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HEMATOLOGICAL PROFILE OF CARPATHIAN GOAT BREED MOTHERS ACCORDING TO AGE AND PHYSIOLOGICAL STATUS - CASE STUDY

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Abstract

Goats are extremely prone to many metabolic diseases that lead to disturbance milk production and their general health. The purpose of this paper was to highlight the particularities of hematological profile Carpathian goat breed according to age and physiological status. The study was conducted in a farm in Poiana Aiudului area, Livezile county of Alba, during July 2020 - March 2021. Blood samples were collected from the jugular vein into EDTA bottles in the period preceding the mount, at the beginning of the gestation and postpartum period. Blood samples were transported in refrigerated conditions (4 degrees C) to the USAMV Cluj-Napoca, Veterinary Medicine Laboratory. The hematological profile was structured in the following elements: White blood cells (WBC-10^9/l), Lymphocyte (LYM-10^9/l), Monocyte (MON-10^9/l), Neutrophils (NEU-10^9/l), Lymphocyte percentage (LY-%), Monocyte percentage (MO-%), Neutrophils percentage (NE-%), Red blood cells (RBC-10^12/l), Hemoglobin (HGB-g/l), Hematocrit (HCT-%), Mean corpuscular volume (MCV- fl), Mean corpuscular hemoglobin (MCH-pg), Mean corpuscular hemoglobin concentration (MCHC-g/dl), Red cell distribution width (RDWc-%). The results obtained were statistically processed, being beneficial in making faster and more efficient decisions to ensure the welfare and health of goats.

Key words*: antepartum, Carphatian goat breed, complet blood count (CBC), postpartum.*

INTRODUCTION

In animal science the goat sector has recently experienced a very good development for increase goat population and the interest given in research studies.

The last thirty years gives a considerable attention to hematological profile of goats because it is desired a standardization of the normal hematological values and variability of hematological parameters. Parameters variability of CBC can be influenced by internal factors (age, sex, race, health) and external factors (environmental differences, climate, etc.) (Kramer J.W., 2000).

The goat sector has always been closely linked to the sheep sector, so information on the hematological profile and immune system of the goat is very limited (Smith et al., 2009). American Dairy Goat Association developed a program blood typing to improve the techniques for breeding and identifying the origin of goats (Smith et al., 2009)

The periparturient period in the life of any animal is very stressful because there are many endocrine and metabolic changes. This period requires the greatest approach to be able to understand the biochemical phenomena which occur in the animal body (Guo et al., 2007). The metabolic changes in goat`s body have been briefly studied over time. Studies show that the metabolism of goats during the transition period are based on only a few measurements (Khan et al., 2002a; Skotnicka et al., 2011). The complete blood count (CBC) is very important in the transition period of animals, because it captures the dynamic changes that occur during the periparturient period. The hematological parameters vary from one breed of goat to another (Azab et al., 1999; Daramola et al., 2005; Opara et al., 2010). The most numerous studies on goat species have been started in African and Asian countries, so this study propose to highlight the changes in the hematologic profile of a Carpathian goat population during the

transition period before mounting to the postpartum period.

MATERIALS AND METHODS

The study was conducted in a farm, individual enterprise Pacurar Emilia, in Poiana Aiudului area, Livezile county of Alba, during July 2020 - March 2021, on Carpathian goat female entered in the genealogical register of the goat species. Thirty percent of goat female population (n = 30) % consisted of young female goats born in 2020 (who have reached the age of 6 months and weighed over 35 kg), primiparous female goats and multiparous female goats. During the monitoring period the maintenance and feeding conditions were the same for the entire study population. The individualization of the goats was done with plastic straps applied to the base of the neck of different colors according to the age of goat.

Blood samples were collected individually from the experimental group at three different times of the year, namely: the period before breeding (June-July), gestation (November-December) and postpartum (February-March). Blood sampling was performed at the same time in the morning to minimize the influence of circadian rhythms (Piccione et al., 2002).

Blood samples were taken from each animal that have the general health good. (livelybehavior, lack of internal and external parasites), in 6 ml vacutainers containing ethylenediaminetetraacetic acid (EDTA) through the jugular vein puncture.

Blood samples were transported in refrigerated conditions (4 degrees Celsius) approximately two hours after collection to USAMV Cluj-Napoca, Veterinary Medicine Laboratory.

The hematological profile was structured in the following elements: White blood cells (WBC-10^9/l), Lymphocyte (LYM-10^9/l), Monocyte (MON-10^9/l), Neutrophils (NEU-10^9/l), Lymphocyte percentage (LY-%), Monocyte percentage (MO-%), Neutrophils percentage (NE-%), Red blood cells (RBC-10^12/l), Hemoglobin (HGB-g/l), Hematocrit (HCT-%), Mean corpuscular volume (MCV- ƒl), Mean corpuscular hemoglobin (MCH-pg), Mean corpuscular hemoglobin concentration (MCHC-g/dl), Red cell distribution width (RDWc-%).

The obtained data were centralized and statistically processed with Excel program and GraphPad, T test and ANOVA test was used to calculate the significance of the age and physiological status between the CBC in goats.

RESULTS AND DISCUSSIONS

The hematological profile of goats depending on the breed, age, sex, physiological status and environmental conditions (altitude, climate, farm management) (Arfuso et al., 2016).

The most important hematological changes produced in the goat species during the transition period from breeding to parturition are related to neutrophilia, monocytopenia and degrease erythtrocyte count. These hematological changes are associated with stress caused by parturition and lactation (El-Ghoul et al., 2000).

White blood cells, lymphocyte, monocyte, neutrophils show significant variations in physiological status, both among animals of the same age depending on physiological status, but also between animals of different ages (Tabel 1).

In organisms, the number of red blood cells is the dynamic activity of the bone marrow, which is released into the peripheral circulation and stored in various organs or basins (Habibu et al., 2018).

Tabel 1. Variation of CBV according to age and physiological status for Carphatian goat

category	ANOVA test	WBC 10^9/l	LYM 10^9/l	MON 10^9/l	NEU 10^9/l	LY %	MO %	NE %
TF	F	29.77	56.45	33.99	45.81	0.008	11.99	24.26
	P value	****	****	****	****	ns	***	****
	R square	0.68	0.8	0.71	0.77	0.006	0.47	0.64
P	F	79.47	36.74	13.62	96.33	2318	5.09	132.9
	P value	****	****	****	****	****	*	****
	R square	6.85	0.73	0.5	0.87	0.99	0.27	0.9
M	F	112.3	24.14	35.96	22.12	129	2.31	93.54
	P value	****	****	****	****	****	ns	****
	R square	0.89	0.64	0.72	0.62	0.9	0.14	0.87
		RBC 10^12/l	HGB g/l	HCT %	MCV ƒl	MCH pg	MCHC g/dl	RDWc %
TF	F	166.4	18.42	6.58	9.73	1.19	6.48	19.26
	P value	****	****	**	***	ns	**	****
	R square	0.92	0.57	0.32	0.41	0.08	0.32	0.58
P	F	713.6	13.31	5.51	9.84	1.09	5.51	1.61
	P value	****	****	**	***	ns	**	ns
	R square	0.98	0.49	0.29	0.42	0.07	0.28	0.1
M	F	132.8	23.76	3.46	14.51	9.18	15.46	1.4
	P value	****	****	*	****	***	****	ns
	R square	0.9	0.63	0.2	0.51	0.4	0.53	0.09

ns: p<0.5; *p>0.5;**p>0.1; ***p>0.01; TF - younger goat femele; P - primiparous goat femele; M-multiparous goat femele; WBC-white blood cells; LYM-lymphocyte; MON- monocyte; NEU-neutrophils; LY - lymphocyte; MO-monocyte; NE -neutrophils; RBC- red blood cells; RBC- red blood cells; HGB- hemoglobin HCT -Hematocrit; MCV - mean corpuscular volume; MCH-mean corpuscular haemoglobin; MCHC- mean corpuscular hemoglobin concentration; RDWc- red cell distribution width.

According to Tables 1 and 2, the WBC values are significant (***p>0.01) between goat of the same age in different physiological statuses, but also between goats of different ages in the same physiological status.

The increase in hemoglobin levels could be due to the increase in free radicals on the erythrocyte membrane, which is rich in lipids, as well as the final erythrocytes lysis, in which case the animal consumes more feed or decreases voluntary intake under heat stress (Srikandakumar et al., 2003).

Neutrophils are the body's main defender against infections and antigens. Elevated neutrophil levels may indicate an active infection; a low neutrophil count may indicate a compromised immune system. Lymphocytes are involved in protecting the body against viral infections. Elevated lymphocyte levels may indicate a depleted immune system. Monocytes are useful in fighting severe infections and are considered the body's second line of defence against infection and the largest cells in the bloodstream (Alam et al., 2011). All these hematological parameters were within normal limits during the period studied, which indicates a proper state of health of the animals. RDW - red cell distribution is useful for identifying animals with anemia and is interpreted together with the other parameters, namely with MCV. Regarding the RDW variation during the transition before breeding to the postpartum period, it is significant for the young female and insignificant for primiparous and multiparous.

Tabel 2. Variation of hematological parameters according to physiological status for Carpathian goat

physiological status	Groups	WBC 10^9/l mean±SD V%	WBC 10^9/l Min/ Max	LYM 10^9/l mean±SD V%	LYM 10^9/l Min/ Max	MON 10^9/l mean±SD V%	MON 10^9/l Min/ Max	NEU 10^9/l mean±SD V%	NEU 10^9/l Min/ Max	LY % mean±SD V%	LY % Min/ Max	MO % mean±SD V%	MO % Min/ Max	NE % mean±SD V%	NE % Min/ Max
normal	TF	10.86±0.31 9.9	10.43 11.41	8.18±0.22 4.9	7.85 8.54	0.29±0.04 0.19	0.22 0.37	6.27±0.53 28.49	5.67 7.12	6.15±3.32 111.05	57.6 66.6	1.51±0.15 2.3	1.3 1.8	36.96±0.89 79.6	35.2 38.2
	P	9.54±0.31 9.76	8.99 9.94	7.98±0.29 8.4	7.48 8.43	0.19±0.04 0.16	0.11 0.24	7.42±0.2 4.2	7.11 7.77	60.32±0.72 52.62	59.2 61.4	1.29±0.37 14.3	0.8 0.9	55.86±0.63 40.26	55.2 56.8
	M	8.74±0.25 6.46	8.39 9.1	6.87±0.29 8.68	6.26 7.23	0.32±0.75 0.56	0.2 0.41	5.34±0.43 18.77	4.55 6.07	60.78±0.72 52.4	59.4 61.8	1.65±0.26 69.44	1 1.9	37.79±0.40 16.76	37.2 38.5
Level of signficance		****		****		****		****		ns		*		****	
gestation	TF	11.09±0.11 14.21	10.84 11.29	7.19±0.30 94.70	6.79 7.74	0.21±0.03 1.3	0.16 0.28	7.65±0.12 16.45	7.43 7.86	61.15±1.66 278	58.9 63.2	1.71±0.08 7.66	1.6 1.8	38.32±0.54 29.51	37.3 38.9
	P	10.29±0.19 3.84	9.96 10.63	7.07±0.4 16.13	6.65 7.95	0.14±0.02 0.06	0.1 0.19	7.08±0.11 1.22	6.92 7.23	44.95±0.52 27.16	44.1 45.7	1.65±0.19 3.61	1.3 1.9	57.86±0.36 13.04	57.3 58.6
	M	9.60±0.18 3.6	9.3 9.87	6.31±0.11 1.29	6.12 6.46	0.21±3.46 0.12	0.17 0.26	6.15±0.16 2.72	5.87 6.42	60.56±0.45 20.48	60.1 61.4	1.65±0.19 3.61	1.3 1.9	39.02±0.76 58.62	37.5 40.3
Level of signficance		****		****		****		****		****		ns		****	
postartum	TF	11.63±0.20 4.3	11.27 11.87	8.26±0.20 4.3	8.02 8.63	0.16±0.02 0.05	0.12 0.2	0.82±0.11 1.35	6.56 6.96	61.26±26 0.46	60.1 61.8	1.44±0.13 1.82	1.3 1.7	36.17±0.6 37.12	35.2 37.5
	P	10.86±0017 2.91	10.54 11.1	8.12±0.14 2.14	7.98 8.45	0.12±0.01 0.02	0.1 0.15	6.41±0.16 2.76	6.16 6.75	45.08±0.46 21.28	44.2 45.7	1.5±0.11 1.33	1.3 1.7	53.51±0.87 75.7	51.6 54.5
	M	10.02±0.11 11.36	9.78 10.13	7.08±0.31 9.65	6.36 7.46	0.13±0.01 0.02	0.11 0.16	5.96±0.16 2.86	5.53 6.12	57.09±0.51 26.76	56.1 57.6	1.18±0.13 1.95	1.3 1.7	35.82±0.28 8.17	35.4 36.2
Level of signficance		****		****		***		****		****		ns		****	

ns: p<0.5; *p>0.5;**p>0.1; ***p>0.01; TF - younger goat female; P - primiparous goat female; M-multiparous goat femele;WBC-white blood cells;LYM-lymphocyte; MON-monocyte; NEU-neutrophils; LY - lymphocyte; MO-monocyte; NE -neutrophils; RBC- red blood cells;

physiological status	Groups	RBC 10^12/l		HGB g/l		HCT %		MCV ƒl		MCH pg		MCHC g/dl		RDWc %	
		mean±SD V%	Min/ Max	mean±SD V%	Min/ Max	mean±SD V%	Min/ Max	mean±SD V%	Min/ Max	mean±SD V%	Min/ Max	mean±SD V%	Min/ Max	mean±SD V%	Min/ Max
normal	TF	15.53±0.29 8.9	15.03 15.91	10.47±0.13 1.8	10.26 10.71	28.01±0.37 14.2	27.5 28.84	19.9±0.37 14.06	16.23 17.36	6.03±0.16 2.6	5.8 6.25	34.38±0.93 87.51	33 35.8	33.55±0.82 67.83	32.4 34.7
	P	15.67±0.17 3.19	15.3 15.9	8.75±0.41 0.17	8.7 8.82	25.86±0.47 22.72	25.13 26.42	17.81±0.44 19.89	16.99 18.46	6.00±0.15 2.3	5.8 6.25	36.26±0.6 36.93	35.4 37.5	37.37±0.87 76.9	36.5 39.5
	M	16.45±0.32 10.52	15.85 17.06	8.36±0.08 0.65	8.25 8.51	26.61±0.61 38.09	25.66 27.73	16.08±0.27 7.6	15.65 16.45	5.77±0.23 5.5	5.3 6.1	37.45±0.49 24.54	36.7 38.2	36.33±0.51 26.45	35.4 36.9
Level of segnificance		****		****		****		****		**		****		****	
gestation	TF	17.39±0.16 26.98	16.99 17.57	11.01±0.25 63.22	10.7 11.4	27.65±0.09 0.83	27.52 27.82	17.29±0.11 13.38	17.08 17.42	6.13±0.14 19.98	5.97 6.4	35.16±0.61 37.37	34.3 35.9	35.28±0.67 45.28	34.1 36.1
	P	17.6±0.09 0.83	17.57 17.84	9.15±0.32 10.72	8.8 9.9	25.42±0.24 6.07	25.12 25.97	18.44±0.18 3.29	18.16 18.67	6.09±0.16 2.67	5.86 6.34	36.71±0.43 19.21	36 37.5	37.88±0.48 23.95	36.9 38.7
	M	17.87±0.06 0.37	17.76 17.96	9.19±0.42 18.98	8.6 9.7	26.21±0.11 1.22	26.12 26.41	16.61±0.28 8.17	16.2 16.9	6.12±0.20 4.18	5.83 6.6	38.09±0.28 8.1	37.6 38.5	36.34±0.43 18.84	35.6 36.9
Level of segnificance		****		****		****		****		ns		****		****	
postartum	TF	16.7±02 4.24	16.43 17.01	10.85±02 4.05	10.47 11.12	28.05±0.26 7.08	27.56 28.45	17.3±0.08 0.75	17.1 17.42	6.11±0.14 2.04	5.87 6.28	34.03±0.54 30.01	33.4 35.2	35.32±0.67 45.95	34.3 36.1
	P	17.8±0.05 0.34	16.98 17.2	9.38±0.34 12.09	8.83 9.86	25.93±0.36 13.21	25.26 26.28	7.81±0.41 17.08	17.06 18.34	6.06±0.09 0.82	5.91 6.25	35.86±0.65 42.26	35.1 37.4	37.71±0.49 24.76	36.7 38.3
	M	17.3±0.08 0.68	17.21 17.46	9.15±0.28 7.5	8.65 9.45	26.73±0.48 23.56	26.07 27.64	16.1±0.17 3.1	15.76 16.34	6.05±0.11 1.29	5.82 6.17	37.19±0.28 8.1	36.8 37.6	36.67±0.51 26.67	35.7 37.3
Level of segnificance		****		****		****		****		ns		****		****	

ns: p<0.5; *p>0.5;**p>0.1; ***p>0.01; TF - younger goat female; P - primiparous goat female; M-multiparous goat female;RBC- red blood cells; HGB- haemoglobin; HCT -Hematocrit; MCV - mean corpuscular volume; MCH-mean corpuscular hemoglobin, MCHC- mean corpuscular hemoglobin concentration; RDWc-red cell distribution width.

CONCLUSIONS

It can be concluded that age and physiological status produce significant changes on some blood parameters of the Carpathian goat raised in the Poiana Aiudului area.

Measurements made on this goat population can improve future studies for a better understanding of the biochemical phenomena that occur in the animal body and ensure a farm management that contributes to animal welfare and ensuring conditions for them, adapted to physiological status.

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