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The effect of birth type on total thiol and native thiol in Aleppo goats and kids

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Abstract:
***Background**: Dystocia refers to the type of birth that does not occur within physiological limits and generally requires serious interventions from the outside. The present study was carried out to investigate the effect of dystocia on total thiol and native thiol, which are oxidative stress markers, in Aleppo goats and kids.*
***Materials and Methods**: A total of 40 Aleppo goats were used in the study. Goats were divided into 2 groups according to the type of birth. The first group of the study (Group 1, n=20); normally born goats and their offspring included the second group of the study (Group 2, n=20); dystocia formed shaped goats and their offspring. Blood samples were taken from the goats and kids in both study groups to be used in postnatal oxidative stress (total thiol, native thiol) evaluations and serum was extracted. Obtained data were analyzed with Independent samples t-test. Pearson correlation coefficients were calculated to determine the relationships between measurements.*
***Results**: According to this; Total Thiol and Native Thiol values of kids and goats were found to be higher in group 1, with a statistically significant difference according to the type of delivery (p<0.05). A statistically significant correlation was found between Total Thiol-Native Thiol binary levels in kids in Group 1 (p<0.05).*
***Conclusion:** In conclusion, significant differences were found in total thiol and native thiol levels in both goats and kids in the dystocia group compared to the normal birth group. Knowing the difference in these parameters, which are indicators of oxidative stress, it was thought that healthier and less offspring could be lost with timely measures.*
***Key Word**: Goat; Kid; Dystocia; Total thiol; Native thiol.*

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I. Introduction

Dystocia; it causes significant economic losses by increasing maternal and offspring mortality, puerperal disease incidence, culling rate and infertility[1]. Pregnancy and birth processes are similar in sheep and goat species, and the first period of birth lasts 3-6 (2-12) hours on average, while the second period is completed in an average of 1 hour2,3. Due to the anatomical structure of the birth canal in small ruminants, the rate of dysocia is low. The incidence of dystocia is between 3-5% on average[2]. However, the death rate due to dystocia is quite high[3].

Oxidative stress occurs when the balance between reactive oxygen and nitrogen species and the antioxidant system is disrupted in the oxidant direction[4]. It is a natural process and there are specialized mechanisms that keep this stress under control. In cases where these mechanisms are inadequate, oxidative damage occurs[5]. If antioxidant systems are not sufficient to counteract oxidative stress, oxidative damage in cells progresses and causes dramatic deterioration of cell functions[6,7,8]. Mild oxidative stress activates antioxidant enzyme systems, but these can only be tolerated by cells[9]. However, when the intracellular defense systems are insufficient, the balance between reactive oxygen variables and antioxidants is disturbed. Thus, it disrupts the structures of cells (especially immune cells) by damaging macro components such as proteins, carbohydrates, lipids and DNA[10,11]. It is known that excessive oxidative stress can cause pathological disorders of tissues and organs. These pathological disorders begin with function, activity and immunological deficiencies, especially in the heart, skeletal muscle, liver and blood cells that require high energy[12].

Thiol or sulfhydryl groups (SH) constitute the most active and functional form of the sulfur atom[13]. In addition to antioxidant defense, SH is critical in enzyme function, protein folding and functionality, detoxification, regulation of transcription factors, signal transduction, apoptosis and cellular stimulation mechanisms, by being in the active sites of enzymes[13]. The SH groups of proteins such as albumin constitute a large part of the plasma or serum SH pool; cysteine, GSH, cysteinylglycine and homocysteine, which are known as low molecular weight thiols, constitute a small portion[13]. GSH, which is the most abundant antioxidant molecule in the cell, constitutes the majority of the intracellular thiol pool[14].

In this study, it is aimed to reveal the effect of dystocia on total thiol and native thiol in Aleppo goats and kids. In this way, it is aimed that the Aleppo goats, which are dense in the region, can be healthier and less offspring loss with additional supplements of kids and mothers after birth.

II. Material And Methods

This study was carried out based on the permission of Harran University Animal Experiments Local Ethics Committee (HRU-HADYEK) dated 07/09/2020 and numbered 2020/004.

Animal selection and experimental protocol

The study material consisted of a total of 40 Aleppo goats, aged between 3-5, which were selected by random sampling method under the same feeding and management conditions in a private enterprise located in the Eyyübiye District of Şanlıurfa province. Goats used in the study; In the anamnesis taken, only animals with a single birth were included in the study, which gave normal births before, did not have any problems after birth, and in order to objectively evaluate the parameters that were considered to be taken into account. The study was carried out between September and April, when the goats' synchronization and birth season is the highest. Goats were divided into 2 groups according to the type of birth. The first group of the study (Group 1, n=20): goats and their offspring that gave normal birth (eutocia), and the second group (Group 2, n=20) consisted of goats and their offspring with dystocia. In the group considered as dystocia; when the total time to delivery exceeded 90 minutes or the fetal membranes had ruptured and there was no progression for 30 minutes, it was classified as a dystocia.

Taking blood and colostrum samples

Blood samples taken from V. jugularis to be used in oxidative stress (total thiol, native thiol) evaluations within 1 hour after birth from goats and kids in both study groups in tubes containing 5 ml coagulation activator were stored at 3000 rpm after being transported to the laboratory under cold chain conditions. They were centrifuged for 10 minutes and their serums were removed and stored at -80˚C until analysis.

Analysis of blood samples

Serum total thiol (Rel Assay, Gaziantep, Turkey) and native thiol (Rel Assay, Gaziantep, Turkey) levels were determined spectrophotometrically (Molecular Device SpectraMax M5 Plate Reader, Pleasanton, California, United States) using a commercial kit.

Statistical analysis

Statistical analysis of the data was performed with the Statistical Package for the Social Sciences (SPSS for Windows; version 22.0) package program. The conformity of the variables to the normal distribution was examined using visual (histogram and probability graphs) and analytical methods (Kolmogorov-Smirnov/Shapiro-Wilk tests). Descriptive analyzes were given as mean ± standard deviation for normally distributed variables. Since it was determined that the relevant data showed normal distribution, these parameters were compared between groups using Independent samples t-test. Pearson correlation coefficients were calculated to determine the relationships between measurements. Cases with a P-value below 0.05 were considered as statistically significant results.

III. Result

Measurement results according to birth type in Capricorns

Accordingly, mean total thiol (287.65±9.47-258.33±10.99) and native thiol (251.97±6.58-238.31±5.03) of Group 1 and Group 2 respectively measurement results are presented in Table 1. A significant difference was observed in the measured total thiol and native thiol values according to the mode of delivery ($p<0.05$). Accordingly, these measurements were higher in the group born as a result of normal delivery (group 1). Correlation analysis results in Group 1 are given in Table 2. Kids in Group 1; A significant relationship was found between total thiol and native thiol value ($p<0.05$). This relationship was found to be positive with a rate of 46.7%. That is, as the total thiol increases, the native thiol value also increases. Despite that; no significant correlation was recorded between the correlated measurements in kids in group 2 ($p>0.05$).

Measurement results according to birth type in goats

Accordingly, the mean total thiol (290.69±8.39-258.98±12.79) and the native thiol (254.97±6.93-245.29±7.26) of Group 1 and Group 2 respectively measurement results are presented in Table 3. A significant difference was noted in the measured total thiol and native thiol values according to the type of delivery (p<0.05). Accordingly, these measurements were found to be higher in group 1 than in group 2. There was no significant relationship between the correlated measurements in group 1 and group 2 goats (p>0.05).

Table no 1: Total thiol and native thiol levels in kids according to the type of birth.

	Eutocia group (Group 1)		Dystocia group (Group 2)		*p
	Mean	St. Dev.	Mean	St. Dev.	
Total tiyol (micromol/L)	287,65	9,47	258,33	10,99	,001
Native tiyol (micromol/L)	251,97	6,58	238,31	5,03	,001

* Significance levels according to Independent T-test results

Table no 2: Correlation analysis in kids in the eutocia group.

		Total tiyol (micromol/L)	Native tiyol (micromol/L)
Total tiyol (micromol/L)	r		
Native tiyol (micromol/L)	r	,467*	

*p<0,05; r: Pearson correlation coefficients

Table no 3: Total thiol and native thiol levels in goats according to the type of birth**.**

	Eutocia group (Group 1)		Dystocia group (Group 2)		*p
	Mean	St. Dev.	Mean	St. Dev.	
Total thiol (micromol/L)	290,69	8,39	258,98	12,79	*,001*
Native thiol (micromol/L)	254,97	6,93	245,29	7,26	*,001*

* Significance levels according to Independent T-test results

IV. Discussion

One of the most important factors affecting the reproductive performance of goats and causing great economic losses is the dystocia[15]. Due to the anatomical structures of the birth canal, dystocia are not common in small ruminants, but the mortality rate due to dystocia is quite high[16]. Dystocia cause severe declines in reproductive performance and increases in puerperal infections. They are also important in that they cause complications that can lead to the death of the offspring and even the mother[2,17,18]. Evaluations between dystocia and the parameters presented in our study were made on lambs, calves and foals[19,20,21,22,23], but no study was found with kids. In addition, the offspring were evaluated in the studies and the effects of the mothers on this dystocia were not evaluated. In the presented study; It is aimed to reveal the effect of dystocia on some oxidative stress parameters in Aleppo goats and kids.

It has been reported that the rate of formation of a dystocia is highest in sheep that have given birth for the first time[24,25,26,27]. In a different study, it was found that 52% of dystocia were observed in first and second pregnancies[28]. Li and Brown[29] reported that as the age of the ewes increases until the age of 4.5, the lambing difficulty decreases, and after this age the lambing difficulty increases. Horton et al.[30] reported that the incidence of dystocia increased with the age of the sheep, but these old sheep mostly gave birth to triplets and were low birth weight lambs. In the present study, animals that did not give birth before were not used, those who gave birth normally and did not have any postpartum problems were selected and this issue was taken into account for the objective evaluation of the parameters to be considered.

Studies on oxidative stress are among the current issues and many studies are conducted in this area[31]. In those affected by dystocia, a higher degree of anxiety, muscle activity, and pain results in significantly higher cortisol concentrations at the time of delivery. Further increase in plasma cortisol concentration during obstetric procedures is the result of stressful procedures such as fetotomy or cesarean section1. This leads to the formation of (ROS), which causes peroxidation of placental membrane lipids, especially polyunsaturated fatty acids, thus resulting in lipid peroxidation/oxidative stress[1]. Elimination of the cause of stress and possibly the negative feedback effect of cortisol causes a decrease in cortisol levels in the postpartum days[32]. The precise determination of oxidative stress is based on a number of widely used analytical methods. In this context, oxidative stress can be monitored with various biomarkers that determine serum antioxidant and pro-oxidant levels[33]. Methods for measuring oxidative stress are mostly based on direct or indirect oxidant and antioxidant measurements[34]. The thiol group is one of the most important elements of the cellular antioxidant defense system, which takes an electron when interacting with free radicals and neutralizes free radicals[35]. Studies on thiol have been examined in many of the pregnancy complications in the field of human medicine. In a study comparing preeclamptic and normal pregnant women, they found the serum thiol level to be lower in the preeclamptic pregnant group compared to the control group[36]. When the relationship with abortion imminens (risk of miscarriage) was examined, a decrease was found in the level of thiol, which has an antioxidant role, and it was thought that the decrease in the antioxidant level may play a role in the etiopathogenesis of abortion imminens[37]. In a similar study, normal pregnant women with idiopathic intrauterine growth retardation (IUGR) and without any problems were compared, and impaired thiol level was found in the third trimester in pregnant women with IUGR[38]. Our study is compatible with the literature data, considering that the thiol level is low in stress situations in human studies. Dystocia cause stress to the animals, in parallel, we have seen that the native thiol and total thiol levels of the goats and kids who gave birth were lower than those who gave normal births. No studies have been found in the field of total thiol and native thiol in veterinary medicine. The present study represents a first in this sense.

V. Conclusion

As a result, significant differences were found in total thiol and native thiol levels in both goats and kids in the dystocia group compared to the normal birth group. Knowing the difference in these parameters, which are indicators of oxidative stress, it was concluded that there could be healthier and less offspring loss with timely measures.

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