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# IDENTIFICATION OF CHANGES IN BODY TEMPERATURE, VULVAR TEMPERATURE, VULVAR LENGTH AND WIDTH PRIOR TO PARTURITION IN SAPERA GOATS

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***ABSTRACT***

*Preparation for parturition in goats requires monitoring physiological indicators to improve the accuracy of predicting the timing of parturition and minimize the risk of birthing complications. This study aimed to identify changes in body temperature, vulvar temperature, vulvar length, and vulvar width prior to parturition in Sapera goats. This study utilized eight pregnant Sapera does observed for five days before kidding (D-5 to D0). Parameters analyzed included body temperature, vulvar temperature, vulvar length, and vulvar width, which were then evaluated using Analysis of Variance (ANOVA) and Tukey's HSD post-hoc test. The results showed that body temperature differed significantly (P<0.05), with a significant decrease occurring one day before parturition (D-1). Meanwhile, vulvar temperature, vulvar length, and vulvar width showed a shifting trend but were not significantly different. It is concluded that the decrease in body temperature one day prior to parturition can be used as a predictive indicator for the timing of birth in Sapera goats.*

***Keywords:*** *Body Temperature, Vulvar, Parturition, Sapera Goats.*

## Introduction

Goats are small ruminant livestock that have high economic value and are able to adapt to various environmental conditions, including areas with limited feed availability. In addition to relatively low maintenance costs, goats also possess good reproductive capabilities, making them widely cultivated in Indonesia. The goat population in Indonesia reached 15,710,055 in 2024 (Badan Pusat Statistik, 2025). One of the goat breeds with great potential for development is the Sapera goat. The Sapera goat is a dairy goat breed that has the highest milk production compared to Peranakan Etawa (PE) and Anglo Nubian goats (Rusdiana et al., 2016). Furthermore, Sapera goats exhibit rapid growth and good adaptability to tropical environments, making them highly potential for development in various tropical regions, both in small-scale and commercial farming systems.

The success of goat farming operations is influenced by reproductive management, particularly during the late gestation phase to parturition. Prior to parturition, the doe undergoes physiological changes, such as fluctuations in body temperature and changes in the vulva, which can be used as indicators that the birthing time is approaching (Del'Aguila-Silva et al., 2023). However, in-field birth detection still largely relies on the intuition or experience of the breeder, frequently leading to delays in handling during parturition. Therefore, the observation of prepartum physiological changes is crucial as a basis for developing more accurate birth predictions. Previous research on Sapera goats indicated that estrus characteristics can vary based on the doe's parity, demonstrating the existence of reproductive physiological variations in Sapera goats (Kumala et al., 2021). Nevertheless, information regarding the physiological changes occurring prior to birth, specifically body temperature and vulvar changes during the prepartum period, remains limited. This study aims to observe prepartum physiological changes in goats to support reproductive management and improve preparedness for birth handling.

## Materials and Methods

This study utilized eight pregnant Sapera does aged 2-4 years (average 3.13 ± 0.350), with a body

weight of 32-40 kg (average 36.13 ± 0.854), and in their 1st to 3rd lactation as the research subjects. The does were maintained in individual elevated pens measuring 1.5 × 1 meter per head and were fed regularly with a combination of fresh forage, silage or fermented feed, and concentrates to meet their nutritional requirements, provided in the morning and afternoon. Drinking water was provided *ad libitum* using easily cleanable waterers. Observations and measurements were conducted from five days prior to parturition (D-5 to D-1) up to the day of kidding (D-day, the day the kids were fully expelled). The parameters observed included body temperature, vulvar temperature, vulvar length, and vulvar width. Body temperature and vulvar temperature were measured using an infrared thermometer gun, whereas vulvar length and width were measured using Vernier calipers with a scale of 0-15 cm and an accuracy of 0.01 cm. All measurements were performed in the morning between 07:00 and 08:00 AM. The collected measurement data were then analyzed using Analysis of Variance (ANOVA), followed by Tukey's HSD post-hoc test. The level of significance was set at 0.05.

## Results and Discussion

### Pattern of Body Temperature Changes Prior to Parturition in Sapera Goats

Body temperature is one of the physiological indicators that can be monitored to predict the time of parturition in goats. Prior to kidding, the doe undergoes hormonal changes that affect her physiological state, including body temperature, as shown in Figure 1.

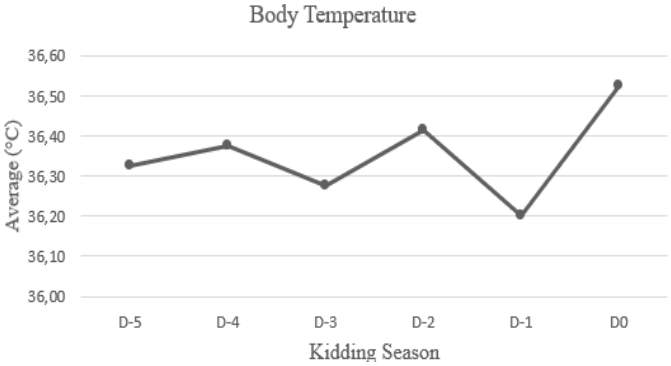


Figure 1. Pattern of body temperature changes

The average body temperature of Sapera does show a changing pattern from five days prior to kidding (D-5) until the day of kidding (D0). From D-5 to D-2, the average body temperature tended to increase, despite a slight decrease on D-3. Subsequently, on D-1, the body temperature experienced a substantial decline and reached its lowest value during the observation period, before increasing again on the day of kidding.

The results of the analysis of variance showed that the body temperature of the does prior to parturition changed significantly ($P<0.05$). Tukey's HSD post-hoc test indicated a significant difference between D-1 and D0. However, the body temperatures on D-2, D-3, D-4, and D-5 were not significantly different from each other, nor from D-1 and D0. This condition indicates that the most distinct change in body temperature occurs within the 24-hour window before parturition.

The decrease in body temperature on D-1 is a physiological indication closely related to hormonal changes, particularly the decline in progesterone levels (Monteiro et al., 2024). Progesterone has a thermogenic effect that helps maintain body temperature during pregnancy (Wrenn et al., 1958). Prior to parturition, progesterone levels drop, thereby reducing this thermogenic effect and causing the body temperature to decrease accordingly. Following parturition, the body temperature increases again, which is presumably related to elevated metabolic activity and the activity of the prolactin hormone during the lactation process (Svennersten-Sjaunja & Olsson, 2005). The findings of this study are in line with previous research in sheep (Nabenishi & Yamazaki, 2017; Abecia et al., 2019) and cattle (Monteiro et al., 2024), which demonstrated that body temperature tends to decline prior to parturition. Therefore, body temperature can be utilized as an important indicator in predicting the time of kidding in Sapera goats.

### Pattern of Vulvar Temperature Changes Prior to Parturition in Sapera Goats

Changes in vulvar temperature prior to parturition are related to physiological and hormonal alterations in the doe, as shown in Figure 2. Approaching kidding, various biological processes take place to prepare the maternal body for parturition.

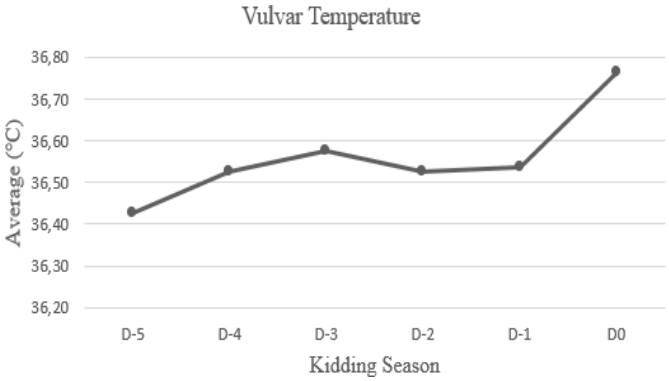


Figure 2. Pattern of vulvar temperature changes

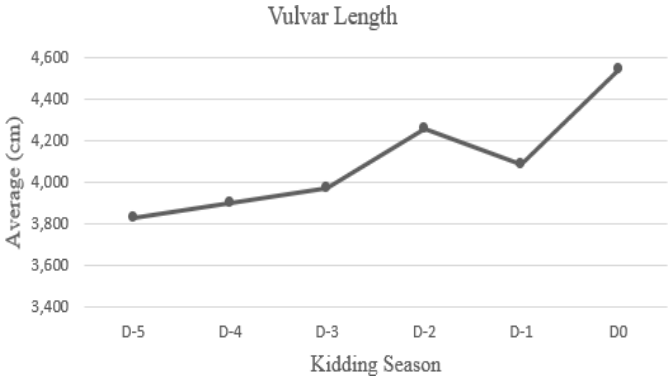


Figure 3. Pattern of vulvar length changes

Data showed that vulvar temperature tended to increase during the observation period. The increase occurred from D-5 to D-3, then slightly decreased on D-2, remained relatively stable on D-1, and increased again on the day of kidding, reaching its highest value. Nevertheless, the results of the analysis of variance indicated that the changes in vulvar temperature were not significantly different. The lack of significance in vulvar temperature changes is presumably due to the distinct temperature responses of different body parts to physiological changes prior to parturition (Cortu & Kahraman, 2025). Furthermore, the observation period was conducted during the preparation phase for fetal expulsion, meaning that the ongoing hormonal changes did not directly produce significant variations in vulvar temperature. Although core body temperature decreased significantly prior to kidding, this alteration was not accompanied by a significant change in vulvar temperature. This result is in line with previous studies demonstrating that temperature variations in reproductive organs exhibit lower sensitivity compared to core body temperature when predicting the timing of parturition (Geiser et al., 2013).

**Pattern of Vulvar Length Changes Prior to Parturition in Sapera Goats**

Vulvar length is one of the parameters that can undergo alterations prior to parturition due to hormonal fluctuations during late gestation. Theoretically, vulvar size increases as a result of elevated vascularization, tissue edema, and relaxation of the reproductive tissues. However, based on Figure 3, the analysis results in Sapera does demonstrated a relatively stable pattern.

The average vulvar length showed an increasing tendency during the observation period. The mean value increased gradually from D-5 to D-2, then slightly decreased on D-1, and increased again on the day of kidding. Despite this increasing tendency, the results of the analysis of variance indicated that vulvar length did not undergo any significant changes during the five days prior to parturition. The lack of significance in vulvar length changes in this study is presumably because the observation period was conducted when the physiological preparation processes for parturition were already underway. Consequently, most of the vulvar alterations had likely occurred before the observation period commenced. Furthermore, external signs prior to parturition vary, both among individuals and between different pregnancies within the same animal; thus, external changes such as alterations in the udder, vulva, and pelvic ligaments do not always demonstrate significant changes (Purohit, 2010).

**Pattern of Vulvar Width Changes Prior to Parturition in Sapera Goats**

Vulvar changes are generally influenced by the elevation of reproductive hormone activity and increased blood flow to the genital area during the pre-partum period. As presented in Figure 4, the analysis results showed that the average vulvar width increased from D-5 to D-1 and reached its highest value on D-1. On the day of kidding, the average vulvar width slightly decreased. However, the results of the analysis of variance indicated that there was no significant effect of the observation days on the vulvar width of Sapera does.

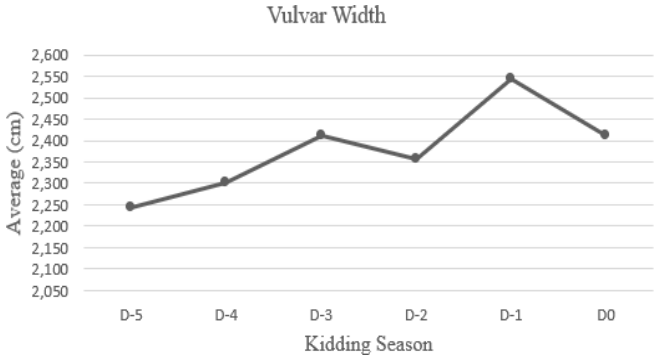


Figure 4. Pattern of vulvar width changes

The analysis results indicated that the vulvar width of Sapera does did not undergo significant changes, remaining relatively constant prior to parturition. Previous research in sheep (Uçmak et al., 2026) demonstrated that the vulvar lips undergo swelling, thickening, softening, and tissue relaxation prior to parturition due to elevated estrogen levels, increased vascularization, and fluid accumulation in the tissue (edema). However, the results obtained in this study were not significant. The lack of significance in vulvar width changes is presumably because tissue fluid accumulation and increased vascularization exert a greater influence on tissue thickness and elasticity rather than altering the vulvar width itself. Furthermore, parturition is a complex process influenced by maternal, fetal, and hormonal factors, which can cause physiological responses to vary among individuals (Purohit, 2010). Consequently, clinical signs prior to kidding, including changes in vulvar width, do not always demonstrate significant changes.

## Conclusion

The results of the study indicated that only body temperature underwent a significant change prior to parturition. The pattern of body temperature alterations demonstrated a decrease one day prior to parturition and increased again on the day of kidding. This indicates that this parameter holds the greatest potential to be utilized as a predictive indicator for the timing of parturition in Sapera goats. However, body temperature cannot be used as the sole predictive diagnostic for impending parturition without the presence of other parameters.

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