

# The Use of Body Temperature to Detect Estrus and Predict Optimal Time of Insemination

*Erwin Mollenhorst<sup>1</sup>, Gerard Griffioen<sup>2</sup>, Mirjam Nielen<sup>1</sup>, Tine van Werven<sup>1</sup>*

<sup>1</sup> *Dept. of Farm Animal Health, Faculty of Veterinary Medicine, Utrecht University, the Netherlands*

<sup>2</sup> *Agis Automatisering, Harmelen, the Netherlands*

## Introduction

With increasing farm sizes and higher numbers of animals per farm worker, time available for observing cows is under pressure. High detection rates of cows in estrus or being diseased, however, are of great importance for good farm management and can improve economic results and animal welfare. Therefore, tools that can help the farm staff observing the herd are welcome. Pedometers are a well-known tool for improving estrous detection and prediction of ovulation (e.g., Roelofs et al., 2005). It is also known that body temperature changes during the estrous cycle as, e.g., shown with vaginal measurements in beef cows (Kyle et al., 1998), lactating (Redden et al., 1993) and non-lactating dairy cows (Fisher et al., 2008). Furthermore, it is generally known that body temperature rises during inflammatory reaction, e.g. caused by clinical mastitis. A new sensor, attached in the cow's ear, is developed to measure body temperature and movement continuously. These data are combined with other data available in the management computer about the cow, e.g., lactation stage and previous estruses and inseminations. Finally, attention lists are generated to alert the farmer for cows that need extra attention. Together with his own observation, the farmer can decide to take a certain action.

With the information from this sensor, we expect that it is possible to improve, among others, estrus detection, time of insemination and detection of diseased animals. For detection of estrus, (sub)clinical mastitis and other diseases, promising results are described by de Mol et al. (1997; 1999) based on activity, milk temperature and yield. In that study data came available twice a day, whereas in the current study, data are available continuously. This makes it possible to generate alerts at any time of the day and can possibly improve, for example, timing of insemination.

## Materials and Methods

We plan to have 800 sensors placed at 80 farms (10 cows at each farm) for three to four months. Cows will be about two weeks ante-partum at the start of the experiment. Farmers are asked to record all observations with regard to parturition, estrus and diseases in order to have data on the true status of a cow. Milk samples for progesterone analysis will be taken of 100 cows (10 farms) twice a week during the post-partum period, in order to detect true estrus periods.

Detection performance will be evaluated for known data patterns, e.g., around estrus. For diseased animals and statuses around parturition or infections, data will first be checked on common patterns in order to develop descriptive parameters, before performance can be evaluated.

## References

- de Mol, R.M., A. Keen, G.H. Kroeze, and J.M.F.H. Achten. 1999. Description of a detection model for oestrus and diseases in dairy cattle based on time series analysis combined with a Kalman filter. *Computers and Electronics in Agriculture* 22:171.
- de Mol, R.M., G.H. Kroeze, J.M.F.H. Achten, K. Maatje, and W. Rossing. 1997. Results of a multivariate approach to automated oestrus and mastitis detection. *Livest. Prod. Sci.* 48:219.
- Fisher, A.D., R. Morton, J.M.A. Dempsey, J.M. Henshall, and J.R. Hill. 2008. Evaluation of a new approach for the estimation of the time of the LH surge in dairy cows using vaginal temperature and electrodeless conductivity measurements. *Theriogenology* 70:1065.
- Kyle, B.L., A.D. Kennedy, and J.A. Small. 1998. Measurement of vaginal temperature by radiotelemetry for the prediction of estrus in beef cows. *Theriogenology* 49:1437.
- Redden, K.D., A.D. Kennedy, J.R. Ingalls, and T.L. Gilson. 1993. Detection of estrus by radiotelemetric monitoring of vaginal and ear skin temperature and pedometer measurements of activity. *J. Dairy Sci.* 76:713.
- Roelofs, J.B., F.J.C.M. van Eerdenburg, N.M. Soede, and B. Kemp. 2005. Pedometer readings for estrous detection and as predictor for time of ovulation in dairy cattle. *Theriogenology* 64:1690.