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Follicular dynamics in Anglo-Nubian goats using transrectal and transvaginal ultrasound

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Abstract

The objective of the current trial was to characterize the follicular dynamics, the time of ovulation and to determine the efficiency of transrectal linear versus transvaginal microconvex endocavitary ultrasound transducers, under tropical conditions. The estrous cycles of goats were subjected to daily ultrasound evaluation for 2 cycles, alternating linear and microconvex transducers. The pattern of follicular growth was characterized by 3 or 4 follicular waves. Follicular wave emergence occurred at days 1.0 ± 0.0, 5.17 ± 1.06, 10.63 ± 2.01 and 14.5 ± 0.33 during the first estrous cycle, and at days 1.17 ± 0.24, 5.33 ± 0.47, 11.17 ± 1.34 and 16.5 ± 0.99 during the second estrous cycle. Similarly the interval between the follicular waves was 4.17 ± 1.05, 5.67 ± 1.07, 5.33 ± 0.70 and 5.75 ± 0.72 days for the first estrous cycle and 4.17 ± 0.43, 5.83 ± 1.05, 7.17 ± 0.99, 6.75 ± 0.72 days for the second estrous cycle. No difference between cycles regarding the timing of follicular wave emergence and interval between follicular waves was recorded. The diameter of the ovulatory follicle was 5.4 ± 0.46 mm and 5.3 ± 0.23 mm in goats with 3 and 4 follicular waves, respectively. The microconvex transducer caused less animal discomfort, allowed faster visualization of the ovaries and produced higher quality images, compared to the linear transducer. In conclusion, it can be said that follicular growth in Anglo-Nubian goats under tropical conditions was characterized by a wave-like pattern which did not differ between estrous cycles and could facilitate more efficient control of ovulation.

Keywords: Follicular dynamics; Ultrasonography; Transrectal; Transvaginal; Goats

1. Introduction

The application of reproductive biotechnologies such as artificial insemination and embryo transfer requires a complete understanding of the events regulating female physiology. This knowledge is necessary to control and synchronize follicular development and ovulation in order to maximize reproductive efficiency during breeding programs (Rubianes and Menchacab, 2003).

In cattle and horses, follicular development detected by ultrasound has demonstrated a wave-like pattern of follicular development as well as follicular growth phases such as recruitment, selection, dominance and atresia (Evans, 2003). In contrast, there are limited studies in which ultrasound has been used to determine the

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pattern of goat follicular development under tropical conditions (Cruz et al., 2005) or goat follicular growth following superovulation treatment (Dorn et al., 1989; Salmito-Vanderley et al., 1999; Castro et al., 1999). In goats with an interovulatory cycle of normal length (19–22 days), the number of follicular waves is usually 4 (Ginther and Kot, 1994; Schwarz and Wierzchos, 2000; Menchaca and Rubianes, 2002). Melo Filho (2002) however followed one estrous cycle of Anglo-Nubian crossbred goats and observed 3 follicular waves. Similar results have been obtained by Cruz et al. (2005) on Saanen and Anglo-Nubian goats, in a tropical environment.

The objective of the current trial was to characterize the pattern of follicular dynamics, determine the time of ovulation and to compare the efficiency of the transrectal linear versus transvaginal microconvex endocavitary ultrasound transducers to monitor the follicular dynamics of Anglo-Nubian goats raised under a tropical environment.

2. Materials and methods

This study was conducted at the Federal Rural University of Pernambuco in Recife, Brazil from January to March 2003 (Latitude (S) 8°3′ and Longitude (W) 34°55′). The study was performed on 6 pluriparous Anglo-Nubian does of 40–45 months of age weighing 35–40 kg. The females were fed 400 g of concentrated diet per day together with mixed grass (*Pennicetum purpureum*, *Pannicum maximum*, *Artocarpus integrifólia*), minerals and water *ad libitum*.

Prior to the experimental period, the frequency, length and intensity of estrous was monitored 3 times a day (from 6:00 to 7:00 am, from 12:00 to 13:00 pm and from 17:00 to 18:00 pm) for 3 consecutive estrous cycles, with the aid of a teaser animal (prepuce/penis-deviated buck). After the third estrous cycle, each doe was evaluated twice daily (7:00–9:00 am and 15:00–17:00 pm) in an environmentally acclimatized chamber. The time of ovulation was determined via the use of a 240 Parus ultrasound apparatus (Pie Medical, Maastrich-Holanda) equipped with a linear (6.0 and 8.0 MHz) and microconvex (5.5 and 7.5 MHz) transducer, with a printer (Seikosha VP-1200, Fukuda-Japan).

Follicular dynamics of the previously naturally synchronized does was monitored daily from 9:00 am to 13:00 pm by the same technician using both transducers. Linear and microconvex transducers were alternated each day. So for example, on one day does were first scanned with the linear transducer and on the following day the microconvex transducer was first used. The time of follicular wave growth was characterized by a simultaneous growth of follicles $\geq$2 mm and the time of ovulation was defined as the lack of dominant follicle observed in a previous visualization associated with the presence of a corpus luteum in the same position.

Data were analyzed using a Wilcoxon Signed-Ranked test to compare the data between the two estrous cycles for each follicular wave pattern and Friedman test to compare the data between waves in each cycle. Differences of $p < 0.05$ were considered to be significant.

3. Results

The pattern of follicular growth differed between does. Two (33.3%) of the does had 3 follicular waves and 4 (66.6%) of the does exhibited 4 follicular waves.

In goats with 3-wave cycles the mean duration of the first and second estrous cycle was 19.5 ± 0.8 and 22.0 ± 0.8 days, while in goats with a 4-wave cycles the mean duration of the first and second estrous cycle was 20.7 ± 0.7 and 23.2 ± 1.5 days, respectively. For all the 6 goats, the mean duration of the first and second estrous cycle was 20.3 ± 0.8 and 22.8 ± 1.3 days, respectively. These differences were not statistically significant. No wave of follicular growth was recorded between the two estrous cycles.

In 3-wave cycle does follicular wave emergence occurred on days 1.0 ± 0.0, 6.7 ± 0.5 and 14.0 ± 1.2 (Fig. 1), and in 4-wave cycles does follicular wave emer-

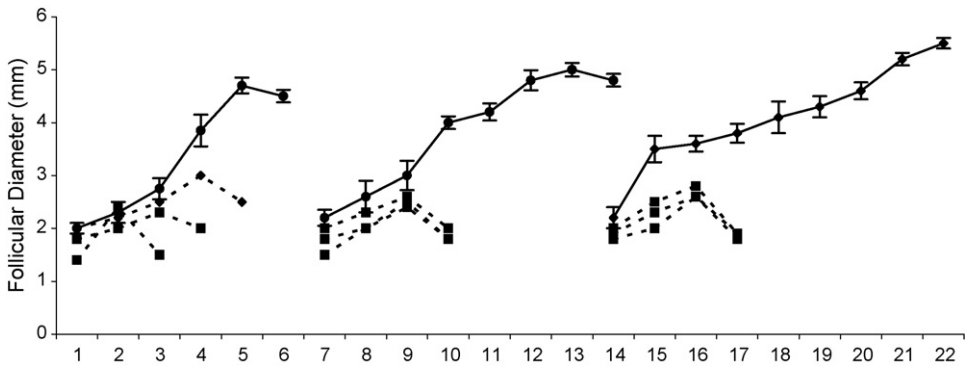

Fig. 1. Follicular dynamics ($\bar{X} \pm$ S.E.M.) in goats with 3-wave pattern of follicular growth.