Pregnancy detection by transrectal and transabdominal ultrasonography in goats

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SUMMARY

Real-time ultrasonography for early pregnancy detection in goats was performed either transrectally or transabdominally. The aim was to determine at what stage of pregnancy it is possible to reliably detect uterine fluid or fetuses by either method. Boer goats were mated and, in a first experiment, ultrasonic examinations were performed on 15 animals at 3.5 d intervals from d 15 to d 50 of pregnancy. In a follow-up experiment, 35 animals were scanned daily between d 15 and the ocurrence of a positive diagnosis. The transrectal and transabdominal ultrasonography was performed using a real-time scanner. In Experiment 1 measurements were conducted at 3.5 day intervals. Uterine fluid was recognized with a transrectal transducer by d 21.9±0.5 (mean±SEM) and fetuses by d 26.0±0.6. With a transabdominal transducer, uterine fluid was first seen on d 26.4±0.5 and fetuses on d 33.1±0.9. In Experiment 2 measurements were conducted daily. With a transrectal transducer, uterine fluid was first recognized on d 19.5±0.3 and fetuses on d 22.9±1.7. With a transabdominal transducer uterine fluid was first seen on d 24.7±0.4 and fetuses on d 29.1±0.6. In conclusion, ultrasonography may serve as a reliable means to detect pregnancy early in the fourth week after mating when using a transrectal probe and toward the end of the fourth week when using a transabdominal transducer.

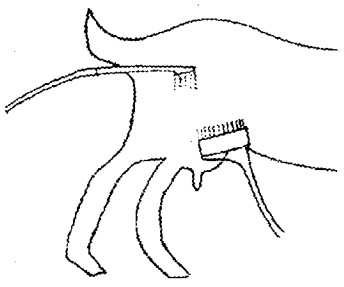
INTRODUCTION

Until recently there was no reliable way of pregnancy detection in goats. A suitable technique, however, could fullfill an important role. Under intensive husbandry conditions non-pregnant does can be eliminated from the breeding flock to save on expenses for feeding, vaccinations etc. Under extensive conditions, pregnant does may receive supplementary feeding. Although transrectal or transabdominal real-time ultrasonography has been shown to provide a reliable means of pregnancy diagnosis in sheep (Buckrell 1988; Haibel and Perkins 1989; Sergeev et al., 1990; Garcia et al., 1993; Schrick and Inskeep 1993; Kaulfuss et al., 1996a; Doize et al., 1997), in the goat there have been but few reports (Botero-Herrera et al., 1984; Martinez et al., 1998; Padilla and Holtz 1999). Kühholzer and Brem (1999) applied the technique to obtain early results about embryo survival in embryo transfer programs. Pregnancy diagnosis may be based on the imaging uterine fluid and the amniotic vesicle or the embryo with its heartbeat. (Gearhart et al., 1988; Lavoir and Taverne 1989; Russel 1990; Reichle and Haibel 1991; Zipper et al., 1997; Kaulfuss et al., 1997; Martinez et al., 1998). The aim of the present study was to determine at what stage of pregnancy uterine fluid or fetuses with heartbeat may be reliably detected by transrectal or transabdominal real-time ultrasonography in Boer goats.

MATERIALS AND METHODS

Nulliparous and parous female Boer goats aging 1 to 7 years, maintained at the Institute of Animal Husbandry and Genetics of the University of Goettingen, Germany, were mated. In the first of two experiments 15 mated does were tested for pregnancy at 3.5 day intervals from 15 to 50 days after mating. This was accomplished by ultrasonography using a real-time scanner (ALOKA SSD 500) equipped with a 7.5 MHz linear-array transducer for transrectal ultrasonography and a 3.5 MHz linear-array transducer for the transabdominal approach. In a follow-up experiment, 35 animals were scanned daily from day 15 after mating until pregnancy was confirmed. Due to the dense winter coat of the animals the hair to the right side of the udder had to be clipped. One person restrained the doe in a standing position. The rectum was manually cleared of feces and the transducer, lubricated with carboxymethylcellulose was introduced (Figure 1). It was gently advanced until the bladder was displayed on the screen. The uterine horns are located cranial to the bladder. Once they were localized, the entire reproductive tract was inspected by rotating the transducer 90° clockwise and then 180° counterclockwise. When conducting transabdominal ultrasonography (Figure 1) the transducer was covered with vegetable oil instead of contact gel and was applied to the clipped skin area and directed toward the uterus. Does were considered pregnant when amniotic fluid and/or fetuses displaying heartbeat were located on three consecutive days.

Figure 1
Transrectal and transabdominal ultrasonography in goats.



RESULTS

With the first experiment uterine fluid was first observed on day 21.9 ± 0.5 (mean ± SEM) with the aid of a transrectal transducer. Four days later (26.0 + 0.6) fetuses and heartbeat could be detected. When applying the transabdominal transducer, uterine fluid was discovered on day 26.4 ± 0.5 whereas fetuses were recognized seven days later on day 33.1 ± 0.9. With both parameters the differences between the two approaches were statistically significant ($P<0.01$; Scheffé-test).

Table 1
Detection of uterine fluid and fetuses with heartbeat by transrectal (7.5 MHz linear-array transducer) and transabdominal (3.5 MHz linear-array transducer) ultrasonography in Boer goats (n=35).

Method	Uterine fluid Mean	SEM	Fetus with heartbeat Mean	SEM
Transrectal	19.5	0.3	22.9	1.7
Transabdominal	24.7	0.4	29.1	0.6

Within columns and rows, values were significantly different (P<0.01; Scheffé-test)

With the follow-up experiment the transrectal probe enabled us to detect uterine fluid by day 19.5 ± 0.3. Three days later, on day 22.9 ± 1.7, fetuses were observed (Table 1). With the transabdominal transducer, uterine fluid was seen on day 24.7 ± 0.4, 4 days later, on day 29.1 ± 0.6, fetuses were recognized. The differences between transrectal und transabdominal ultrasonography were statistically significant (P<0.01; Scheffé-test).

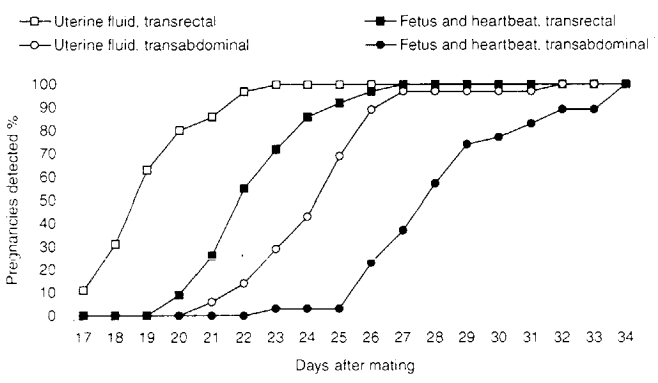
As shown in Fig. 2, with a transrectal probe reliable pregnancy detection on the basis of uterine fluid was possible by day 23 of pregnancy; fetuses were visualized in all does by day 27. With the abdominal approach the corresponding times were 27 and 34 days.

DISCUSSION

Transrectal Procedure

In the present experiment, with the transrectal approach uterine fluid was observed by day 20 after mating using a 7.5 MHz transducer. Using a 5.0 MHz transducer Martinez et al. (1998) reported that in Anglo Nubian goats uterine fluid was detected two days earlier (Day 18). The difference may be explained by the different transducer frequencies. Lower frequencies have a deeper penetration. Perhaps in animals in a standing position this is advantageous. Fetal heartbeat was seen by day 23 after mating in our investigation, compared to day 21 reported by Martinez et al. (1998) in Anglo-Nubian goats using a 5.0 MHz transducer. Again frequency of the transducer may play an important role. Another point to be considered is the position of the animal during the measurement. In ewes, uterine fluid was recognized as early as day 15 after mating and the fetal heartbeat by day 19 with a 7.5 MHz transducer if the animals were positioned in dorsal recumbency (Schrick and Inskeep 1993). Dorsal recumbency is a position easily established in sheep, whereas in goats it implies vigorous protest and struggle and is, therefore, not practicable.

Figure 2
Realiability of pregnancy detection in 35 pregnant Boer goats does examined daily.



Transabdominal Procedure

In the present study, uterine fluid was recognized by day 25 after mating with the abdominal approach using a 3.5 MHz transducer. Fetal heartbeat was detected by day 29. For both cases, no comparable findings have been reported for goats in the literature. In comparison to these results, in the ewe with another transducer frequency (5.0 MHz) similar results were reported for the detection of uterine fluid (Gearhart et al., 1988). The detection of fetal heartbeat in our study was a few days earlier than reported in ewes. According to Gearhart et al.(1988) in ewes in standing position fetal heartbeat by was detected between 25 and day 50, where Kaulfuss et al. (1996b) found it by day 34 using a 5.0 MHz tranducer. The use of the lower frequency transducer (3.5 MHz) used in the present study could have been responsible for our detection of fetal heartbeat of an earlier stage.

In conclusion, ultrasonography may serve as a reliable means of pregnancy detection in the goat. The earliest stage of pregnancy detection depends on the type of probe used (transrectal vs transabdominal) and the frequency range of the ultrasound waves.

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