The effects of non-genetic factors on the morphometric parameters of sheep placenta and the birth weight of lambs

ANGELIKA BRZOZOWSKA[1*], NATALIA WOJTASIAK[1], BARBARA BŁASZCZYK[1], TOMASZ STANKIEWICZ[1], MARTA WIECZOREK-DĄBROWSKA[2], JAN UDAŁA[1]

[1]Department of Animal Reproduction Biotechnology and Environmental Hygiene, West Pomeranian University of Technology, Szczecin; 29 Klemensa Janickiego Street, 71-270 Szczecin
[2]National Research Institute of Animal Production, Kraków, Experimental Department, Kołbacz, 1 Warcisława Street, 74-106 Stare Czarnowo

SUMMARY

The objective of this study was to determine morphometric parameters of sheep placenta and the birth weight of lambs and their relationship with the type of pregnancy, litter sex and age of ewes. Placenta was obtained directly after delivery from Pomeranian sheep (n=128), including single (n=99) and multiple (n=29) pregnancies. For twin pregnancies, monochorionic and dichorionic placentas were taken into account. The following were determined: lamb birth weight (BWL), placental weight (PW), placental length (PL), placental width (WP), cotyledons number (CN), cotyledons weight (CW), mean diameter of the cotyledon (MDC), umbilical cord diameter (DUC). One-way ANOVA variance analysis was used for statistical comparisons and the Pearson and/or Spearman's correlation coefficient for correlation analysis. The primiparous were shown to have significantly lower PW and MDC ($p<0.05$) compared to older sheep. On the other hand, in the case of PL ($p<0.05$) and CN ($p<0.01$), which were significantly higher in the primiparous compared to multiparous. A significantly higher BWL was found in the male lambs than in the female lambs ($p<0.05$). Significantly higher PW, MDC ($p<0.01$) and CW ($p<0.05$) were found in the placenta from which male lambs were born. There was also a significantly higher BWL in male lambs ($p<0.05$) born from dichorial twin pregnancy. CW was significantly higher in the dichorial placenta from which the male lambs were born ($p<0.05$). Comparing the placenta from single and twin dichorial pregnancies, it was shown that type of pregnancy had a significant impact on the development of some placental indices and the birth weight of lambs. Significantly heavier lambs were born from single pregnancy ($p<0.01$). Also PW and PL ($p<0.01$) and CN ($p<0.01$) were significantly higher in single pregnancy placentas. In turn, MDC ($p<0.05$) was significantly higher in twin placental dichorial pregnancies. Monochorial placenta were characterized by significantly larger PW and CW ($p<0.05$) from which the male lambs were born. The obtained results showed that morphometric parameters of sheep placenta and birth weight of lambs depend on the type of pregnancy, litter sex and age of ewes. These results may be helpful in assessing postpartum placenta in this animal species. In addition, recorded differences in placenta parameters and birth weight of lambs may be useful in ultrasound assessment of placental and fetal development during pregnancy.

KEY WORDS

Cotyledon, litter size, placenta, lamb, sheep.

INTRODUCTION

The results regarding reproductive parameters are of key importance in sheep breeding. They particularly concern the assessment of the course of pregnancy, whose proper development may affect the health of newborn lambs. Among many factors, placenta plays the key role[1]. It starts when an embryo is implanted and from that moment, it play a significant role in the development of pregnancy[2]. This is where the morphological and functional analysis of the placenta originated. It has been shown that some morphometric parameters of the placenta can directly affect fetal growth and development, and thus the success of pregnancy[3]. On the example of sheep placenta, it was confirmed that its certain indicators can directly contribute to placental insufficiency, and thus constitute one of the factors that determine the mortality of newborn livestock[4]. Therefore, this type of work is important in the diagnosis and monitoring of pregnancy, especially *in vivo*[5]. Currently, ultrasound is increasingly used for this purpose, the use of which is associated with the ability to correctly interpret it [5]. Therefore, you should first learn about morphology of the placenta, including actual dimensions of its structures, which is best done by direct testing[6,7], e.g. non-invasive, using the placenta expelled immediately after delivery. This type of work can have practical significance, especially in controlling pregnancy and increasing productivity in large livestock farms[5]. They can also be helpful for breeders in preparing for deliveries from multiple pregnancies or the occurrence of heavy births and other complications during this period, which results in minimizing infant mortality[5]. However, previous studies have not tak-

Corresponding Author:
Angelika Brzozowska (angelika_brzozowska@zut.edu.pl).

Table 1 - The number of male lambs and female lambs born and died up to 2 weeks of age from single and multiple pregnancies.

Type of pregnancy (n)		Lambs			
		alive[1]		dead[2]	
		male lambs	female lambs	male lambs	female lambs
Single (n= 99)		43	51	3	2
Twin (n=28)	dichorial (n=18)	16	16	2	2
	monochorial (n=10)	8	12	-	-
Triplet (n=1)		2	1	-	-

[1]live born lambs
[2]dead lambs born and those that did not survive up to 2 weeks of age

Table 2 - Mean (±SD) birth weight of lambs and morphometric parameters of sheep placenta from single pregnancies in ewes of different ages.

Parameters		Age of ewes			Statistically significant differences
		I (1 year; n=20)	II (2-5 years; n=41)	III (5> years; n=33)	
		1	2	3	
BWL (g)	Mean ± SD	5375.00±767.69	5226.83±712.05	5163.64±648.47	NS
	Range	3600.00-6500.00	3800.00-6900.00	3800.00-6500.00	
PW (g)	Mean ± SD	305.45±68.71	307.24±66.10	318.85±78.06	1<3; p<0.05
	Range	200.00-403.00	196.00-494.00	187.00-482.00	
PL (cm)	Mean ± SD	153.06±17.57	141.12±17.39	143.23±21.39	1>2; p<0.05
	Range	126.70-185.00	116.00-181.40	106.60-214.00	
WP (cm)	Mean ± SD	54.03±7.77	55.88±7.90	57.07±9.85	NS
	Range	37.50-69.00	40.00-76.70	40.70-74.90	
CN	Mean ± SD	86.20±14.64	69.24±17.91	70.27±18.06	1>2,3; p<0.01
	Range	55.00-113.00	37.00-98.00	40.00-107.00	
CW (g)	Mean ± SD	92.82±39.75	102.39±23.53	96.83±36.54	NS
	Range	43.00-166.00	53.00-135.00	33.50-170.00	
MDC (cm)	Mean ± SD	2.09±0.36	2.33±0.46	2.24±0.24	1<2; p<0.05
	Range	1.45-2.68	1.65-3.95	1.73-2.89	
DUC (cm)	Mean ± SD	0.64±0.11	0.64±0.11	0.62±0.13	NS
	Range	0.50-0.80	0.50-0.90	0.40-0.90	

Statistical significance of p < 0.01; p < 0.05; SD - standard deviation; NS - no significant; BWL - lamb birth weight; PW - placental weight; PL - placental length; WP - placental width; CN - cotyledons number; CW - cotyledons weight; MDC - mean diameter of cotyledons; DUC - umbilical cord diameter.

en into account all the morphometric parameters of the placenta that can be tested, as well as the relationships between them, taking into account fetal and maternal factors. One of the aspects not yet discussed in the available literature is the analysis of sheep's placenta in multiple pregnancy, especially twin occurring frequently in sheep[8, 9], taking into account the classification into a monochorial placenta, having one chorion and a common placenta for developing fetuses and dichorial, where they are two chorions and completely separate placenta for each fetus in twin pregnancy[10]. It is also worth examining the effect of fetal sex on the placenta[11] and mother's age, with which reproduction parameters are known to change[12,13]. Therefore, it is so important to include the foregoing aspects in the analysis of placenta, which are not fully explained in the available literature. The purpose of this study was to examine morphometric parameters of the sheep placenta depending on the type of pregnancy, litter sex and age of ewes, and to analyze the birth weight of lambs.

MATERIAL AND METHODS

The study was carried out on Pomeranian sheep kept on an organic sheep farm in the Experimental Plant of the National Research Institute of Animal Production in Kołbacz (Kołbacz, Poland: latitude 53°30' N). The Pomeranian sheep are the main breed in the population of meat and wool sheep raised in the north-western region of Poland. This breed is included in the livestock genetic resources conservation program. In the study, sheep were kept in a pasture-alcove system, under conditions of uniform feeding. Nutrition was carried out according to standards adapted for this species, based on fodder, and oth-

Table 3 - Mean (± SD) birth weight of lambs and morphometric parameters of sheep placenta from single female and male pregnancies.

Parameters		Sex of lambs		Statistically significant differences
		female (n=51)	male (n=43)	
		1	2	
BWL (g)	Mean ± SD Range	5082.35±613.42 3800.00-6500.00	5418.60±756.64 3600.00-6900.00	1<2; p<0.05
PW (g)	Mean ± SD Range	294.24±68.53 187.00-494.00	330.74±68.45 196.00-482.00	1<2; p<0.01
PL (cm)	Mean ± SD Range	146.23±19.99 117.00-214.00	142.22±18.33 106.60-185.00	NS
WP (cm)	Mean ± SD Range	54.49±7.87 37.50-68.00	57.58±9.17 41.00-76.70	NS
CN	Mean ± SD Range	73.10±18.04 37.00-107.00	73.35±19.13 37.00-113.00	NS
CW (g)	Mean ± SD Range	89.61±33.07 33.50-166.00	111.59±26.33 67.00-170.00	1<2; p<0.05
MDC (cm)	Mean ± SD Range	2.18±0.43 1.45-3.95	2.33±0.30 1.74-3.15	1<2; p<0.01
DUC (cm)	Mean ± SD Range	0.61±0.12 0.40-0.90	0.66±0.11 0.50-0.90	NS

Statistical significance of $p < 0.01$; $p < 0.05$; SD - standard deviation; NS - no significant; BWL - lamb birth weight; PW - placental weight; PL - placental length; WP - placental width; CN - cotyledons number; CW - cotyledons weight; MDC - mean diameter of cotyledons; DUC - umbilical cord diameter.

Table 4 - Mean (± SD) birth weight of lambs and morphometric parameters of sheep placenta from dichorial twin pregnancies including lambs sex.

Parameters		Sex of lambs		Statistically significant differences
		female (n=16)	male (n=16)	
		1	2	
BWL (g)	Mean ± SD Range	3800.00±307.06 3400.00-4300.00	4141.67±716.63 2400.00-4900.00	1<2; p<0.05
PW (g)	Mean ± SD Range	242.25±32.13 213.00-292.00	274.00±74.18 197.00-436.00	NS
PL (cm)	Mean ± SD Range	110.90±21.48 75.80-141.40	123.46±27.62 91.00-187.40	NS
WP (cm)	Mean ± SD Range	54.73±6.72 44.20-64.90	52.67±8.69 39.00-68.80	NS
CN	Mean ± SD Range	50.00±20.23 35.00-98.00	58.67±21.29 36.00-102.00	NS
CW (g)	Mean ± SD Range	64.50±2.12 63.00-66.00	87.86±9.96 69.00-96.00	1<2; p<0.05
MDC (cm)	Mean ± SD Range	2.50±0.39 2.00-2.96	2.42±0.29 2.01-2.89	NS
DUC (cm)	Mean ± SD Range	0.60±0.14 0.40-0.80	0.67±0.10 0.60-0.90	NS

Statistical significance of $p < 0.01$; $p < 0.05$; SD - standard deviation; NS - no significant; BWL - lamb birth weight; PW - placental weight; PL - placental length; WP - placental width; CN - cotyledons number; CW - cotyledons weight; MDC - mean diameter of cotyledons; DUC - umbilical cord diameter.

er forages and concentrate feeds, depending on the time of year (summer and winter nutrition). In the grazing season from May to October, sheep grazed in the meadow, and in the fold they received oats, hay and straw. In the winter, from November to April, the sheep stayed in the fold, where they were fed with oats, straw and hay. The animals had constant access to water and salt licks. Sheep were mated during their natural breeding season (September) in a natural way, no oestrus synchronization methods were used. Duration of pregnancy was determined based on the day of mating and the success of mating was confirmed by transrectal ultrasound (USG scanner 480, Pie Medical, linear probe with frequency of 7.5 MHz) and vaginal mucus resistance measurements (ohmmeter Dramiński, Poland)[14]. To distinguish single and multiple pregnancy, abdominal ultrasound was performed (USG scanner EDAN U50, sectoral probe with frequency of 5 MHz). A total of 128 sheep were included in the study.

Data collection

Placentas were obtained immediately after deliveries. The following types of placenta were obtained from single pregnancies and twin pregnancies. In twin pregnancies there were: monochorial and dichorial (Fig. 1). After delivery, the sex and birth weight of lambs (BWL) were determined (veterinary weight; MENSOR WE15P2-A, Poland). In the first stage, placentas obtained from single (n=94) and twin (n=16) pregnancies, from which live lambs were born, were used for comparative analyses. On the other hand, the parameters of placentas obtained from monochorial twin pregnancies (n=10) were subjected to a separate analysis due to the type of placenta, which prevents comparative analysis with other types of placenta. Due to the presence of one large placenta, the total birth weight of lambs (TBWL) was determined for a given monochorial placenta. According to the classification given by Steven[15], monochorial placentas include chorionic sacs: joined by avascular tips and completely fused with placental vascular asymmetry, and without asymmetry of the placental vessels. The study also took into account the survival of lambs, distinguishing a group of live-born lambs and a group of dead lambs up to 2 weeks of age.

Placenta characteristics were determined based on the following parameters: placenta weight (PW), placenta length (PL), placenta width (WP), number of cotyledons (CN), the weight of cotyledons (CW), mean cotyledon diameter (MDC), umbilical cord diameter (DUC). The length of the placenta was measured using a non-stretchy cord according to the method described by Vernunft et al.[16]. Each placenta was placed on the countertop with the fetal surface outside and the umbilical cord arranged centrally. Estimation of organ length was done along the main curvature that was opposite the umbilical cord base (Fig. 2). Necrotic placenta elements were not included in the measurements. In turn, determination of the placenta width was based on the method given by Winder et al.[17]. The measurement was taken at the widest point of the placenta after it was cut along the curvature opposite the umbilical cord (Fig. 2). Then the number of cotyledons was estimated and isolated from the placenta, then the diameters of randomly selected 10 cotyledons from the placenta were measured[8]. Cotyledon diameters were estimated by averaging the length and width (cm) measurements[18] using a caliper (Fig. 3). Then the obtained values were averaged and the mean diameter of the cotyledons per test placenta was obtained. All isolated cotyledons from the placenta were weighed using the same scale as placental and lamb weight measurements. The umbilical cord diameter was measured using a caliper.

Statistical analysis

Statistical analysis of the study results was performed using the Statistica program version 13.3 (StatSoft, Poland). Mean values and standard deviations were calculated. One-way analysis of variance (ANOVA) was used to determine the significance of differences between the normal distribution means. The Duncan test was used as the post-hoc test. For variables that did not meet the parameters of parametric tests, the non-parametric Kruskal-Wallis test was used to analyze the variance. A multiple comparison test was used as the post-hoc test. Correlation analysis was done by calculating Pearson and/or Spearman's correlation coefficients. The level of statistical significance was $p < 0.05$.

Figure 1
Type of placentas in twin pregnancies: A - monochorial placenta; B - dichorial placenta.

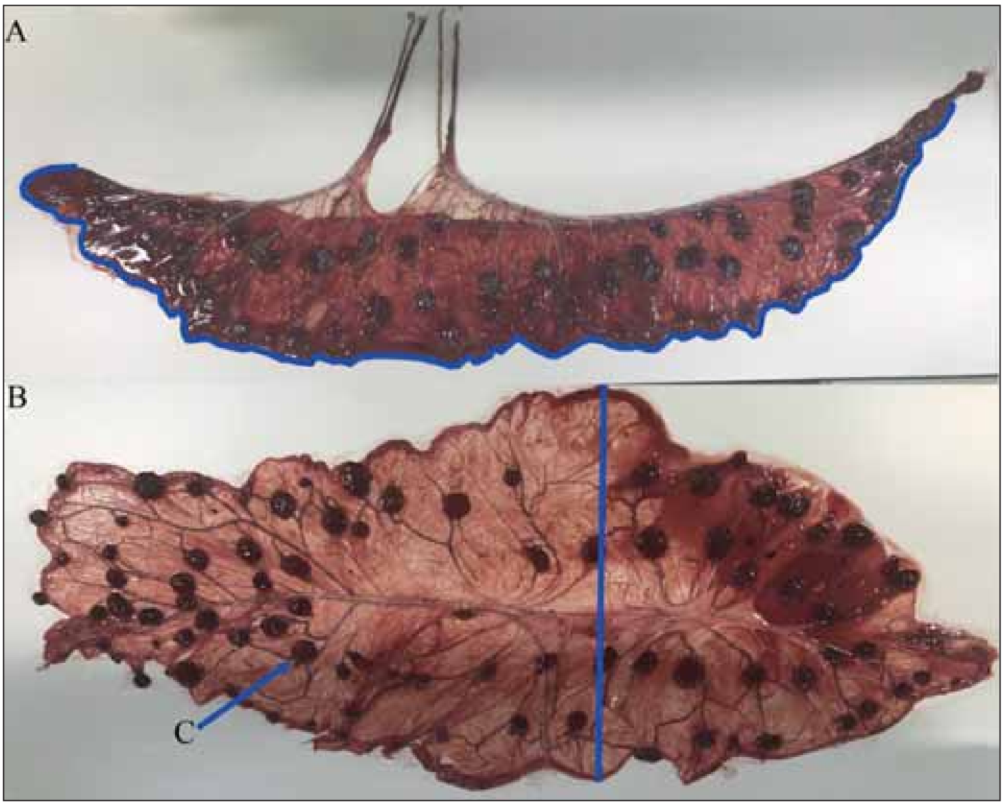

Figure 2
Representative picture of sized ovine placentas of one litter; the line demonstrates the measurement of placental length (A) and width (B); C-cotyledon.

RESULTS

Table 1 presents numbers of pregnant sheep, pregnancy types, live and dead lambs up to two weeks of age. The sex of lambs was also taken into account. The number of sheep with single pregnancy was more than three times higher than the number of sheep with multiple pregnancies. In the examined sheep were born more male lambs than female lambs. In twin pregnancies, there were more dichorial than monochorial ones. The mortality rate of lambs was similar in both sexes (Table 1).
Table 2 presents the average values of morphometric parameters of placenta and birth weight of lambs from single pregnancies depending on the age of the ewes. There were significant differences in placental weight, with the lowest weight for the youngest ewes, and the highest for sheep over 5 years of age. The length of nulliparous placenta was greater than that of older sheep, but significant differences were noted between nulliparous placenta and ewe placenta at the age of 2-5 years. Nulliparous placenta also had more cotyledons than the older sheep placenta. On the other hand, the mean diameter of the cotyledon was smaller than in older sheep's placentas, with significant differences between the cotyledons of nulliparous placenta and the cotyledons of sheep aged 2-5 years. In the remaining parameters, no significant differences were found between the examined groups of ewes (Table 2).
The average birth weight of lambs and morphometric parameters of the placenta from single pregnancies, taking into account the sex of lambs, is given in Table 3. Male lambs had a significantly higher birth weight than female lambs. Also, the placental weight from male pregnancies was significantly higher than from female pregnancies. Similarly, the differences in cotyledon weight and mean diameter of cotyledon were shaped. However, no statistical differences were found in other parameters (Table 3).
Table 4 shows the average values of analyzed parameters of the placenta and birth weight for female and male lambs born from dichorial twin pregnancies. The birth weight of male lambs was significantly higher than that of female lambs. The differences in cotyledon weight were similar. However, no significant differences were found in other parameters examined (Table 4).
Table 5 presents the results regarding the comparison of the birth weights of lambs and placental morphometric parameters between single and twin dichorial pregnancies. Lambs from single pregnancies had a significantly higher birth weight than lambs with twin dichorial pregnancy. The placenta weight was also significantly higher in single pregnancies than in lambs from dichorial twin pregnancies. The differences in placental length and the number of cotyledons were similar. In turn, the mean diameter of cotyledon was significantly larger in twin dichorial placentas than in single pregnancies. No significant dif-

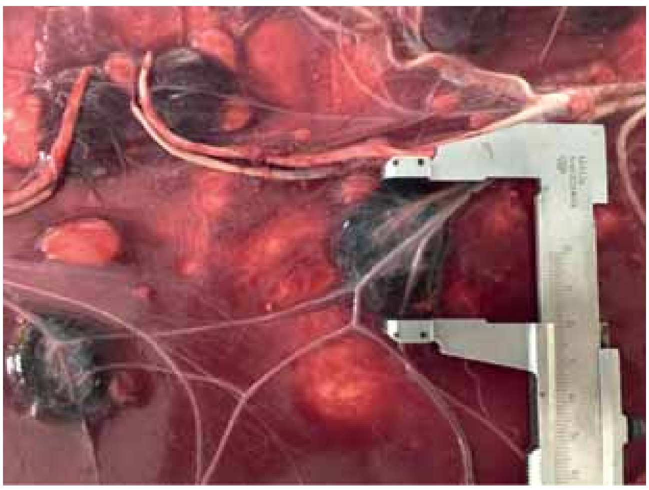

Figure 3 - Measurement of cotyledon using a caliper.

Table 5 - Mean (± SD) birth weight of lambs and morphometric parameters of sheep placenta from single and twin dichorial pregnancies.

Parameters		Type of pregnancy		Statistically significant differences
		single (n=94)	dichorial twin (n=32)	
		1	2	
BWL (g)	Mean ± SD Range	5236.17±699.44 3600.00-6900.00	4005.00± 601.29 2400.00-4900.00	1>2; p<0.01
PW (g)	Mean ± SD Range	310.94±70.53 187.00-494.00	261.30±61.81 197.00-436.00	1>2; p<0.01
PL (cm)	Mean ± SD Range	144.42±19.26 106.60-214.00	118.17±25.38 75.80-187.40	1>2; p<0.01
WP (cm)	Mean ± SD Range	55.85±8.61 37.50-76.70	53.54±7.79 39.00-68.80	NS
CN	Mean ± SD Range	73.21±18.45 37.00-113.00	55.20±20.79 35.00-102.00	1>2; p<0.01
CW (g)	Mean ± SD Range	98.10±32.19 33.50-170.00	82.67±13.45 63.00-96.00	NS
MDC (cm)	Mean ± SD Range	2.25±0.38 1.45-3.95	2.45±0.33 2.00-2.96	1<2; p<0.05
DUC (cm)	Mean ± SD Range	0.63±0.12 0.40-0.90	0.64±0.12 0.40-0.90	NS

Statistical significance of $p < 0.01$; $p < 0.05$; SD - standard deviation; NS - no significant; BWL - lamb birth weight; PW - placental weight; PL - placental length; WP - placental width; CN - cotyledons number; CW - cotyledons weight; MDC - mean diameter of cotyledons; DUC - umbilical cord diameter.

ferences were found in other parameters (Table 5).

Table 6 presents the average total birth weight of twin lambs and placental parameters from monochorial twin pregnancies. The average placental weight from female twin pregnancies was significantly lower than from male twin pregnancies. In contrast, the weight of cotyledons was significantly higher in placenta from male twin pregnancies than from female ones. No statistical differences were found in other parameters (Table 6).

Table 7 shows correlation coefficients between the tested morphometric parameters of the placenta, and the age of ewes and the birth weight of lambs. It was shown that the birth weight of lambs was positively correlated with placental weight, placental length, cotyledon number and weight. There were no significant correlations between the age of ewes and placental parameters (Table 7).

DISCUSSION

Morphometric parameters of the sheep placenta were examined depending on the type of pregnancy, litter sex and age of ewes, as well as the analysis of lambs birth weight. The obtained results confirmed that the foregoing factors had an impact on some morphometric parameters of the placenta and the birth weight of newborn lambs. Some results of research on given parameters were similar to those observed in the works of other authors. Additional results were also obtained that could expand knowledge in this area of sheep research.

In this study, no impact of sheep age on the weight of newborn offspring was found. Similar observations were noted in studies of Karakus and Atmaca[19]. On the other hand, other authors showed that age of ewes no affects the birth weight of lambs[20].

This study showed that the number of placental cotyledons decreased with increasing age, and the mean diameter of cotyledon increased. Results regarding the number of cotyledons were similar to those obtained in another study[21], however they differed from the results obtained by Kolosov et al.[3] and Pettigrew[22]. It can be presumed that in older sheep, the decrease in the number of cotyledons and the increase in the cotyledon diameter with age can lead to minimizing losses in the exchange of nutrients between the mother and the fetus. Parraguez et al.[4] showed similar conclusions regarding the number and diameter of cotyledons. It is known that cotyledons as fetal placenta (placentomes) are responsible for nutrition of the fetus, due to the penetration of metabolites from these structures from the mother[23]. It is possible that a smaller amount of cotyledons may affect the weight of lambs born to older sheep than by nulliparous. Confirmation of this hypothesis can be the results of this work.

As the pregnancy progresses, the size of cotyledons may change due to nutritional requirements of the fetus[23]. It can be assumed that the larger diameter of cotyledon is intended to increase the penetration of nutrients into the fetus. It can be assumed that this is not enough to offset the smaller number of cotyledons per placenta. Thus, it can affect the birth weight of lambs.

This study also noted significant differences in placental length between primiparous and older sheep. Placental length had highest values in youngest sheep. However, there is no analysis of this indicator in sheep available in the literature, which is why it is so important to continue research in this area.

Significant differences in some placenta parameters and birth weight were noted between female and male lambs in single pregnancies. It was shown that placental weight, cotyledon

Table 6 - Mean (± SD) total birth weight of lambs from monochorial twin pregnancies and morphometric parameters of placenta.

Parameters		Twin		Statistically significant differences
		female (n=6)	male (n=4)	
		1	2	
TBWL (g)	Mean ± SD Range	7966.67±801.66 6500.00-8600.00	7875.00±309.57 7600.00-8300.00	NS
PW (g)	Mean ± SD Range	435.33±77.75 332.00-540.00	523.75±37.62 485.00-573.00	1<2 ; p<0.05
PL (cm)	Mean ± SD Range	203.82±35.85 167.50-271.50	203.90±15.47 182.00-215.40	NS
WP (cm)	Mean ± SD Range	57.82±3.37 53.00-61.00	56.10±10.01 44.50-64.90	NS
CN	Mean ± SD Range	95.33±11.00 80.00-108.00	105.25±14.50 88.00-120.00	NS
CW (g)	Mean ± SD Range	153.75±61.45 112.00-244.00	223.00±31.11 201.00-245.00	1<2 ; p<0.05
MDC (cm)	Mean ± SD Range	2.34±0.34 1.96-2.94	2.34±0.24 2.04-2.61	NS
ADUC (cm)	Mean ± SD Range	0.63±0.08 0.50-0.70	0.68±0.10 0.60-0.80	NS

Statistical significance of p < 0.01; p < 0.05; SD - standard deviation; NO - no significant; TBWL - total lamb birth weight; PW - placental weight; PL - placental length; WP - placental width; CN - cotyledons number; CW - cotyledons weight; MDC - mean diameter of cotyledons; ADUC - average umbilical cord diameter.

weight and their diameters were affected by the sex of the lambs. Similar results were obtained in the studies of other authors[8,24]. It is possible that this is due to the different requirements of the male and female fetus[25,26]. The male lambs, due to their higher birth weight, compared to female lambs, need more nutrients delivered through the placenta. Therefore, it may increase placental weight, cotyledon weight, and mean cotyledon diameter in the placenta where the fetus was male.

The study also analyzed twin dichorial placentas, where cotyledons had a larger weight in the placenta from which the male lambs were born. As in the case of single pregnancy, the weight of cotyledons was greater in placenta from dichorial twin pregnancies from which male lambs were born. Similarly, the birth weight of lambs was higher for male twins.

Other authors' conclusions indicated that the size and weight of the litter affect the weight of the placenta and the size of cotyledons[27]. The smaller number and weight of cotyledons in twin pregnancy dichorial placentas compared to single pregnancy placentas confirm these assumptions. In contrast, the increase in cotyledon diameter in twin pregnancies compared to those with single pregnancies may be the result of the placenta trying to minimize losses in nutrient transport to twin fetuses, caused by a reduced amount of cotyledons in each part of the dichorial placenta per fetus. Previous studies showed that twin pregnancies caused changes in maternal and fetal physiology differently from single pregnancies[28].

In this study, differences were noted in the influence of litter size on individual morphometric parameters of the placenta. Some authors suggested that in cases where the placenta was burdened with multiple pregnancy, specific interactions occurred between developing offspring[11]. There may be uneven competition for already limited resources in the twin placenta, which may subsequently lead to differences in the birth weight of twin lambs.

This study also considers the second type of monochorial twin placenta in pregnancy. Monochorial placenta due to their structure carry a greater risk of anastomosis of placental vessels [29]. It is possible that the occurrence of anastomoses of these vessels limits the access to nutrients to one of the twin fetuses, and thus affects its development and birth weight[30]. The available literature has not yet included the classification of twin placenta into dichorial and monochorial in sheep, and thus the morphometric parameters of the placenta in this aspect have not been analyzed. That is why it is so important to continue re-

Table 7 - Correlation coefficients between placental morphometric parameters and the age of ewes and lamb weight.

	Age of ewes	Lamb birth weight
Age of ewes	-	
Lamb birth weight	0.04	-
Placental weight	0.13	0.75**
Placental length	0.03	0.72**
Placental width	0.07	0.15
Cotyledons number	-0.10	0.54**
Cotyledons weight	0.23	0.69**
Mean diameter of cotyledons	0.17	0.004
Umbilical cord diameter	-0.14	0.14 (*) p<0.05; (**) p<0.01

search and extend the analysis to include placental types and their possible impact on the morphometric parameters of the placenta and on fetal development.

CONCLUSIONS

The obtained results indicate that processes in the body of a ewe during pregnancy occur on many levels. These processes are directed in particular at creating favorable conditions for fetal development, which in turn affects the survival of newborns. It can be assumed that the proper course of pregnancy, including the proper development of the placenta and obtaining its best parameters can affect success in the delivery period. It is similar with birth weight in farm animals, which has a great impact on the survival and further development of the offspring[30]. The obtained results showed that the morphometric parameters of sheep placenta and the birth weight of lambs depend on the type of pregnancy, litter sex and age of ewes. These results should be helpful in assessing postpartum placenta in this animal species. In addition, recorded differences in placenta parameters and birth weight of lambs may be useful in ultrasound assessment of placental and fetal development during pregnancy.

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