EFFECT OF MATERNAL AGE ON PLACENTAL CHARACTERISTIC AND KID BIRTH WEIGHT

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Abstract

Optimum placental development influence fetal growth and may hence postnatal mortality of offspring. The aim of this study was to examine the effect of dam age on placental characteristics and kid birth weight in Saanen goats. The experiment were conducted on 10 youth goat singleton bearing Saanen does (ranging from 10 to 12 months of age) and 10 mature singleton bearing Saanen does (ranging from 3 to 4 years of age). Birth weight, kid’s sex and placental measurements were recorded within 12 h after parturition. Adolescent doe had significantly lower (P<0.05) kid birth weight and placental weight than those of mature doe. Also the total number of placental cotyledons dissected from the chorioallantois in mature does were significantly higher (P<0.05) than those of adolescent doe. There were positive correlation between kid birth weight and placental weight (0.795; P<0.01), kid birth weight and total cotyledons number (0.578; P<0.01) and placental weight and total cotyledons number (0.594; P<0.01). The results suggest that adolescent dams in the first parity may alter placental characteristics and fetal development resulting in a reduced kid birth weight from singleton gestations.

Key words: maternal age, placenta, cotyledon, fetal development, kid birth weight.

INTRODUCTION

The placenta is defined as a functional organ which provides nutrients, gases and waste exchange between the maternal and fetal systems (Igwebuike, 2010). Placental characteristics are important indicator of postnatal mortality of offspring in small ruminants (Ocak et al., 2014). Mellor and Stafford (2004) reported that postnatal viability of newborn is associated with placental growth and development during gestation. The caprine have polycotyledonary placenta and placentomes performs exchange between the maternal and foetal circulatory system (Ocak et al., 2014). Thus, exchange capacity of placental between the maternal and fetal systems in the caprine is depend on placental size and number of the placentomes (Ocak et al., 2014). Therefore the size, which is relationship with nutrient transfer capacity of the placenta, play a pivotal role in determining the prenatal growth trajectory of the fetus and hence birth weight and postnatal viability (Sen et al., 2013). Placental growth and development support consequent fetal development during mid- to late gestation (Redmer et al., 2004; Sen et al., 2013). Previous studies indicated that placental development during gestation is dominantly affected by maternal factors, especially nutrition levels (Owens et al., 1994; Wu et al., 2004; Sen et al., 2013). Also, many studies have demonstrated that there are relationships between weight of the placenta and birth weight of the newborn (Osgerby et al., 2003; Sen et al., 2013). Dwyer et al. (2005) reported that maternal age affected birth weight and placental characteristics. Moreover, Wallace et al. (2001) suggest that nutrient partitioning during gestation was changed to promote growth of the maternal body at the expense of the gradually increasing nutrient requirements of the gravid uterus and mammary gland in young growing females. Thus, adolescent dams have an increased risk of a major restriction in placental mass, and leads to a significant decrease in birth weight with high mortality rates within the first year of life (Wallace et al.,
Therefore, we hypothesized that adolescent dams in the first parity may alter placental development due to a large part of the nutrition intake deliver to continue body mass growth, resulting in change placental characteristics and birth weight. The aim of this study was to examine the effect of dam age on placental characteristics and kid birth weight in Saanen goats.

MATERIALS AND METHODS

The study was conducted on 10 adolescent (ranging from 10 to 12 months of age) and 10 mature singleton bearing Saanen does (ranging from 3 to 4 years of age) in normal breeding season. All does were pregnant by naturally mate using mixed multiple sires and housed under the same conditions.

Birth weight (BW) and the sex of kids were recorded within 12 h after parturition. Each doe was left to deliver the placenta naturally and placentas were collected from singleton gestations immediately after delivery; care was taken to ensure that any placental weight (PW) taken were of the total placenta with any fluid being removed before weighting. The total numbers (TCN) of placental cotyledons dissected from the chorioallantois were also counted and determined.

The effects of maternal age on placental characteristics and kid birth weight were analyzed using a completely randomized design by the General Linear Model (GLM) procedure of the SPSS package program. The sex of kids was used as a cofactor in the model to adjust the birth weight and the placental characteristics. Significant differences between means were tested using Duncan’s test and results were computed as mean ± s.e.m. Statistical significance was considered at P<0.05 and P<0.01. Relationships between variable traits for discrete data were determined with Pearson correlation analysis at the 95% confidence interval.

RESULTS AND DISCUSSIONS

Dwyer et al. (2005) reported that increasing maternal parity increased the lamb birth weight carried by ewes and younger ewes have low birth weight than older ewes. Similarly, in the present study adolescent does in the first parity produced kids with low birth weight compared to mature goats (Table 1).

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<th>BW (g)</th>
<th>PW (g)</th>
<th>TCN</th>
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<td>Adolescent</td>
<td>3098.5 ± 33.8&lt;sup&gt;b&lt;/sup&gt;</td>
<td>412.4 ± 26.3&lt;sup&gt;b&lt;/sup&gt;</td>
<td>118.0 ± 6.0&lt;sup&gt;b&lt;/sup&gt;</td>
</tr>
<tr>
<td>Mature</td>
<td>3757.3 ± 45.4&lt;sup&gt;a&lt;/sup&gt;</td>
<td>661.7 ± 30.6&lt;sup&gt;a&lt;/sup&gt;</td>
<td>132.0 ± 5.0&lt;sup&gt;a&lt;/sup&gt;</td>
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<sup>a,b</sup> Different superscript letters in the same column indicate significant difference (P<0.05).

As a general fact, the does may be used as stock breed once they reach to 60-70% of their adult weight. In the present study, although the adolescent does had sufficient live weight for breeding (approximately 30 kg), their some placental traits (placental weight and cotyledon numbers) found to be insufficient and they had low birth weight in their offspring compared to mature goats. Adolescent does relatively having lower body weight, might have caused a delay in feto-placental development during gestation, allowing in lower birth weight in kids. The underlying mechanism of this result can be explained that younger dams utilized dietary nutrients in high level for growth of body when their body weight is lower (Wallace et al., 2001). Otherwise, they might have decreased the transfer of nutrients to the feto-placental growth and development. In the other word, when the does are not reached the optimal breeding body weight, their priority would be their nutritional requirements rather than their fetus. For this reason, breeders should develop strategies fulfilling both maternal nutrient requirements, especially for younger pregnant does, and the feto-placental growth and development.

The results of present study demonstrated that increasing of maternal age increased placental weights and cotyledon numbers. Placenta of adolescent doe was lighter and contained fewer amounts of cotyledons than those of older doe (Table 1). Similarly, Konyali et al. (2007) indicated that the first parity does had lower placental weight and higher cotyledon density, but total numbers of cotyledon in per placenta were greater than higher parity does in contrast to our study. Ocak et al. (2013) also showed...
that maternal parity influenced placental traits and ewes in the 1-3 parities had lower placental weight, total cotyledon numbers and total cotyledon weights than those of ewes in the <3 parities, without affecting the cotyledon density. Dwyer et al. (2005) also reported that placenta weight and average cotyledon weight were not changed number of cotyledon, increased with ewe age or parity. Contrast to Ocak and Onder (2011) reported that placental weight was not influenced by parity, but total cotyledon numbers and total cotyledon weights were affected. Previous studies showed that low weight of placenta and reduced numbers of cotyledons associated with growth deficiency of fetus (Jenkinson et al., 1995; Greenwood et al., 2000; Dwyer et al., 2005). Therefore, these differences in placental weight, cotyledon number and total cotyledon weight by parity explained that adolescent doe carried lighter kids than mature goats in the second or third parities. The explanation of this situation is very difficult, but future experiments may be clarified with histological studies. On the other hand, reduced numbers of the cotyledons obtained from placentas of adolescent doe may show evidence of decreased growth of fetus in comparison to those of older does.

Previous studies reported that there was no significant correlation between birth weight and placental weight in sheep (Ocak et al., 2013) and goats (Ocak et al., 2014). However, in the present study pearson coefficient showed a significant positive correlation between birth weight and placental weight (0.795; \(P<0.01\), Figure 1). Echternkamp (1993), Dwyer et al. (2005) and Konyali et al. (2007) reported similar findings for beef cattle, sheep and goats. The positive correlation between kid birth weight and total cotyledons number (0.578; \(P<0.01\), Figure 1)obtained in the present study are in agreement with past studies in beef cattle and sheep (Echternkamp, 1993; Dwyer et al., 2005; Konyali et al., 2007). The positive correlation observed in the present study between placental weight and total cotyledons number (0.594; \(P<0.01\), Figure 1).

This result is support the findings of Ocak and Onder (2011) and Ocak et al. (2014). It was observed that increased placental weight causes an increase in total cotyledon number and kids’ birth weights.

CONCLUSIONS

In conclusion, the results of the present study imply that maternal age influence placental development and exchange capacity of placenta to fetus, which reflect variations in birth weight of kids. Especially, adolescent dams exhibit different placental morphology cause placental insufficiency.

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REFERENCES


TECHNOLOGIES OF ANIMAL HUSBANDRY
THE CONCENTRATION OF LACTOFERRIN AND ITS RELATIONSHIP WITH MINERALS AND AMINO ACIDS IN COWS MILK

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Abstract
Lactoferrin is a biologically active glycoprotein of the transferrin family found mainly in milk and to a lesser extent in other biological fluids as well as the secondary granules of neutrophils. As an iron-binding molecule, Lactoferrin is involved in the transport and excretion of iron but also known to bind to proteins such as IgA, casein, lysozyme and to DNA. This study aimed at establishing the relationships between Lactoferrin in cow milk and the concentration of minerals and amino acids. Ten Holstein Frisian cows in their first lactation were used in this study. Colostrum sample were collected immediately after parturition and milk samples were collected weekly for the first 60 days of lactation. Concentrations of minerals and amino acids in colostrum and milk samples were determined and used to construct the relationships between these variable and Lactoferrin concentration. The concentration of Lactoferrin in the colostrum was higher (P<0.05) than in milk (732.8 vs 350.3 mg /L). The concentration of Lactoferrin in milk declines with advancing lactation. The concentrations of some minerals (calcium, phosphorus, magnesium and iron) in colostrum were 130 mg /L, 0.82%, 76.00 mg /L and 16.52 ppm respectively. The correlation coefficient between the lactoferrin and calcium, phosphorus, magnesium were positive and significant namely, 0.665, 0.268 and 0.289 respectively. The correlation coefficient between lactoferrin and iron was negative and significant (-0.614). Moreover, the correlation coefficient between Lactoferrin and the methionine and Lucien were positive and highly significant (0.18125 and 0.33908 respectively), While with the non-essential amino acids was being positive and significant. It conclusion, lactoferrin has a tight relationship with main milk components, being has an important role for birth calves through its high percentages in colostrum. Also, the repeatability between lactoferrin and minerals has a pronounced importance for birth calves growth.

Key words: Lactoferrin, component minerals, amino acid, cow milk.

INTRODUCTION
Both milk and colostrum provide a complete food source for newborn calves. The colostrum is considered as the only source of primary acquired immunity for the newborn. The immune secretions in the breast, will be eliminated by specialized receptors, both colostrum and milk contain viable cells, which include cytokines, proteins and antimicrobial peptides such as lactoferrin, defenses, cathelicidins. The immune system in the colostrum is associated with the ability of the newborn’s intestine, allowing the passage of large molecules such as alklopeulenat molecules, as the concentrated immunity in the colostrum and intestinal permeability decreases rapidly and gradually in the first 48 hours of the baby’s life (Moore et al., 2005), so it is necessary for newborn calves to address an adequate amount of the colostrum during the period of his life to gain negative immunity and to be able to survive until the autoimmune system is fully develop. The immune factors, in milk and colostrum play an important role in defending the protected newborn from pathogenic organisms (Boyso – Oviedo et al., 2007.

The innate immune system is the essential line is to protect the body from infectious pathogens before the immune system in the saliva is initiated, as it represents a complex interaction between the cellular and molecular processes, which aims to discover the causes of harmful diseases and eliminating them at a later time, having the innate immune system evolution of the cow’s udder to a highly effective defense mechanism in the host (Rainard and Riolled, 2006), it has also been assumed that the udder itself may be an extension for the innate immune system (Vorbach et al., 2006).