

## IN-VIVO ENDOMETRIAL DATING UTILIZING HISTOLOGY BY IMAGING

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### Abstract Body

In-Vivo Endometrial Dating Utilizing Histology By Imaging

Histology-based endometrium dating (in human, bovine and porcine) is accurate to within 24-48 hours. However, it is invasive and cannot be performed continuously. Minimally invasive methods such as endometrium ultrasound imaging or hormone blood levels are indirect, less accurate and subject to various biases.

Since in many cases low live birth rate in in-vitro fertilization (IVF) treatments is due to lack of uterus receptivity, embryo transfer (ET) timing may be critical for the success of IVF. The timing may be also correlated to the level of precision in endometrium dating.

We determined the cycle day for four sows using three different conventional methods:

- (1) a veterinarian-determined estrus date,
- (2) time-series of blood hormone levels,
- (3) histology analysis of endometrial biopsies.

A new method ("*histology-by-imaging*") was undertaken and consisted of in-vivo and ex-vivo low magnification imaging of the endometrium surface, followed by image processing and statistical analysis.

Histology H&E sections were processed from the biopsies and diagnosed for endometrium dating.

Cycle day estimates from each of the conventional methods were compared to each other and to results from the new method.

The traditional endometrium dating methods (histology, hormone level series, estrus) turned out to be consistent with each other to within error range of 2-4 days, depending on the method and the actual cycle day.

Comparison to the histology-by-imaging method is based on gland-pore and blood vessel spatial density and size

as well as pore coiling degree. Sow endometrium at different cycle days exhibit very different distributions

of the above mentioned statistics.

**We found that the pore density is anti-correlated with the progesterone levels (and follows the estradiol rise),**

**while the gland sizes show correlation with the estradiol levels.**

Images from different uterus sites or magnification levels show similar morphological parameters.

In-vivo and Ex-vivo images exhibit the same statistical evolution of pore density and size distributions.

Implementation of histology-by-imaging may help to determine uterine status or optimal timing of embryo transfer in a minimally-invasive manner.

This, in turn, may lead to more accurate predictions of the endometrial window of implantation for women undergoing IVF treatments.

### Abstract image

# Endometrium Surface – Structure Analysis

