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Early pregnancy diagnosis in ewes by means of transrectal real-time ultrasonography (short communication)

Summary

This study was performed to determine the optimum time for early pregnancy diagnosis with transrectal scanning in ewes. A total of 42 ewes was examined, using a real-time 5 MHz linear-transducer from day 19 to 29 (Group I, n=22) and from day 30 to 44 (Group II, n=20) after AI or natural mating. Ultrasonic results were compared with lambing records. Accuracy, sensitivity, specivity, positive and negative predictive values for these tests were 77.3%, 84.2%, 33.3%, 88.9%, 25.0% in Group I, and 80.0%, 74.3%, 85.7%, 90.9% and 53.8% in Group II, respectively. No significant differences were seen between the accuracy and positive predictive values of Group I and II. It was concluded, that the accuracy of pregnancy diagnosis by real-time transrectal ultrasonography can be high already 19 to 29 after AI or natural mating.

Key Words: ovine, ultrasound, pregnancy diagnosis

Zusammenfassung

Titel der Arbeit: Frühe Trächtigkeitsdiagnose mittels Ultraschall bei Schafen (Kurzmitteilung)
Die vorliegende Studie wurde an 42 Schafen durchgeführt um die optimale Zeit für eine frühe rektale Trächtigkeitsdiagnose mittels Ultraschall zu bestimmen. Die Tiergruppe I wurde vom 19. bis 29. Tag nach künstlicher Besamung und die Gruppe II vom 30. bis 44. Tage nach dem Natursprung untersucht Die Ultraschallmessergebnisse konnten mit den Ablammergebnissen verglichen werden. Für die Genauigkeit, Empfindlichkeit, Spezifik, die positive oder negative Voraussage der gefundenen Werte ergaben sich in Gruppe I 77,3 %, 8,2 %, 33,3 %, 88,9 %, 25,0 % in der Gruppe II 80,0 %, 74,3 %, 85,7 %, 90,9 % bzw. 53,8 %. In beiden Gruppen wurden keine signifikanten Unterschiede zwischen dem Genauigkeitswert und dem positiven Trächtigkeitsergebnis gefunden. Es konnte geschlußfolgert werden, dass die frühe Trächtigkeitsdiagnose mittels Ultraschall bereits am 19. bis 29. Tag nach der Befruchtung eine hohe Genauigkeit erbringt.

Schlüsselwörter: Schaf, Ultraschall, Trächtigkeitsdiagnose

Introduction

Early pregnancy diagnosis is an important economic issue in sheep production. Unfortunately there are only few methods for early pregnancy diagnosis in sheep, based on immunological or biochemical methods. Requirement of laboratory facilities, low reliability and accuracy rates, and being improper and uneconomical make all these methods impractical in field (RICHARDSON, 1972; RUSSEL, 1989; WATT, 1984). More recently the use of the linear-array real-time ultrasonography for the diagnosis of pregnancy has been reported in sheep by WHITE et al. (1984). The use of transabdominal ultrasonography for pregnancy diagnosis is often preferred in sheep in the field. The pregnancy can be determined by transabdominal ultrasonography 30 days after breeding. Its application is recommended between day 40 and 80 after breeding because of its high accuracy rate (WHITE et al., 1984; TAVERNE et al., 1985; BUCKRELL, 1988). Moreover pregnancy can be determined transrectally by

means of ultrasonography. The principles and techniques of transrectal ultrasonography in sheep have been reviewed (BUCKRELL et al., 1986; BUCKRELL, 1988; GEARHART et al., 1988; GARCIA et al., 1993; SCHERICK and INSKEEP, 1993). The authors showed the successful pregnancy diagnosis using 5 MHz transducer after day 25 of gestation. The earliest indication of pregnancy, based on scanning extraembryonic fluid and membranes, has been observed on day 15 after breeding (SCHERICK and INSKEEP, 1993). GEARHART et al. (1988) and GOLL et al. (1992) reported the earliest detection of pregnancy on day 18 and 20 with variable accuracy. This study was presented to determine the optimum time for early pregnancy diagnosis by means of real-time transrectal ultrasonography in sheep with respect to two different time periods of pregnancy.

Materials and Methods

A total of 42 ewes of different breeds and their cross (Awassi, Corriedale, Karaman, Merino and Awassi x Akkaraman cross) between 2 and 7 years of age, were used at two Goverment Breeding Farms. The ewes were separated into two groups. In group I ewes (n = 22) were subjected to artificial insemination and examined 19 to 29 days later. In group II ewes (n = 20) were mated naturally 30 to 44 days prior to ultrasonographic examination.

The ewes were not withheld from food and water before ultrasonography. During the examination each ewe was placed in dorsal recumbence in a tilting cradle in group I. Ewes of group II were in a standing position during examination. A portable scanner (480 Vet, Pie Medical, Maastricht, The Netherlands) with a 5 MHz rectal transducer was used. The probe was fitted into rectal rod (3 x 64 cm) and contact gel was applied to the surface of the transducer and rod to provide better contact and lubrication. The rod was inserted into the rectum, 15 or 20 cm deep, to be able to scan the uterine horns. The surface of the transducer was first towards the right ileum to scan the bladder and then it was rotated 120° to 180° clockwise or counterclockwise across the uterine horns to scan the entire pelvic region in each group.

The pregnancy was diagnosed, using one or more of following criteria: luminised and fluid filled uterine horns, embryonic vesicles, foetal pole or body of the foetus, foetal heart beats and placentomes, depending on the status of pregnancy. But when the first two were imaged, no further criteria were necessary. Ultrasonic results were recorded and then compared with actual lambing records. The accuracy, sensitivity, specifity, positive and negative predictive values were calculated as described by BUCKRELL et al. (1986), TAVERNE et al. (1985) and GEARHART et al. (1988) to assess the performance of the ultrasonographic technique. Student's t-test was used to prove differences between the two groups.

Results and Discussion

Ewes in group I and II were ultrasonographically examined on different days of pregnancy (Table 1).

According to the actual lambing records, 32 ewes lambed and 10 ewes not lambed. Four of 32 ewes lambed twins, 3 of which was in group I. The determination of litter

Table 1
Pregnancy period of the ewes on day of ultrasonographic examination (Trächtigkeitstag der Schafe zum Zeitpunkt der Messung)

| Group I | | Group II | |
Stage of pregnancy	Number of animals (n)	Stage of pregnancy	Number of animals (n)
Day 19	1	Day 30	3
Day 20	2	Day 32	3
Day 22	4	Day 34	1
Day25	1	Day 35	2
Day 26	2	Day 37	2
Day 27	5	Day 40	2
Day 28	3	Day 41	2
Day 29	4	Day 44	5

size was not taken into consideration. The results of the ultrasonic examinations compared with the actual lambing records and criteria to assess its performance are shown in Table 2.

Table 2
The results of the ultrasonic examinations (Ergebnisse der Ultraschallprüfung beider Versuchsgruppen)

Parameter	Group I (n = 22 animals)	Group II (n = 20 animals)
Stage of the pregnancy	day 19 to 29	day 30 to 44
Diagnosed pregnant correct (a)	16	10
Diagnosed pregnant incorrect (b)	2	1
Diagnosed not pregnant correct (c)	1	6
Diagnosed not pregnant incorrect (d)	3	3

From the results in Table 2 the following characteristics of the method were calculated:

	Group I	Group II
Accuracy (a+c/e) x 100	77.27a	80.00a
Sensitivity (a/a+d) x 100	84.21	74.32
Specificity (c/b+c) x 100	33.33	85.71
Positive predictive value (a/a+b) x 100	88.88a	90.90a
Negative predictive value (c/c+d) x 100	25.00	66.66

Values within a row followed by the same letter are not statistically different (P>0.9)

Figure: Ultrasonic images of the ovine conceptus on various days of pregnancy. a. abdominal wall, b. fluid filled uterine lumen, c. embryo, d. urinary bladder (Ultraschallbefunde an unterschiedlichen Trächtigkeitstagen)

The recommendation, that the animals should be withheld from food and water 12 hours prior to examination (BUCKRELL, 1988) to allow good quality of ultrasonic imaging, is not approved in this study. The transrectal examination in dorsal recumbence was found to be safer than in standing position. But it required at least two assistants to elevate and lower the animal to be placed in the tilting cradle with easy restrain and no assistance during the examination. The dorsal recumbence also provided good contact between the transducer and reproductive tract, when the cranial part of the cradle was slightly elevated.

Majority of pregnancies were detected based on the ultrasonic appearance of the uterine lumen in the first group (Fig.). The animals were considered to be pregnant, when demarcable, anechoic, round or oval structures were seen in the uterine lumen on day 19 to 25 of gestation. GEARHART et al. (1988) reported that, clear fluid distension of one or both uterine horns was the earliest detectable sign of pregnancy by either intrarectal or transabdominal ultrasonography. Therefore no attempt was made to determine the criteria such as foetal movement, heart beats etc., in reaching the definitive diagnosis. But these criteria were mainly used in group II. The body of the uterus was imaged usually over the urinary bladder but it was also found anterior or dorsal to the bladder in the nongravid or early pregnant ewes. As reported by GARCIA et al. (1993), the urinary bladder especially in the rectal scanning served as an important point of reference for the location of reproductive tract in these animals.

GOLL et al. (1992) reported, that the optimal interval for pregnancy diagnosis by rectal scanning was between day 30 and 50 post mating. Our results show, that the method allows a accuracy of 77.3 % already between day 19 to 29 after AI Moreover our results revealed positive predictive values of 88.9 % and 90.9% in group I and II respectively. In comparison to our results GEARHART et al. (1988) stated, that the conditional probabilities of correctly identifying a pregnant ewes were 12.28 % from day 0 to 25 and 64.76 % from day 26 to 50 of gestation.

The errors in the positive diagnoses in group I and II were 11.1 % and 9.1 %, respectively. In group one, 7 ewes were scanned 19 to 22 days after breeding, 6 of these ewes lambed. The diagnosis was correct in 4 of 7 cases, but 3 ewes were misdiagnosed to be not pregnant. That means that determination of pregnancy was difficult before day 23.

BUCKREL et al. (1986) suggested, that the use of 7.5 MHz transducer may improve the imaging at the early stages of pregnancy and GARCIA et al. (1993) reported about highly accurate percentage rate in nonpregnant sheep. In our study lower negative predictive values were found probably due to the use of 5 MHz transducer. Because there is no statistical differences between the two groups (P>0.9) with respect to the percentage of accuracy and positive predictive values, we recommend to do the early pregnancy diagnosis with rectal scanning from day 19 to 29 of pregnancy with reliable accuracy.

References

BUCKRELL, B.C.:
        Application of ultrasonography in reproduction in sheep and goats. Theriogenology, 29 (1988), 71-84.

BUCKRELL, B.C.; BONNET, B.N.; JOHNSTON, W.H.:
>   The use of real-time ultrasound rectally for early pregnancy diagnosis in sheep. Theriogenology, 25 (1986), 665-678
GARCIA, A.; NEARY, M.K.; KELLY, G.R.; PIERSON, R.A.:
>   Accuracy of ultrasonography in early pregnancy diagnosis in the ewe. Theriogenology, 39 (1993), 847-861
GEARHART, M.A.; WINGFIELD, W.E.; KNIGHT, A.P.; SMITH, J.A.; DARGATZ, D.A.; BOON, J.A.; STOKES, C.A.:
>   Real-time ultrasonography for determining pregnancy status and viable fetal numbers in ewes. Theriogenology, 30 (1988), 323-337
GOLL, I.; MAREK, J.; KREJCI, M.; RIHA, M.:
>   Pregnancy diagnosis in sheep using real-time ultrasonography. 12th Int. Cong. on Animal Reprod, The Hague, The Netherlands, Vol. 4 (1992), 37-39
RICHARDSON, C.:
>   Pregnancy diagnosis in the ewe. A review. Vet. Rec. 90 (1972), 264-275
RUSSEL, A.J.F.:
>   The application of real-time ultrasonic scanning in commercial sheep, goats and cattle production enterprises. In: M. A. M. TAVERNE and A. H. WILLEMSE, (eds.), Diagnostic Ultrasound in Animal Reproduction. Kluwer Academic Publishers, The Netherlands, (1989), 73-87
SCHERICK, F.N.; INSKEEP, E.K.:
>   Determination of early pregnancy in ewes utilizing transrectal ultrasonography. Theriogenology, 40 (1993), 295
TAVERNE, M.A.M.; LAVOIR, M.C.; VAN OORD, R.; VAN DER WEYDEN, G.C.:
>   Accuracy of pregnancy diagnosis and prediction of foetal numbers in sheep with linear-array real-time ultrasound scanning. Vet Quarterly 7 (1985), 256-263
WATT, B.R.; ANDERSON, G.A.; CAMPBELL, I.P.:
>   A comparison of six methods uses of detecting pregnancy in sheep. Aust. Vet. J., 61 (1984), 377-382
WHITE, I.R.; RUSSEL, A.J.F.; FOWLER, D.G.:
>   Real-time ultrasonic scanning in diagnosis of pregnancy and the determination of foetal numbers in sheep. Vet Rec 115 (1984), 140

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Buchbesprechung

Kälberkrankheiten

GÜNTER RADEMACHER

160 Seiten, 9 Tabellen, 116 Abbildungen, BLV Verlagsgesellschaft München, Wien, Zürich, in der Verlagsunion Agrar mit DLG Verlag Frankfurt, Landwirtschaftsverlag Münster-Hiltrup, 2000, ISBN 3-405-15839-7, DM 49,90

Trotz der Fortschritte in der modernen Landwirtschaft und Veterinärmedizin sind immer noch nicht unerhebliche Verluste in der Kälberaufzucht zu beklagen, die eine effektive Rinderhaltung negativ belasten. Erinnert sei an den Durchfall bei neugeborenen Kälbern oder die Rindergrippe, also klassische Faktorenkrankheiten. Bei diesen spielen sowohl Infektionsfaktoren als auch betriebsspezifische Managementprobleme eine bedeutende Rolle. Das Ziel dieses Buches besteht darin, ausgehend von neuen Erkenntnissen und umfangreichen Erfahrungen, den Leser besser zu befähigen, vorbeugend wirken zu können. Es ihm zu ermöglichen, durch Früherkennung, Schäden am Tier zu verringern und ihm geeignete Behandlungsmöglichkeiten vorzuschlagen.
Im allgemeinen Teil des Buches werden Informationen vermittelt, die das frühe Erkennen von Krankheitserscheinungen erleichtern. Zahlreiche Vorbeugemaßnahmen bei der Kälberaufzucht werden, ausgehend von der Beschreibung der Merkmale gesunder und kranker Kälber, vorgestellt. Es folgen Abschnitte über allgemeine Vorbeugemaßnahmen untergliedert in den Teil bei eigener Aufzucht und bei Zukaufskälbern, Impfungen sowie die Beschreibung der häufig auftretenden Fehler. Im speziellen, dem umfangreichsten Buchteil, werden die gegenwärtig bedeutendsten Kälberkrankheiten gut gegliedert und durch Texthervorhebungen oder Tabellen unterstützt, sehr anwendungsorientiert beschrieben. Es folgen in gleicher Weise die Organkrankheiten, Mangelkrankheiten und Vergiftungen sowie die angeborenen Erkrankungen. Eine Vielzahl guter, farbiger Abbildungen und farbiger Texthervorhebungen, die besonders Beachtenswertes zusammenfassen, unterstützen die Aussagen. Zu jeder Krankheit werden meist die Ursachen, Krankheitserscheinungen und -verlauf, Diagnostik und wo möglich, vorbeugende Maßnahmen, beschrieben. Auch auf häufig vorkommende Behandlungsfehler wird ausführlich eingegangen.
Dieses in verständlicher Form übersichtlich geschriebene sehr praxisrelevante Buch kann wesentlich dazu beitragen, die gegenwärtig noch viel zu hohen Kälberverluste zu verringern und die Zusammenarbeit zwischen Landwirt und Tierarzt effektiver zu gestalten. Daher ist es vor allem und besonders praktischen Landwirten zu empfehlen. Darüber hinaus ist es für Auszubildende, in der Beratung Tätige wertvoll und es ist sehr gut geeignet Studierenden der Landwirtschaft und Veterinärmedizin wichtige Informationen zu liefern.

ERNST RITTER, Dummerstorf