# Normal involution of the broad ligament in post-partum dairy cows in practice

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It has been shown by Lyons (2015) that there is a detectable difference in the ultrasonic appearance of the bovine broad ligament when comparing cows with and without endometritis, but the author is unaware of work looking at the normal involution of this structure.

This study was to characterise the normal involution of the lymphatics and vasculature of the broad ligament of the female bovine reproductive tract. Involution was assessed by trans-rectal B-mode ultrasonography using an Easi-scan 3, 4.5-8.5 MHz linear rectal probe (BCF Technology Ltd, Midlothian), images were collected in 'detail' mode at 8.5MHz. A cross sectional image of the previously gravid uterine horn 2-4cm cranial to the uterine body was obtained, and an image of the ipsilateral broad ligament ventral to that point was frozen and stored. The image was adjusted to give maximal broad ligament depth.

Thirty-four cows were recruited on two dairy farms in the North of England, with complete data sets from 26 cows. Animals were excluded due to temperament (n=4), vaginal lacerations (n=1) and clinical metritis (n=3). Animals were examined once a week (from four days or more post-partum) for six weeks. Images were collected and analysed with the most hypoechoic areas of the image assumed to be fluid in the broad ligament; 'fluid' was expressed as a percentage of the total broad ligament area of the saved image. The three largest vessel diameters were measured in the saved image using open source Image-J freeware.

A linear regression model was fitted to determine which of the following variables (what variables were considered?) were associated with fluid content and diameter of vessels (days post-partum, cow, parity, oestrus, body condition score at calving body condition score at 6 weeks, body condition score change, endometritis, farm) (Minitab 17). Days post-partum was found to be highly significant demonstrating a reduction in fluid percentage over time (47.33% initially reducing to 12.49%, $P<0.001$). There was a significant variation between cows in the percentage of fluid over time ($P=0.014$) and heifers had more fluid in their ligament than cows ($P=0.042$); overall $R^2$ for the model was 0.66. Animals in oestrus had a statistically significantly increased percentage of fluid in the broad ligament ($P<0.001$) and the diameter of the two largest vessels decreased with time over the six-week period (Diameter 1, reduced from 6.02mm to 3.18mm over the six weeks $P<0.001$, Diameter 2, reduced from 3.13mm to 2.60mm $P=0.002$).

There was no association between the percentage of fluid in the broad ligament and: body condition score at calving, body condition score six week later, body condition change, farm or the presence of endometritis. Endometritis did show a trend towards increased diameter of the largest vessel but this was not significant (Endo- 4.13mm, Endo+ 5.14mm $P=0.074$).

This study demonstrates that it is possible to characterise changes in the broad ligament post calving and factors associated with involution of this structure. Further research should concentrate on the practical applications of the technique and the possibility of integration of collection of such data automatically into ultrasound equipment. Further work could concentrate on broad ligament anatomy and the likelihood of self-cure from endometritis, potentially identifying cows that require treatment and reducing unnecessary treatment on farm. More rapid and targeted treatment of endometritis may mitigate some of the negative effects on future reproductive performance.

## REFERENCES

**Lyons, T.** (2015) Assessment of Broad Ligament ultrasonography as a novel technique for endometritis diagnosis in dairy cows. Cattle Practice **23**(2)**:** 366