/dl)	2.99	3.12	3.02	3.04±0.07	0.03
$\alpha$ 1 glob.(g/dl)	0.84	0.72	0.25	0.60±0.31	0.10
$\alpha$ 2 glob.(g/dl)	0.59	0.83	0.91	0.78±0.17	0.03
$\beta$ glob.(g/dl)	0.70	0.65	0.70	0.68±0.03	0.04
$\gamma$ glob.(g/dl)	1.44	1.42	1.83	1.56±0.23	0.05
AGR	0.83	0.86	0.81	0.83±0.02	0.04
glucose (g/l)	0.75	0.83	0.93	0.84±0.09	0.03
TC (g/l)	1.85	1.35	2.20	1.80±0.43	0.18
alpha LP (%)	65.1	73.7	87.8	75.5±11.4	131
beta LP (%)	34.9	26.3	12.2	24.5±11.5	131
Ca (mg/dl)	9.05	8.26	9.14	8.82±0.48	0.23
P (mg/dl)	5.81	5.19	5.57	5.52±0.31	0.09
urea (g/l)	0.32	0.44	0.42	0.39±0.06	0.03
creat. (mg/l)	19	23	33	25.0±7.21	52.0
ALP (UI/l)	30	20	15	21.7±7.64	58.3
ALT (UI/l)	3	1	2	2.00±1.00	1.00
AST (UI/l)	6	2	3	3.67±2.08	4.33
LDH (UI/l)	60	75	78	71.0±9.64	93.0

#1: male, #2 and 3: females,  $\bar{x}$ : arithmetic mean, SD: standard deviation, V: variance, TP: total protein, alb.: albumin,  $\alpha$ ,  $\beta$ ,  $\gamma$ : alpha, beta and gamma globulins, AGR: albumin /globulin ratio, TC: total cholesterol, LP: lipoprotein, creat.: creatinine, ALP: alkaline phosphatase, ALT: alanine aminotransferase, AST: aspartate aminotransferase, LDH: lactate dehydrogenase.

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