# Transabdominal ultrasonographic determination of fetal gender in the horse during mid-gestation – a comparative study using randomized video images to investigate variation in diagnostic performance among raters, and the effect of month of gestation

Anna Tönissen[1,2], Gunilla Martinsson[2], Sebastian Pricking[1,2], Henning Otzen[1], Franziska Ertmer[1], Janina Rau[1], Jutta Sielhorst[1], Karl Rohn[3] and Harald Sieme[1]

[1] Clinic for Horses – Unit for Reproductive Medicine, University of Veterinary Medicine Hannover, Hannover, Germany
[2] National Stud Lower Saxony, Celle, Germany
[3] Institute of Biometry, Epidemiology, and Information Processing, University of Veterinary Medicine Hannover, Hannover, Germany

**Summary**: Late pregnancy check ups in mares during advanced gestation by transabdominal ultrasound bring reliable results on feto-maternal and fetal well-being. Fetal gonads can be scanned as well. Aim of this study was to evaluate accuracy of fetal gender determination by using B-Mode and Doppler ultrasonography video images analyzed by different raters. The accuracy of these diagnoses was compared among the raters. Pregnancy checks were performed on different stud farms in the mid-west of Germany. The day of gestation was derived from breeding records, and the mares were examined between 70–240 days pregnant. Fetal sex was determined as well by B-Mode and Doppler sonography. Examinations were videotaped. Gonads with homogenous structure and a hyperechogenic line along the longitudinal axis, or an intense Doppler signal along this axis were assigned to be male. Gonads with bizoned echogenicity and a strong circular Doppler signal were assigned female. To review the practicability and repeatability of gender determination 100 videotapes were selected and shown to 20 voluntary raters who correlated videotapes and fetal gender. Confirmation of gestation and fetal well-being during advanced gestation (90–240 days) by transabdominal ultrasound examination is practicable. Gender determination can be accomplished by a combination of B-Mode and Doppler sonography. The best results can be accomplished during 4th (75%) and 5th (62%) month of gestation, especially by using Doppler ultrasonography. Practitioners who are unexperienced in gender determination can complete the task based on videotapes showing fetal gonads. Characteristic optical features can be identified better referring to vascularisation detected by colour Doppler ultrasonography. In conclusion gender determination by transabdominal sonography can be conducted by using a combination of B-Mode and Doppler sonography. Optimal working conditions and videotaping the examination can increase the accuracy. Using colour Doppler helps to find distinctive features and determine the gender with greater accuracy. The accuracy of the diagnoses is optimal between 4-5 month of gestation.

**Keywords**: mare / gender determination / transrectal ultrasonography / transabdominal sonography / reproduction

## Introduction

Ultrasound technology gets more sophisticated, transabdominal sonography of the fetus during advanced gestation in mares can be performed easily. Currently commercial interests become more important in horse breeding due to difficult economical situations. The value of a pregnant broodmare can be set differently, if the sex of the fetus is known. Decisions about the maintenance of mares in stock can be made based on known fetal gender. As a result, breeders show increasing interest in fetal gender determination for managing their sales (*Bucca* 2011, *Holder* 2011).

Gender determination in pregnant mares can be performed in three different ways, by identifying the genital tubercle during 54-84 days (*Curran* and *Ginther* 1989), by transrectal examination during 90-150 days (*Holder* 2011) or by transabdominal examination after 150 days with the aim to outline the gonads and external genitalia (*Holder* 2014).

The genital tubercle is a small bilobulated structure which is located ventrally between the hind legs. It can be identified on day 52 to 53 at the earliest, it represents the forerunner of the clitoris in female and the penis in male fetus (*Holder* 2014). It is placed at an equal distance between umbilical cord and tail. After 55 days it starts to migrate in caudal direction towards the tail in female and cranial towards the umbilical cord in male fetus. Best results in gender determination can be achieved between 59 and 68 days (*Bucca* 2005, *Renaudin* et al. 1997). After 80 days amnionic fluid decreases, the uterus is pulled over the pelvic rim and the fetus sinks ventrally. Reaching and depicturing the genital tubercle is hardly possible (*Holder* 2011).

The short period of time to perform sex determination, the experience needed to make a reliable prediction and the evaluation of only one distinctive feature are the biggest disad-

vantages. Matters are complicated further by the fact that the equine fetus is encouraged to move by drifts of allantoic fluid generated by examination. This leads to acustic shadows which aggravates gender determination (*Holder* 2014).

Afterwards evaluable gender specific differences increase. In male penis, prepuce, scrotum and gonads, in the female fetus mammary glands including nipples, vulva, clitoris and gonads can be visualized. The focus is on the gonads, they are equally shaped and located in both sexes. In female gonads echogenicity is bizoned, because of the different structure of cortex and medulla, in male gonads homogenous echogenicity and a typical hyperechogenic line along the longitudinal axis in the middle is typical (*Renaudin* et al. 1997). These features can be visualized even better by using colour Doppler ultrasonography (*Resende* et al. 2014). Access can be gained transrectally (90–150 days) or transabdominally (90 days – term). Transabdominal examination is the safest and least invasive way to examine the mare during advanced gestation. There is no risk of perforating the rectum also pregnancy check ups by transabdominal ultrasonography in non-lactating mares cause a lower stress reaction than transrectal sonography (*Schönbom* et al. 2015).

## Material and methods

### Animals

Gender determination by transabdominal sonography was performed in 689 german thoroughbred mares during the annual late pregnancy check up in the fall. The age of the animals was between 3 and 23 years, pregnancy was progressed between 70 and 240 days of gestation.

### Ultrasonographic examination

For the transabdominal examination a real time portable Logiqe ultrasound unit by General Electrics Healthcare, Solingen, Germany, with colour Doppler and videotape function was used. Combined with a convex probe working at frequencies from 2 to 6 MHz. B-Mode and colour Doppler sonography were performed at 5 MHz with a scanning depth of 16 cm (as described by *Tönissen* et al. 2015). Once the gonads were seen examination was videotaped first in B-Mode, than with Doppler function.

Mares were examined during a serial screening, time to perform pregnancy check up and gender determination was limited to 3–5 minutes. With increasing experience the time needed for gender determination decreased. Mares were not restrained in stocks, sedation was not used in any mare. If the gonads of the fetus could not be seen properly or too much movement prevented a good view on the gonads, no prediction about the sex was made. If no fetus was to be found, the examination was continued transrectaly to confirm gestation.

Skin disinfectant containing alcohol was brought on the abdomen with a sponge, or if tolerated by the mare, sprayed on. The area around the udder and up to the xyphoid had to be soaked with disinfectant. Clipping was not necessary.
The examiner was positioned on the left flank, probe was held with the right hand and slowly moved along the abdomen starting around the udder and continuing in cranial direction. Once the fetus was visible its position was detected and the focus was laid on the hindquarters. Landmarks for orientation are scull, beating heart, stomach, umbilical cord and spine. Gonads were located and scanned thoroughly then the colour Doppler was used to visualize their vascularisation.

**Table 1** Fetal sex determination performed by 20 raters based on videotapes of transabdominal examinations of mares during advanced gestation taped with the purpose to determine the sex (50 B-Mode recordings, 50 Doppler recordings).

| Gender determination by participants | Agreement | | Disagreement | | No determination | |
|---|---|---|---|---|---|---|
| Collectively n=1955* | n=1022 | | n=669 | | n=264 | |
| | 52,28% | | 34,22% | | 13,5% | |
| | ♀/♀ | ♂/♂ | ♀/♂ | ♂/♀ | ♀ | ♂ |
| | 523 | 499 | 296 | 373 | 136 | 128 |
| | 51,17% | 48,83% | 44,25% | 55,75% | 51,52% | 48,48% |
| B-Mode n=970 | n=478 | | n=333 | | n=159 | |
| | 49,28% | | 34,33% | | 16,39% | |
| | ♀/♀ | ♂/♂ | ♀/♂ | ♂/♀ | ♀ | ♂ |
| | 256 | 222 | 159 | 174 | 75 | 84 |
| | 53,56% | 46,44% | 47,75% | 52,25% | 47,17% | 52,83% |
| Doppler n=985 | n=544 | | n=336 | | n=105 | |
| | 55,23% | | 34,11% | | 10,66% | |
| | ♀/♀ | ♂/♂ | ♀/♂ | ♂/♀ | ♀ | ♂ |
| | 267 | 277 | 137 | 199 | 61 | 44 |
| | 49,08% | 50,92% | 40,77% | 59,23% | 58,10% | 41.90% |

*Some recordings could not be played properly by the participants computers.

Gonades are oval shaped and to be found in the ventrocaudal abdomen, ventral to the kidneys and dorsal to the fetal bladder. Homogenous texture equal to fetal liver with a hyperechoic longitudinal line along its centre (representing mediastinum testis) and an intense signal along this line using colour Doppler ( representing blood flow along the mediastinum testis) were considered male. A hyperechoic circle around the central echodense core (representing the corticomedullary border) and a strong circular signal on the outer layer using Doppler were considered female.

In some male gonads, using colour Doppler, a signal on the lateral contour representing the pampiniformis plexus was detectable, in contrast to the liquid flux in the mediastinum testis it could not be seen in every fetus.

Results of gender determination and observed optical features were recorded and compared to the actual sex of the foal in the following year. After false prediction the regarding videotapes were reviewed to analyze the cause of the false prediction.

*Evaluation by raters*

To review the repeatability and practicability of equine fetal gender determination by transabdominal sonography, 100 video images showing fetal gonads from all the videotapes taken during the serial examination were selected. Sex of the fetus shown in the tapes was confirmed after birth and before the selection was completed. 50 tapes were recorded during B-Mode sonography, 50 tapes during colour Doppler sonography. The tapes were to be watched independently and their numbering was different in both modes, so the tapes couldn`t be paired up and every recording had to be judged individually. The length of the tapes was between 5 and 20 seconds, although the majority had a length between 14 and 16 seconds. The collection was made by an experienced examiner, who selected samples of all tapes showing the gonads adequately, so sex determination was possible. Some B-Mode tapes showed body parts of the fetus that were passed on the way to the caudal third, colour Doppler tapes were only taken, when the probe was directly above the gonads.

Gender determination based on these tapes was conducted by 20 voluntary participants. All of them are veterinarians with experience in equine reproduction. The degree of experience (high, medium, low) was settled by self-assessment. Few participants have already conducted fetal sex determination by transabdominal sonography. To standardize the evaluation among the raters, the raters received an explanation of the diagnostic criteria and the features of typical B-Mode and Doppler images. They were asked to determine gender, report optical features they recognized and how often the tape was replayed, before determination was conducted.

*Statistical analysis*

Statistical analysis was done using SAS software (SAS Institute, Cary, NC). All data were included in a descriptive analysis. The Kolmogorov-Smirnov test was used to test model residues for normal distribution. Differences in rates of correct, incorrect, and inoperable fetal sex determinations between month of gestation were analyzed by Chi-squared (2) test. For groups with ≤5 cycles, Fisher's exact test was used. Differences in rates of correct, incorrect, and inoperable fetal sex determinations between modes of sonography (B-Mode, Doppler), and examiners were analyzed by McNemar- and Bowker test and Kappa statistics. In all cases, values are given as rates (%) and differences between sonographic-mode, month of gestation and examiner were considered statistically significant for p 0.05.

## Results

20 veterinarians with a varying degree of experience in equine reproduction, especially in transabdominal ultasonography analyzed 100 videotapes. Their degree of experience was set by self-assessment. 13 participants would consider themselves as highly experienced in equine reproduction, 4 see their experience in a medium and 3 in a low range. Collectively there were 1955 tapes to be judged, some of the recordings (45) couldn`t be played properly by the participants computers, these were taken out of the statistical evaluation.

**Table 2** Gender determination by participants during different stages (month) of gestation. In every evaluated stage the use of Doppler sonography helped to achieve a higher rate of agreements. Most correct determinations could be noticed during 4th month, the earliest possible stage for transabdominal ultrasonographic gender determination.

|  | 4. month n=92 | 5. month n=287 | 6. month n=580 | 7. month n=673 | 8. month n=329 |
|---|---|---|---|---|---|
| Agreement | 70,65% (65) | 57,91% (161) | 48,97% (284) | 49,33% (332) | 53,80% (177) |
| B-Mode | n=60 68,33% (41) | n=138 53,62% (41) | n=300 48,67% (146) | n=320 45,00% (144) | n=149 46,98% (70) |
| Doppler | n=32 75,00% (24) | n=140 62,14% (87) | n=280 49,28% (138) | n=353 53,26% (188) | n=180 59,44% (107) |
| Disagreement | 17,39% (16) | 25,54% (71) | 36,55% (212) | 37,00% (249) | 36,47% (120) |
| B-Mode | 25,00% (15) | 24,64% (34) | 35,33% (106) | 38,44% (123) | 36,91% (55) |
| Doppler | 3,13% (1) | 26,43% (37) | 37,86% (106) | 35,69% (126) | 36,12% (65) |
| Not possible | 11,96% (11) | 16,55% (46) | 14,48% (84) | 13,67% (92) | 9,73% (32) |
| B-Mode | 6,67% (4) | 21,74% (30) | 16,00% (48) | 16,56% (53) | 16,11% (24) |
| Doppler | 21,87% (7) | 11,43% (16) | 12,86% (36) | 11,05% (39) | 4,44% (8) |

Altogether 1022 agreements (52%) and 669 disagreements (34%) of determined and actual sex could be noted; in 264 cases (14%) no prediction was made. Within the agreements, 544 (55%) were reached while watching the colour Doppler tapes (Table 1).

Month of gestation clearly had an influence on determination (B-Mode p = 0,012; Doppler p = 0,0002) (Table 2). Most correct predictions were made during 4th month: 65/92 (70,6%), B-Mode 41/60 (68,3%), Doppler 24/32 (75%).During 5th month 161/278 (57,9%) correct determinations were made, thereof 74/138 (53,6%) using B-Mode and 87/140 (62,1%) using Doppler. The results for 6th month of gestation show 284/580 (48,9%)agreements, 146/300 (48,6%) B-Mode and 138/280 (49,2%) Doppler.7th month of gestation: 332/673 (49,3) total, B-Mode 144/320 (45%), Doppler 188/353 (53,2%), 8th month: 177/329 (53,8% )total, B-Mode 70/149 (46,9%), Doppler 107/180 (59,4%). Irrespective of advancement of gestation Doppler sonography is more efficient than only using B-Mode.

**Table 3**     Results of fetal gender determination of 20 raters associated with their experience in gynecological topics. The degree of experience was established by self-assessment of the participants regarding their daily work on studfarms. Showing most matches in gender determination by the least experienced participants in equine gynaecology.

| Experience | Recordings watched* | Agreement | | Dissagreement | | No determination | |
|---|---|---|---|---|---|---|---|
| Low n=287 | 2,7 B-Mode 2,4 Doppler 2,2 | 159 55,40% | | 113 39,37% | | 15 5,23% | |
| | | B-Mode n=141 | Doppler n=146 | B-Mode n=141 | Doppler n=146 | B-Mode n=141 | Doppler n=146 |
| | | 68 48,23% | 91 62,33% | 63 44,68% | 50 34,25% | 10 7,09% | 5 3.42% |
| Medium n=497 | 2,2 B-Mode 2,6 Doppler1,8 | 250 50,30% | | 174 35,01% | | 73 14,69% | |
| | | B-Mode n=247 | Doppler n=250 | B-Mode n=247 | Doppler n=250 | B-Mode n=247 | Doppler n=250 |
| | | 117 47,37% | 133 53,20% | 83 33,60% | 91 36.40% | 47 19,03% | 26 10,4% |
| High n=1168 | 2,7 B-Mode 3 Doppler 2,6 | 610 52,23% | | 381 32,62% | | 177 15,15% | |
| | | B-Mode n=579 | Doppler n=589 | B-Mode n=579 | Doppler n=589 | B-Mode n=579 | Doppler n=589 |
| | | 290 50,09% | 320 54,33% | 187 32,29% | 194 32,94% | 102 17,62% | 75 12,73% |

*Arithmic mean of numbers the videotapes have been watched

**Table 4**     Coincidence of optical features on fetal gonads shown on videotapes taken during serial examinations and rated by an experienced examiner with results detected by 20 participants. The features could be identified better in the tapes that were taken while using Doppler sonography.

| | Optical feature identified | Optical feature misjudged | No optical feature recognized |
|---|---|---|---|
| B-Mode n=970 | 37,32% 362 | 25,46% 247 | 37,22% 361 |
| Doppler n=985 | 42,74% 421 | 24,77% 244 | 32,49% 320 |

| Identified optical features | Bizoned echogenicity ♀ | Hyperechogenic line along longitudinal axis ♂ |
|---|---|---|
| B-Mode | 19,69% 191 | 17,63% 171 |
| Doppler | 21,52% 212 | 21,22% 209 |

| Misjudged optical feature | ♀ showed/♂ recognized | ♂ showed/ ♀ recognized |
|---|---|---|
| B-Mode | 9,54% 94 | 15,23% 150 |
| Doppler | 12,16% 118 | 13,3% 129 |

Examiners experience was a significant parameter as well ( B-Mode p = 0,0061, Doppler p = 0,0198) (Table 3). The least experienced examiners showed the highest results for correct determinations 159/289 (55,4%). 68/141 viewing B-Mode tapes (48,2%) and 91/146 (62,3%) viewing Doppler tapes. Average experienced participants showed a total agreement of 250/497 (50,3%): 117/247 (47,4%) B-Mode and 133/250 (53,2%) Doppler. Highly experienced examiners reached a total of 610/1168 (52,2%), 290/579 (50,1%) while watching B-Mode tapes and 320/589 (54,3%) while watching Doppler tapes.

Judging videotapes of examinations that were taken while using Doppler sonography leads to more correct gender determinations, than watching tapes of examinations in B-Mode (Table 4).

## Discussion

Transabdominal sonography is the least invasive way to perform gender determination in advanced gestation. Before 90 days of pregnancy finding the fetus is difficult, but if the mare accepts the probe close to her udder a pregnancy check up can be performed as early as 70 days transabdominally. The fetus and parameters of its well-being (movement, heart rate, aortic diameter, growth ) can be visualized easily (Bucca et al. 2015).Echogenicity of fetal fluid, the presence of echogenic free floating particles and the combined thickness of uterus and placenta (CTUP) can be assessed during examination, so important visual cues for fetoplacental well-being can be gathered in passing (Reef et al. 1995).

Fetal gonads can be scanned sufficiently, if the fetus is in a good position and the mare is calm. Gender determination based on fetal gonads is possible. Using Colour Doppler function raises correct determinations. Finding the right position with the probe above the fetal gonads and staying very still to visualize their vascularisation as good as possible is important to keep the errors down. Videotaping is a good way to review the examinations and maybe find distinctive features which couldn`t be seen during the actual examination in the stable. Especially if conditions for gender determination aren`t adequate (lights not adjusted, screen set too far away from examiner). Reviewing the tapes after the actual sex of the foals is known is a good way to evaluate mistakes that have been made during previous determinations. The duration needed to conduct an examination decreases with the practitioners experience. The severity of determination is an individual parameter, it depends on working conditions, cooperativeness of mare and fetus and on examiners experience and patience. A serial examination might not be the best requirement for gender determination by transabdominal ultrasonography. To reduce the errors and increase the number of achievable determination, it should be possible for examination to take more than 5 minutes, it may have to be conducted more than once in some cases, optimal working conditions are indispensable for good results. External genital should be regarded more to confirm gender determinate based on gonads.

This study showed that the level of experience in equine reproduction doesn`t correlate with the number of correct gender determinations. In fact the least experienced partici-

pants showed most agreements, especially when Doppler was used (62%), they also seem to be more decisive with only 7% B-Mode and 3% Doppler non determinations. The lack of experience might lead to impartiality while judging the tapes. Medium and highly experienced veterinarians show a smaller amount of accordance during evaluation. It is reported that experienced veterinarians achieve varying levels (65%, >90%, 100%) of accuracy when determing fetal sex (*Mari* et al. 2002, *Resende* et al. 2014, *Bucca* et al. 2015). In our opinion, the principal causes for the high level of error in this study are that only videotapes were analyzed retrospectively by raters not familiar and unexperienced with the technique of transabdominal ultrasonographic fetal sexing.

Most agreements have been achieved during 4th (68% B-Mode, 75% Doppler) and 5th month (54% B-Mode, 62% Doppler) of gestation. Until 150 days the fetus usually is found in the caudal third near the udder, the distance between probe and fetus is small. With progressing pregnancy the fetus moves further cranial within the mares abdomen, this usually causes a bigger distance. The extending costal arch and flexed pelvic rim of the fetus cause acustic shadows, the elongation of the umbilical cord forming loops also impairs the view.

Distinctive optical features have been identified in B-Mode (37%) as often, as not recognized at all (37%).Doppler sonography shows these features in a clearer way (42% identified, 33% not recognized). Seeing bizoned echogenicity or a hyperechoic line along the longitudinal axis by using B-Mode is hard to distinguish and clearly needs a lot of practice. Females are easier to identify because the bizoned echogenicity is visible from more angles and a more recognizable feature, most disagreements were in males that were judged females. If the probe is not positioned exactly above the gonade, the hyperechoic line might not seem to be in the centre of the gonad and appears like an outer layer.

## Conclusions

To summarize, pregnancy check ups with fetal gender determination during advanced gestation by transabdominal sonography are conductable, mares show a high level of acceptance. With examiner`s increasing experience determination will be performed faster with less errors. Using colour Doppler sonography and creating optimal conditions for examination can increase the number of correct determinations. Gender determination should not be performed during serial examinations with a given time frame to be conducted.

Practitioners who are unexperienced in transabdoninal sonography can determine gender referring to videotapes taken during examinations. Although identifying distinctive optical features needs a lot of practice and experience. The use of colour Doppler increases success of gender determination. The accuracy of the diagnoses is optimal between 4–5 month of gestation.

## References

*Bucca S.* (2005) Equine fetal gender determination from mid- to advanced pregnancy by ultrasound. Theriogenology 64, 568-571

Bucca S., Fogarty U., Collins A., Small V. (2015) Assessment of feto-placental well being in the mare from mid-gestation to term: trans-rectal and transabdominal feature. Theriogenology 64, 542-557

Bucca S. (2011) Fetal gender determination from mid to advanved gestation. In: McKinnon A. O:, Squires E. L:, Vaala W. E; Varner D. D. (eds.), Equine Reproduction 2nd Edition, Ames: Wiley-Blackwell; 2011:2094-2098

Curran S, Ginther O. J (1989) Ultrasonic diagnosis of fetal sex by location of genital tubercle. J. Equine Vet Sci 9, 77-83

Holder R. D. (2011) Fetal sex determination in the mare between 55 and 150 days of gestation. In: McKinnon AO, Sqquires EL, Vaala WE, Varner DD (eds), Equine Reproduction 2nd Edition, Ames: Wiley-Blackwell, 2080-2093

Holder R. D. (2014) Ultrasound determination of fetal sex. In: Dascanio J. and McCue P. (eds.), Equine Reproductive Procedures 1st Edition, John Wiley and Sons; 2014: 1955-200

Mari G., Castagnetti C., Belluzzi S. (2002) Equine fetal sex determination using a single ultrasonic examination under farm conditions. Theriogenology 58, 1237-1243

Reef B., Vaala E., Worth T., Hammett B. (1995) Ultrasonographic evaluation of the fetus and intrauterine environment in healthy mares during late gestation. Vet. Radiol. Ultrasound 36, 533-541

Renaudin C. D., Gillis C. L., Tarantal A. F. (1997) Transabdominal combined with transrectal ultrasonographic determination of equine fetal gender during midgestation. Proceedings of the Annual Convention of the AAEP; 43, 251-255

Resende H. L., Carmo M. T., Ramires Neto C., Alvarenga M. A. (2014) Determination of equine fetal sex by Doppler ultrasonography of the gonads. Equine Vet J 46, 756-758

Schönbom H., Kassens A., Hopster-Iversen C., Klewitz J., Piechotta M., Martinsson G., Kißler A., Burger D., Sieme H. (2015) Influence of transrectal and transabdominal ultrasound examination on salivary cortisol, heart rate, and heart rate variability in mares. Theriogenology 83, 749–756

Tönissen A., Martinsson G., Otzen H., Schürmann K., Schütze S., Ertmer F., Kassens A., Sielhorst J., Brehm R., Sieme H. (2015) To perform fetal gender determination in the mare by ultrasound during early and advanced gestation. Pferdeheilkunde 31, 153-158

Erweiterte Zusammenfassung

**Transabdominale ultrasonographische fetale Geschlechtsbestimmung beim Pferd in der fortgeschrittenen Tächtigkeit – eine vergleichende Studie unter Verwendung von stichprobenartig ausgewählten Videoaufnahmen um Variationen in der Diagnostik verschiedener Probanden und den Effekt des Trächtigkeitsmonat festzustellen**

Bei fortgeschritten tragenden Stuten ist es möglich die Geschlechtsbestimmung am Fetus mit Hilfe von transabdominaler Sonographie durchzuführen. Die Akzeptanz dieser Untersuchung ist groß und das Risiko für Verletzungen bei Pferd und Untersucher ist deutlich geringer als bei der transrektalen Untersuchung. Die Gonaden lassen sich ultrasonographisch gut darstellen und es können ebenfalls wertvolle Informationen über die fetale Gesundheit gewonnen werden. Während der alljährlichen Herbstuntersuchung des Vollblutpferdes in Deutschland wurden auf verschiedenen Gestüten Videoaufnahmen während der transabdominalen Ultraschalluntersuchungen zu Geschlechtsbestimmung angefertigt. Aus diesen Aufnahmen wurden 100 repräsentative Mitschnitte durch einen erfahrenen Untersucher ausgewählt und diese 20 Tierärzten vorgeführt. Die Probanden verfügen über einen unterschiedlichen Erfahrungsschatz und einen unterschiedlich großen Anteil an gynäkologischen Fällen in ihrer täglichen Praxis. Ziel dieser Studie war es herauszufinden, in wieweit eine Übereinstimmung von dem durch die Probanden erkannten und dem tatsächlichen Geschlecht erzielt werden kann. Auch der Einfluss der tierärztlichen Erfahrung des Probanden, des Trächtigkeitsmonats und des Sonographiemodus wurden evaluiert. Das Erkennen typischer optischer Merkmale wurde ebenfalls berücksichtigt. Homogenität und eine hyperechogene Aufhellung im Zentrum im B-Mode, sowie ein deutliches zentrales Signal im Doppler werden als Kennzeichen für männliche Gonaden angesehen. Zweizonige Echogenität im B-Mode und ein deutliches kreisförmiges Dopplersignal werden als Kennzeichen für weibliche Gonaden gewertet. 50 Aufnahmen zeigen Gonaden im B- Modus, 50 Gonaden im Doppler-Modus, sie wurden zwischen dem 70. und 240. Trächtigkeitstag angefertigt, der Trächtigkeitstag wurde anhand von Deckbescheinigungen der Stuten errechnet. Die meisten Übereinstimmungen wurden im 4. Trächtigkeitsmonat erzielt (75%); im 5. Monat waren es 62%. Die Verwendung der Dopplerfunktion erhöhte die Anzahl der Übereinstimmungen, typische optische Merkmale konnten ebenfalls besser mit Doppler erkannt werden. Die tierärztliche Erfahrung der Probanden korreliert nicht mit der Höhe der erzielten Übereinstimmungen. Wenig erfahrene Probanden können ebenfalls anhand von Videoaufnahmen die Geschlechtsbestimmung durchführen. Die Vaskularisation der fetalen Gonaden, welche unter Verwendung des Dopplers aufgezeigt wird, ist bei der fetalen Geschlechtsbestimmung ein wichtiger Faktor, der einbezogen werden muss um eine korrekte Aussage treffen zu können. Während der Untersuchung sind die äußeren Gegebenheiten und die Kooperationsbereitschaft der Stute von essentieller Bedeutung. Es müssen in jedem Fall die bestmöglichen Arbeitsbedingungen geschaffen werden (richtige Positionierung von Ultraschallgerät, gute Lichtverhältnisse, ruhige Umgebung). Unruhige Stuten und unnötig lange Dauer der Untersuchung führen zu fetalen Bewegungen, welche die Untersuchung und vor allem das adequate Darstellen der Gonaden zusätzlich erschweren. Mit wachsender Erfahrung und Sicherheit des Untersuchenden sinkt die benötigte Zeit und das Geschlecht kann besser bestimmt werden. Eine kritische Selbstüberprüfung durch Betrachtung der angefertigten Videoaufnahmen sollte in jedem Fall erfolgen. Transabdominale Ultraschalldiagnostik zur Bestimmung des fetalen Geschlechts ist eine schonende nicht invasive Untersuchungsmethode. Unter idealen Arbeitsbedingungen mit gutem Equipment, das die Möglichkeit der Dopplersonographie und des Aufnehmens der Untersuchung bietet, ist ein Erlernen der Technik auch wenig erfahrenen Tierärzten möglich. Es sollte keine Aussage über das Geschlecht getätigt werden, ohne Zuhilfenahme der Dopplerfunktion zum Auffinden der typischen optischen Merkmale. Der bestmögliche Zeitraum zur Geschlechtsbestimmung liegt zwischen dem 4. und 5. Trächtigkeitsmonat.