

GENERAL ASPECTS REGARDING THE HAEMATOLOGICAL PROFILE IN EWES DURING PREGNANCY AND PUERPERIUM

ASPECTE GENERALE PRIVIND PROFILUL HEMATOLOGIC LA OI ÎN PERIOADA DE GESTAȚIE ȘI PUERPERIUM

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ABSTRACT | REZUMAT

This scientific paper records the personal investigations revealing the influence of the physiological status on the main haematological parameters (total number of white cells, total number of red blood cells, haemoglobin, haematocrit, average red blood cell volume, average erythrocyte content in haemoglobin, mean red blood cell haemoglobin) in ewes and, invariably, the importance of correcting the possible variations of these parameters in order to maintain the state of health and the wellbeing of the animals, the ultimate goal being to achieve the maximum economic potential of this species.

During this study, predominantly not significant from a statistical point of view ($p > 0.05$) variations of the haematological parameters were observed in non-pregnant, pregnant and in the first third of the lactation period (20, 40 and 60 days) ewes, except for the mean values of the white blood cell count where significant decreases ($p < 0.05$) have been observed at the beginning of the lactation period, but also for the mean haemoglobin concentration values, that were significantly elevated ($p < 0.05$) in pregnant ewes. The mean values of all studied parameters were found within the limits of the reference ranges for this species. Gestation and also lactation are demanding periods for the body, fact that was reflected in the haemoleucogram aspect by variations of the main studied parameters, increased mean values for parameters such as haemoglobin, erythrocyte count and, implicitly, haematocrit being recorded. In antithesis with the ascending trend recorded for the aforementioned parameters, were found the mean values of the leukocytes, their evolution being marked by a downward trend in both gestation and throughout the beginning of the lactation period. Some of the studied parameters did not record variations correlated with the succession of different physiological stages, their mean values remaining constant throughout the study (MCV, MCH, and MCHC).

In conclusion, for all the studied parameters, the mean values were found within the reference intervals, mostly without statistically significant fluctuations, except for the mean values of some parameters, such as WBC in lactation and haemoglobin concentration in gestation to which significant decreases and, respectively, increases have been observed during the study.

Key words: physiological status, haematological profile, haemoleucogram, ewes

Prezenta lucrare consemnează cercetările personale ce relevă influența statusului fiziologic asupra principalelor parametrii hematologici (numărul total de leucocite, numărul total de eritrocite, hemoglobina, hematocritul, volumul eritrocitar mediu, conținutul eritrocitar mediu în hemoglobină, concentrația eritocitară medie în hemoglobină) la oaie și, invariabil, importanța corectării eventualelor variații ale acestor parametrii în vederea menținerii stării de sănătate și bunăstare a animalelor, scopul principal fiind atingerea potențialului productiv maxim din punct de vedere economic al acestei specii.

Pe parcursul acestui studiu s-au constatat variații ale parametrilor hematologici la oile negestante, gestante și aflate în prima treime a perioadei de lactație (zilele 20, 40 și 60) preponderent nesemnificative din punct de vedere statistic ($p > 0.05$), excepție făcând valorile medii ale numărului de leucocite care au înregistrat scăderi semnificative ($p < 0.05$) la începutul perioadei de lactație, dar și valorile medii ale hemoglobinei, acestea fiind semnificativ crescute la oile gestante. Valorile medii ale tuturor parametrilor studiați s-au încadrat în limitele intervalelor de referință pentru această specie.

Gestația, dar și lactația reprezintă perioade solicitante pentru organism, fapt ce se reflectă în aspectul hemoleucogramei prin variații ale principalelor parametrii studiați, înregistrându-se creșterea valorilor medii pentru parametrii precum hemoglobina, numărul de eritrocite și, implicit, hematocritul.

În antiteză cu tendința ascendentă înregistrată în cazul parametrilor anterior menționați s-au regăsit valorile medii ale numărului total de leucocite, evoluția acestora fiind marcată de o tendință descendentă atât în gestație, cât și la începutul perioadei de lactație. O parte dintre parametrii studiați nu au înregistrat variații corelate cu succesiunea diferitelor stadii fiziologice, valorile medii ale acestora rămânând constante pe toată durata studiului (MCV, MCH și MCHC).

În concluzie, în cazul tuturor parametrilor studiați valorile medii s-au încadrat în limitele intervalelor de referință, cu fluctuații preponderent nesemnificative din punct de vedere statistic, excepție făcând valorile medii al unor parametrii precum numărul total de leucocite – în lactație și concentrația de hemoglobină – în gestație, parametrii la care au putut fi observate variații semnificative în sens descendent și, respectiv, ascendent pe durata studiului.

Cuvinte cheie: status fiziologic, profil hematologic, hemoleucograma, ovine

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In Romania, the climate and relief conditions are favourable for the efficient exploitation of sheep and goats, and the health management of the small ruminants is reflected in veterinary medicine by several studies and research that cover the physiology and pathology of these animals (5-10, 15, 17-19). Also, an increased interest in small ruminants' health has been recorded in several countries where those animals are an important source of food (4, 12-14, 20-24).

Currently, significant efforts are being made in order to improve the productive and reproductive potential of sheep and goats, while taking into account the biological potential and the diversity of the genetic structure of native and imported breeds. The economically efficient exploitation of sheep and goats is strictly correlated with the exceptional biological and adaptive peculiarities that sheep and goats have demonstrated over time in both native farms and other countries with various climatic conditions and landforms. Romanian veterinary medicine has responsibly turned to good account research findings and has managed to preserve animal and public health (11). In this context, the accuracy and precision of blood biochemistry and haematology techniques nowadays allow both the monitoring of the animal health status and, also, the development of an individual metabolic profile that reflects the nutritional needs of each individual. Thus, the metabolic profile tests complement the classical morpho-clinical diagnosis methods. The quantitative changes in the major blood components represent an important factor in establishing a diagnosis and are the consequence of functional or morphological disturbances or the body's overstress in various physiological or pathological stages (9). Dosage of the main blood parameters also have prognostic value, since even if the general condition of the animal is unchanged, disturbances of these values – abnormally increased or decreased, may cause disturbances of the homeostasis and, implicitly, organ or systemic disorders within a relative period of time.

This scientific paper represents a continuation of previous researches as part of an extensive study on the influence of the physiological status on the metabolic profile of sheep and goats. Since the last part of gestation and the first part of lactation are metabolically demanding physiological periods (8), through this study, which has as main objective monitoring the haematological, biochemical and hormonal parameters, the research was focused on three main aspects: maintaining the mother's health, ensuring the harmonious growth and health of the product/ products of conception and keeping the productivity at the desired level.

MATERIALS AND METHODS

Herd, animals and samples

The experiment was carried out between August 2017 and April 2018 in a livestock of sheep and goats belonging to a household in the village of Comosteni, Gangiova commune, Dolj County. The livestock was composed of 38 sheep Țurcana mixed breed, of which 33 ewes and 5 rams and 24 goats.

In order to investigate the influence of the physiological status on the ewes' haematological profile, an experimental group of 10 healthy ewes was formed.

All animals were well-maintained, with roughly equal waist, showing no history of pathologies, approximately 3 years of age, multiparous. Throughout the study - approximately 9 months, the ewes were fed with alfalfa hay (*Medicago sativa*) and meadow hay *ad libidum* and approximately 250 grams of mixed feed (containing: grains, molasses, calcium carbonate, salt, a vitamin and mineral premix). The water was provided *ad libidum* throughout the whole period of the study.

The 10 ewes from the experimental group were marked and followed during 3 stages of their physiological status: non-pregnant, pregnant and lactating on day 20, day 40 and day 60. Sampling was performed on: August 15, 2017 for non-pregnant, December 11, 2017 for pregnant (approximately 90th day of gestation) and February 25, 2018; March 17, 2018; April 6th 2018 for lactating on day 20, 40, 60. During the study, the health of the studied animals did not suffer any changes, the foetal mortality rate was 0% and there were no post-partum behavioural disorders recorded.

Blood samples were collected through the holder-vacutainer system in EDTA harvesting tubes (purple cap according to international colour code). Each tube was numbered to fit each of the 10 subjects. Thus each sheep was assigned a number from 1 to 10 through which it will be identified by the end of the experiment.

Determination of the haematological profile

The following haematological parameters were determined by using the MS-45™ haematology analyzer (Melet Schloesing Laboratoires, France): white blood cells (WBC), red blood cells (RBC), haemoglobin (Hb), haematocrit (Ht), mean corpuscular volume (MCV), mean corpuscular haemoglobin (MCH), and mean corpuscular haemoglobin concentration (MCHC).

RESULTS AND DISCUSSIONS

Variations of the haematological parameters in non-pregnant, pregnant and in the first third of the lactation period (days 20, 40 and 60) ewes were predominantly

Table 1

**The mean values of the haematological profile
in correlation with the physiological status of the studied group of ewes ($X \pm sx$)**

Physiological status Parameters	Non-pregnant	Pregnant	Lactating			Reference range
			20 th day	40 th day	60 th day	
WBC (m/mm^3)	8.32 $\pm$ 0.44	7.66 $\pm$ 0.38*	7.21 $\pm$ 0.29**	6.80 $\pm$ 0.21**	7.35 $\pm$ 0.31*	4 - 12
RBC (M/mm^3)	11.04 $\pm$ 0.77	12.18 $\pm$ 1.51*	10.17 $\pm$ 1.38*	10.51 $\pm$ 1.46*	10.92 $\pm$ 1.49*	9 - 15
Hb (g/dl)	12.07 $\pm$ 1.11	14.20 $\pm$ 1.98**	11.20 $\pm$ 0.94*	11.24 $\pm$ 1.03*	10.90 $\pm$ 0.75*	9 - 15
Ht (%)	36.1 $\pm$ 3.32	41.0 $\pm$ 3.91*	34.3 $\pm$ 2.95*	32.7 $\pm$ 2.84*	33.5 $\pm$ 2.91*	27 - 45
MCV (fl)	32.7 $\pm$ 2.11	33.6 $\pm$ 2.31*	33.7 $\pm$ 2.01*	31.1 $\pm$ 2.63*	30.7 $\pm$ 2.10*	28 - 40
MCH (pg)	10.9 $\pm$ 0.78	11.6 $\pm$ 0.85*	11.0 $\pm$ 0.57*	10.7 $\pm$ 0.49*	10.0 $\pm$ 0.44*	8 - 12
MCHC (g/dl)	33.4 $\pm$ 2.01	34.6 $\pm$ 2.86*	32.6 $\pm$ 1.97*	34.3 $\pm$ 1.99*	32.5 $\pm$ 2.13*	29 - 40

* $p > 0.05$ – statistically significant difference; ** $p < 0.05$ – statistically non-significant difference; sx – standard deviation.

not significant from a statistic point of view ($p > 0.05$) and the mean values shown in Table 1 were within the limits of the reference intervals of this species for all the studied parameters.

The analysis of the haematological parameters in correlation with the physiological status in ewes revealed that as the lactation progresses, there can be observed a statistically significant decrease ($p < 0.05$) of the WBC, and a non-significant decrease ($p > 0.05$) of the RBC and Hb compared to the mean values obtained in non-pregnant ewes, that also represented the control lot. Decreased WBC mean values during the lactation period were more pronounced at the beginning of the lactation period – 20th day and 40th day of lactation, whereas in the 60th day a slight increase of the values was observed. Similar results regarding the evolution of this parameter were also highlighted in other studies regarding the haematological parameters in sheep (2) or cattle (16), the main cause incriminated by various authors being the migration of the leukocytes from blood to milk in order to perform a better phagocytosis and, therefore, to protect the mammary gland from the pathogens' action, but also in order to provide a necessary load of antibodies for the new-born lamb.

Also, a statistically not significant ($p > 0.05$) decrease of the RBC mean values was observed in the case of the early lactating ewes, compared to the results obtained for pregnant and non-pregnant ewes, results that are consistent with those recorded by other authors and mentioned in the specialized literature (3).

The increase of the mean haemoglobin levels in pregnant ewes compared to those obtained in non-pregnant ewes was statistically significant ($p < 0.05$) and may have been caused by the increased metabolic rate and, implicitly, by the increased oxygen demand along with the advancement of the gestation period. Similar results on the haemoglobin concentration mean values in lactating ewes were also reported in the speciality literature (1, 2).

In pregnant ewes, higher mean values of the Ht were also observed, but with no statistically significant differences ($p > 0.05$) compared to the values obtained in non-pregnant and lactating ewes. MCV, MCH and MCHC are the three parameters that remained unchanged throughout the study without showing any statistically significant variations ($p > 0.05$).

CONCLUSIONS

Variations of the haematological parameters in non-pregnant, pregnant and lactating (the first third of the lactation period, respectively 20th, 40th and 60th days) ewes were predominantly not significant from a statistical point of view ($p > 0.05$) and the mean values obtained were found within the range of the reference intervals for all the studied parameters.

The analysis of the haematological parameters in correlation with the physiological status of the studied group of ewes revealed that at the beginning of the lactation period, there can be observed a significant de-

crease of the mean values of white blood cells count ($p < 0.05$) and a non-significant decrease ($p > 0.05$) of the mean values of erythrocytes count and haemoglobin concentration compared to the average values obtained in non-pregnant ewes, as a control lot. The main causes of the significant decrease of the white blood cells count mean values in 20th and 40th day of lactation ($p > 0.05$) was the massive migration of the leukocytes from the mother's blood into milk in order to protect the mammary gland from the pathogens' action by performing phagocytosis, but also in order to provide the necessary antibodies for the new-born lamb. The significant increase of the haemoglobin concentration mean values in pregnant ewes ($p < 0.05$) was mainly due to the accelerated metabolic rate and, implicitly, due to the increased oxygen demand in advanced gestation.

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