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Morphometry of ovarian structures by transrectal ultrasonography in Serrana goats

J. Simões^{a,*}, J. Potes^b, J. Azevedo^a, J.C. Almeida^a, P. Fontes^a,
G. Baril^c, R. Mascarenhas^d

^a University of Trás-os-Montes e Alto Douro, Apartado 1013, 5000-911 Vila Real, Portugal

^b University of Évora, 7000-803 Évora, Portugal

^c INRA, Physiologie de la Reproduction et des Comportements, 37380 Nouzilly, France

^d INIAP, Estação Zootécnica Nacional, 2000-763 Vale de Santarém, Portugal

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Abstract

The accuracy of transrectal real-time ultrasonography (RTU) scanning technique to detect ovarian structures (follicles and corpus luteum) of Serrana goats was compared to the data obtained by observation of ovarian sequential slices. This slicing technique (SLI) was considered as reference method. The laparoscopy and laparotomy techniques were also used for corpora lutea identification. For this purpose the ovaries of 14 females were observed, 7–8 days after ovulation, by transrectal ultrasonography followed by laparoscopic examination. Then ovaries were removed and studied by slicing. In the sliced sections of each ovary ($n = 28$), follicles and corpus luteum (CL) were identified and counted. CL and follicular diameters were measured using a millimetre scale.

The total number of follicles, counted by RTU, was significantly lower than that observed by SLI ($P < 0.01$). This difference was mainly due to the under estimation of <2 mm follicles category. The correlation coefficient between category data obtained by RTU and SLI methods for the number of follicles ≥ 3 mm was high ($r^2 = 0.95$, $P < 0.001$), which highlights the use of UTR as a potential methodology to study the follicular dynamic of goats.

There were no significant differences ($P > 0.05$) between the average number (mean \pm S.D.) of corpus luteum identified per ovary by RTU (0.71 ± 0.75), laparoscopy (0.58 ± 0.71), laparotomy (0.67 ± 0.76) or SLI (0.83 ± 0.76) methods. The accuracy for the identification of ovulation, validated by CL detection on D7–D8 by SLI (100%), was 91.7%, 87.5% and 83.3% by RTU, laparotomy and laparoscopy, respectively. The negative predictive value of RTU, laparotomy and

*Corresponding author.

E-mail address: jsimoes@utad.pt (J. Simões).

laparoscopy to verify the absence of a CL in the ovary was 81.8%, 75.0% and 69.2%, respectively. The specificity of all three methods for the CL identification was 100%. No significant differences ($P > 0.05$) were found in the probability to detect the exact number of CL (0, 1 or 2) counted in each ovary between the RTU (87.5%), laparotomy (83.3%) and laparoscopy (75.0%) methods when compared with the reference method.

The diameter of spherical CL could be estimated with reliability ($r^2 = 0.86$; $P < 0.001$). The real-time ultrasonographic scanning proved to be a highly accurate method for detection and measurement of several categories of follicles and CL size in Serrana goats. The results of the present study show that laparoscopy and RTU are similarly reliable techniques for CL detection. However, the RTU represents a non-traumatic technique with advantages to animal welfare both in experimental and reproductive evaluation of the size of ovarian structures.

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1. Introduction

Real-time ultrasonographic scanning permits the study of ovarian structures in small ruminants and, as a result, the monitoring of their evolution by successive observations. As a non-invasive method, it presents great advantages when compared with laparoscopy or laparotomy. This technique is less stressful, administration of anaesthetics and sedative agents are not necessary and successive observations can be performed without causing adverse effects (e.g.: internal adhesions and infections) and the complete scanning of ovarian structures is possible. However, high levels of training are necessary for the ultrasonographic technique to be compatible with good livestock practice and animal welfare. On the other hand, a routine identification of ovaries and their structures could be difficult or not possible in some stages of sheep and goat oestrous cycle (Buckrell, 1988).

Several studies have been done in superovulated goats to determine the accuracy of ultrasonography for detection of ovulation rate (Riesenberg et al., 1998), the presence of follicles (Dorn et al., 1989) or preovulatory follicles (Menchaca et al., 2001) and time of ovulation (Suyadi and Holtz, 1998). Recently, the validation of RTU technique to evaluate the number of large follicles (Baril et al., 1999), the ovulation time (Baril et al., 2000) and the number of corpora lutea related to the phase of the oestrous cycle (Bouttier et al., 2000) in goats was reported. In the greater part of these studies, the accuracy of transrectal RTU was evaluated by comparison with only a referential method, such as laparoscopy (Baril et al., 2000 and Bouttier et al., 2000), laparotomy (Menchaca et al., 2001) or ovarian dissection (Dorn et al., 1989 and Baril et al., 1999). To our knowledge, the evaluation of the number of corpus luteum counted by RTU, laparoscopy or laparotomy methods and their relationship with slicing method has not yet been performed.

The purpose of this experiment was to evaluate the accuracy of transrectal ultrasound scanning to estimate the number and size of follicles and corpus luteum (CL) and to compare this method with laparoscopy and laparotomy on day 7 or 8 after ovulation. The slicing technique was used as a reference method.

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