

Changes in uterine blood flow and endometrial echostructure after induction of an acute uterine inflammation in cows

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The aim of this study was to prove the suitability of computer assisted analysis of endometrial echostructure and colour Doppler sonography of uterine blood flow in the diagnosis of an endometrial inflammation.

Four non-lactating Simmenthal cows were scanned under standardized conditions (fixed installed pre- and postprocessing of the B-mode images) by means of a 7.0 MHz microconvex probe before and after an intrauterine infusion of 100 ml 4% m-cresolsulfonic acid-formaldehyde-polycondensate (Lotagen®, Essex, Germany). Two non-lactating Simmenthal cows were used as a control group, they were infused with 100 ml 0.9% NaCl. The intrauterine infusions were carried out on Day 2 of oestrous cycle (Day 0 = day of ovulation). B-mode ultrasound of the uterus and colour Doppler sonography of the left and right uterine arteries were always performed immediately before (0h) and 1, 4, 6, 12, 24, 48, 72, and 96 hours after infusion. Five different B-mode images of the uterus were digitized and the Mean Grey Level (MGL) determined using a computer-assisted texture analysis program. Uterine blood flow was reflected by the time-averaged maximum velocity (TAMV).

As there were correlations between the MGL of the five B-mode images ($P < 0.0003$) and between TAMV values of the left and right uterine arteries as well ($P < 0.0001$) mean values from each examination were used for further evaluations. After the intrauterine infusion of 0.9% NaCl no changes ($P > 0.05$) in TAMV were detected. In contrast the intrauterine application of L on hour 1 led to an increase (277%, $P < 0.0001$) of TAMV resp. to an decrease of MGL (87%, $P < 0.0001$) compared to the mean values before infusion (0h = 100%). While TAMV remained on elevated levels until the end of the investigation period (hour 96), MGL reached baseline values already 12 hours after the infusion.

The results show that computer-assisted texture analysis of endometrial B-mode images as well as colour Doppler sonography of uterine blood flow are useful methods to detect changes after the induction of an acute endometrial inflammation. Changes in uterine blood flow are more distinct than in the echotexture during an endometrial inflammation after Lotagen infusion.

Keywords: sonography, blood flow, echostructure, inflammation, cow