

A Comparison of Changes in Endometrial Echotexture and Estradiol 17- β in the Mare During Natural and Hormonally Manipulated Estrous Cycles

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The presence of ultrasonographically detectable endometrial folding or edema begins at the onset of estrus. An interdigitating pattern of alternating anechoic and echoic areas in the endometrium is visualized via ultrasonography. Echotextural changes of the endometrium are largely associated with changes in ovarian steroid hormone levels. Computer-assisted image analysis permits the assessment of changes in echotexture via digital evaluation of the pixels within the image. The objectives of the study were: to utilize computer-assisted image analysis to characterize changes in the echotexture of the edematous endometrium; to assess estradiol 17- β levels of the mare during estrus; to describe how hormonal manipulation affected these parameters; and to subjectively compare mean numeric pixel values (NPV) of the endometrium with mean estradiol 17- β levels

Ten maiden mares were evaluated every 12 hours during estrus until ovulation using an Ausonics Impact with a 6mHz microconvex probe. Serum samples were obtained at 4 hour intervals throughout the entire estrus period. Mares were examined during 4 estrous cycles: cycle 1 a natural estrus; cycle 2 a PGF_{2 α} -induced estrous period; cycle 3 a PGF_{2 α} -induced estrous period with hCG administered when a follicle ≥ 35 mm was attained; and cycle 4 a PGF_{2 α} -induced estrous period with hCG administered when grade II endometrial edema was first attained. Ultrasound images of the uterine body were recorded on S-VHS tape, captured and digitized (PCVISION+, Imaging Technology Inc., Woburn, MA) at a resolution of 640 x 480 pixels. Echotextural changes were objectively assessed using the SYNERGYNE 18 (R.A. Pierson, Saskatoon, SK) program. Each cross-sectional image of the uterus was divided into four quadrants. A circular spot (25 mm²), encompassing approximately 20% of the total area of the endometrium in each respective quadrant, was randomly placed in the endometrium in each of the four quadrants, an overall mean for the 4 spot measurements was calculated. Data points were standardized from ovulation (time 0 = ovulation). A repeated measures, general linear ANOVA (SPSS) was performed for mean NPV and mean estradiol 17- β levels over time from ovulation at a significance level of $p < 0.05$.

Mean NPV of the endometrium in the uterine body and mean estradiol 17- β levels were significantly different over time from ovulation in cycles 1, 3, and 4 and 1, 2, 3, and 4, respectively. Hormonal manipulation resulted in abbreviated changes in mean NPV. During cycle 1, estradiol 17- β levels increased until -24 hrs then decreased. Estradiol 17- β levels decreased throughout estrus in cycles 2, 3, and 4. Generally, there was an inverse relationship between mean NPV and mean estradiol 17- β levels; therefore, as mean estradiol levels increased, mean NPV decreased. In summary, uterine body endometrial echotextural changes and estradiol 17- β levels during estrus are important characteristics to evaluate when assessing a mare for impending ovulation.

Key words: mare, endometrial edema, echotexture, estradiol-17 β .