

Prediction of parturition in bitches using rectal temperature measurement

A. Grellet^a, F. Aguer^a, C. Mariani^b, A. Adib-Lesaux^b, A. Morin^c, S. Chastant-Maillard^a.

a. NeoCare, Ecole Nationale Vétérinaire de Toulouse, UMR 1225 INRA/ENVT, Toulouse, France. b. Royal Canin, Aimargues, France. c. Centre d'Etude, de Sélection et d'Élevage de Chiens guides d'Aveugles et autres Handicapés (CESECAH), Lezoux, France
s.chastant@envt.fr

Rectal temperature is considered in bitches as a non-invasive tool to detect whelping onset. Although a drop was observed approximately 24 hours before whelping (1), the predictive value of body temperature variation to detect the onset of whelping has been poorly investigated. The aim of this study was (i) to evaluate factors influencing body temperature before whelping, (ii) to evaluate predictive value of rectal temperature variation and its threshold to determine parturition onset. In total, 217 gestations were followed in 86 Labrador bitches from the same breeding kennel, from 2009 to 2017. The day of ovulation was determined from serial peripheral blood progesterone measurements, and bitches were inseminated 2 and 3 days post ovulation. The day of the first insemination was defined as Day 0. Rectal temperature was measured 3 times per day, at 8 am, 2 pm and 6 pm, from Day 53 to whelping. The time of the parturition was defined as the expulsion of the first puppy. Linear mixed models (MIXED procedure, R studio software) with the bitch and year modeled as random effects were performed to identify variables affecting body temperature. This model included as fixed effects: age of the dam at whelping, whelping season, litter size, the time of the day (morning, mid-day, evening), the time before whelping (hours). Effect Size Index was used for evaluation of the clinical impact of factors of statistical significance (2). Receiver operating characteristic (ROC) curves were drawn to define the best cut-off values for high and low probability of parturition. **Results:** In total, 3879 rectal temperatures were registered (mean number of measurements per gestation: 18; min=5; max=32). Rectal temperatures were significantly influenced by age at parturition ($p<0.001$), litter size ($p<0.001$), time of the day ($p<0.001$), and time before whelping ($p<0.001$). Among these, only time before whelping presented a crucial clinical importance (based on the Effect Size Index). Rectal temperature started to significantly decrease 48 hours before whelping (37.7°C, 37.6°C, and 37.2°C for respectively 168-48h, 48-24h and 24-0h before whelping, $p<0.05$). Models based on only one rectal temperature per day were of lower performances (area under the curve (AUC) between 0.719 and 0.842 depending on the moment of the day) than models based on two or three measurements per day (with AUC=0.933 and 0.957 respectively). The best cut off value to discriminate bitches with high probability of whelping onset in the following 24h was at 0.4°C and 0.5°C for two and three measurements per day, respectively. Predictive negative values (PNV) for these thresholds were high: 99.3% and 99.7%, respectively. However predictive positive values were low: 25.2 % and 18.4 % respectively. This study confirms that body temperature decreases within the 48 hours before whelping. Two to three measurements per day allow a better prediction of the whelping than a single measurement. The high PNV is very useful to take the decision to follow the bitch during the night or not. If no decrease of body temperature $\geq 0.4^\circ\text{C}$ was observed in the previous 24 hours, this study evidenced that the bitch has 99.3 % of probability not to start her whelping in the following 24 hours. However, false positive results (a decrease of temperature without whelping in the following 24 hours) are quite high (15%). Predictive value of rectal temperature, with association of other methods of whelping prediction, like for example progesterone assay, remains to be evaluated.

(1) Concannon P. et al. Biol Reprod, 1977;16(4): 517-526. (2) Hojat M, Xu G. Advances in health Sciences Education: Theory and Practice. 2004;9(3):241-249.



EVSSAR 2018



European Veterinary Society For Small Animal Reproduction
XXI International Congress - Venice (I) - June 22nd-23rd, 2018

21st EVSSAR Congress

Reproduction and Pediatrics in Dogs, Cats and Small Companion Animals

Venice, Italy

Congress Center Terminal 3

22 - 23 June 2018



Editors: Sabine Schäfer-Somi, George Mantziaras, Sebastian Arlt

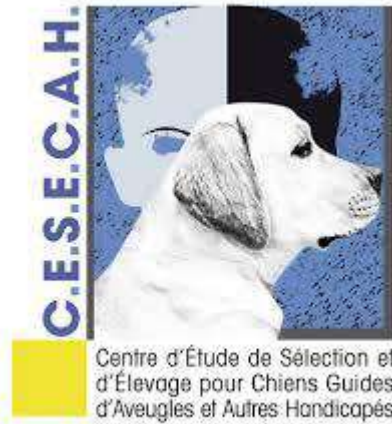
Prediction of parturition in bitches using rectal temperature measurement

A. Grellet¹, F. Aguer¹, C. Mariani², A. Adib-Lesaux², A. Morin³, H. Mila¹, A. Mugnier¹, S. Chastant-Maillard¹

¹ **NeoCare**, Ecole Nationale Vétérinaire de Toulouse, UMR 1225 INRA/ENVT, Toulouse, France

² **Royal Canin**, Aimargues, France

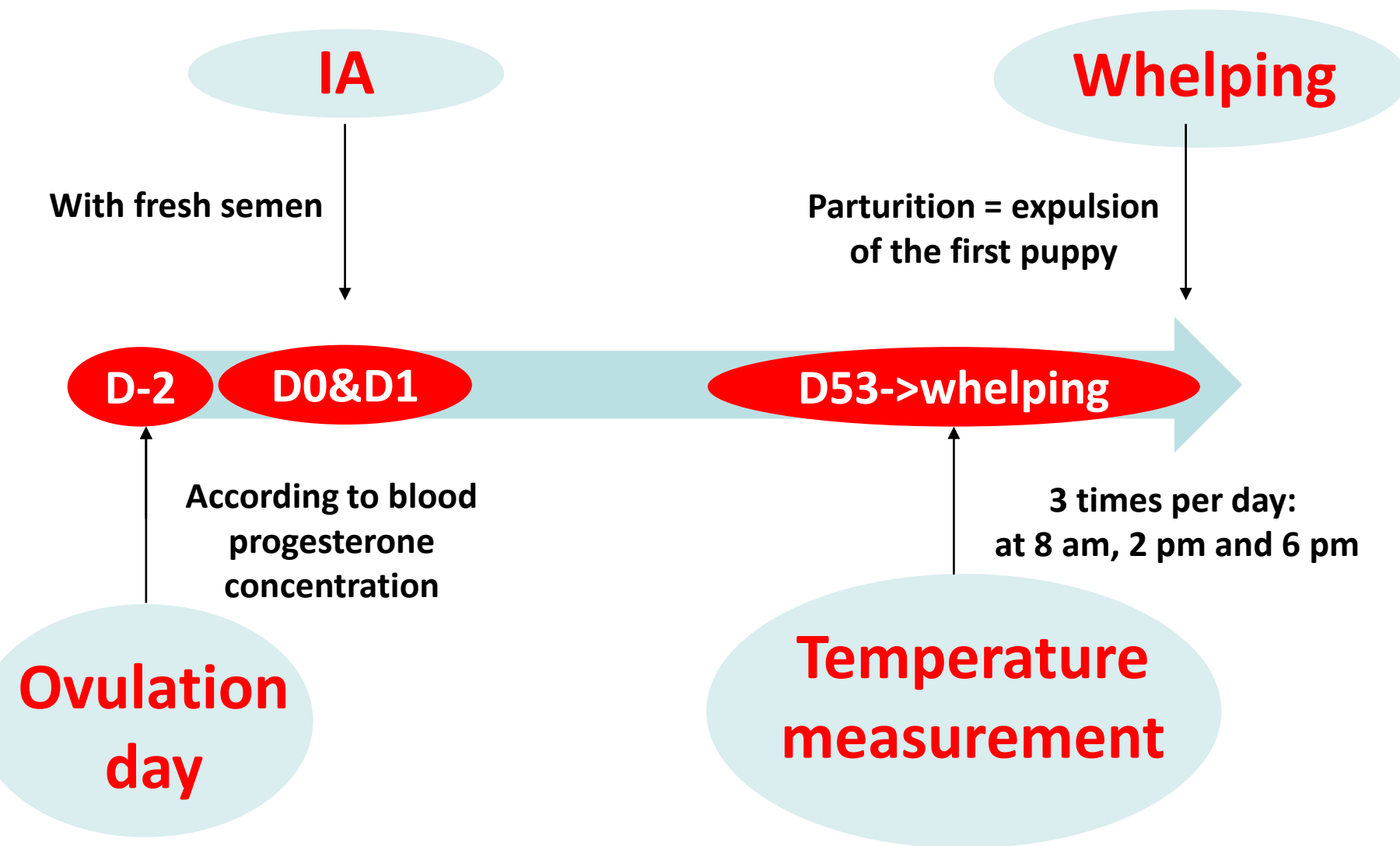
³ **CESECAH** (Centre d'Etude, de Sélection et d'Elevage de Chiens guides d'Aveugles et autres Handicapés), Lezoux, France



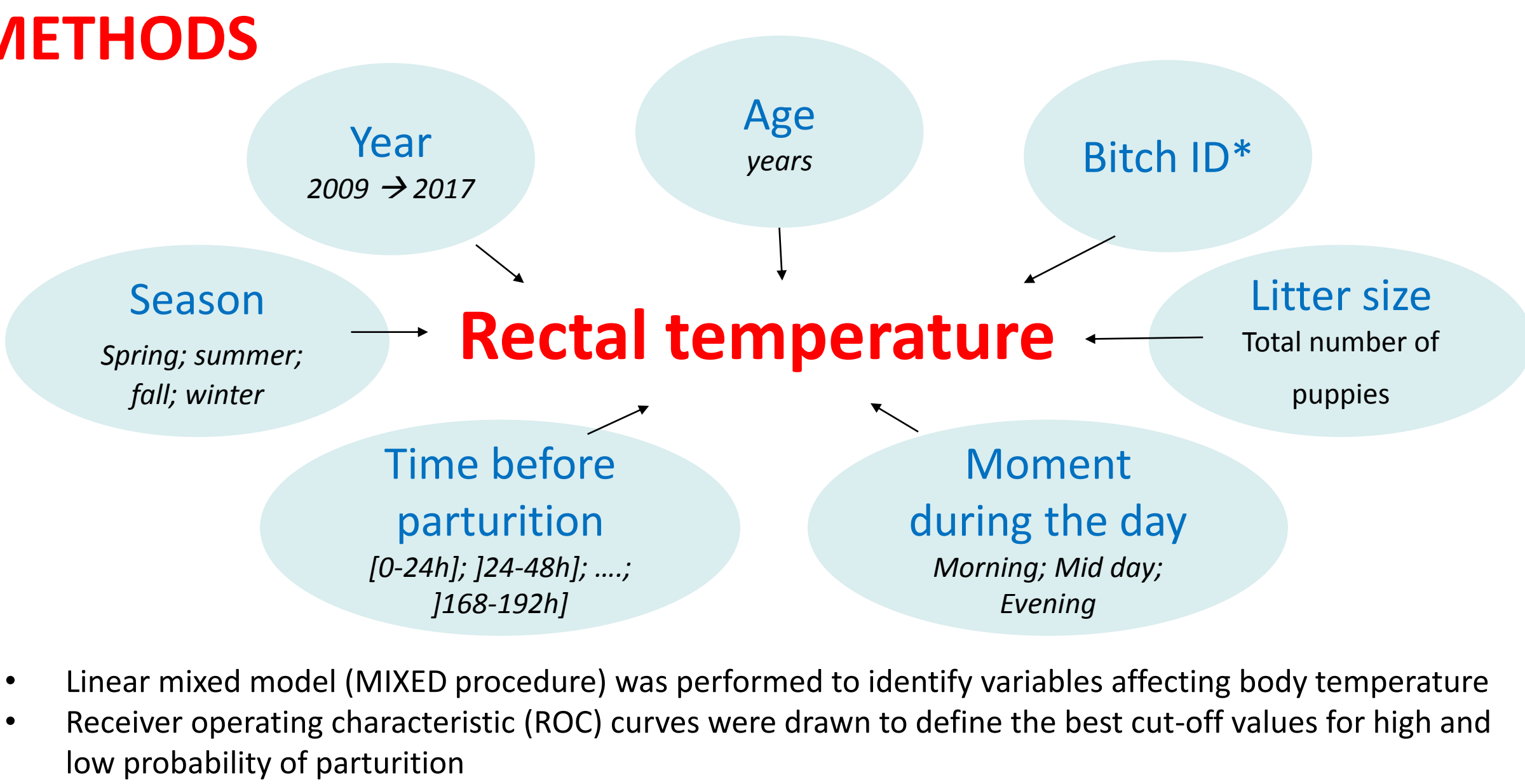
INTRODUCTION

Rectal temperature is considered in bitches as a non-invasive tool to detect whelping onset. Although a drop was observed approximately 24 hours before whelping, the predictive value of body temperature to detect the onset of whelping has been poorly investigated. The aim of this study was (i) to evaluate factors influencing body temperature before whelping, (ii) to evaluate predictive value of rectal temperature variation and its threshold to determine parturition onset.

MATERIALS AND METHODS



83 Labrador bitches
206 gestations
1 breeding kennel
From 2009 to 2017



RESULTS

3699 rectal temperatures
Mean number of measurements per gestation: 18; min=5; max=32

Evaluated parameter	P-value	Mean \pm SD [°C]		
Time before parturition	<0.001	>48h: 37.7 \pm 0.3	24-48h: 37.6 \pm 0.3	<24h: 37.2 \pm 0.4
Moment during the day	< 0.001	8am: 37.6 \pm 0.4	2pm: 37.5 \pm 0.4	6pm: 37.6 \pm 0.4
Year	<0.001	\leq 2012: 37.6 \pm 0.4		>2012: 37.5 \pm 0.4
Age of the dam	0.025	<3y: 37.6 \pm 0.4	3-7y: 37.6 \pm 0.4	>7y: 37.5 \pm 0.4
Season	0.025	Summer: 37.6 \pm 0.4		Others: 37.6 \pm 0.4
Litter size	0.16	<7: 37.6 \pm 0.4	7-10: 37.6 \pm 0.4	>10: 37.5 \pm 0.4

Only the **time before parturition** had a clinical impact on body temperature based on the Effect Size Index (Table 1).

Fig.1. Median rectal temperature depending on time before parturition in 206 bitches.

78% (161/206) of bitches with temperature $\leq 37.1^{\circ}\text{C}$ whelped in the following 24h

14% (28/206) of bitches presented at least ones temperature $\leq 37.1^{\circ}\text{C}$ between 2 and 7 days before whelping

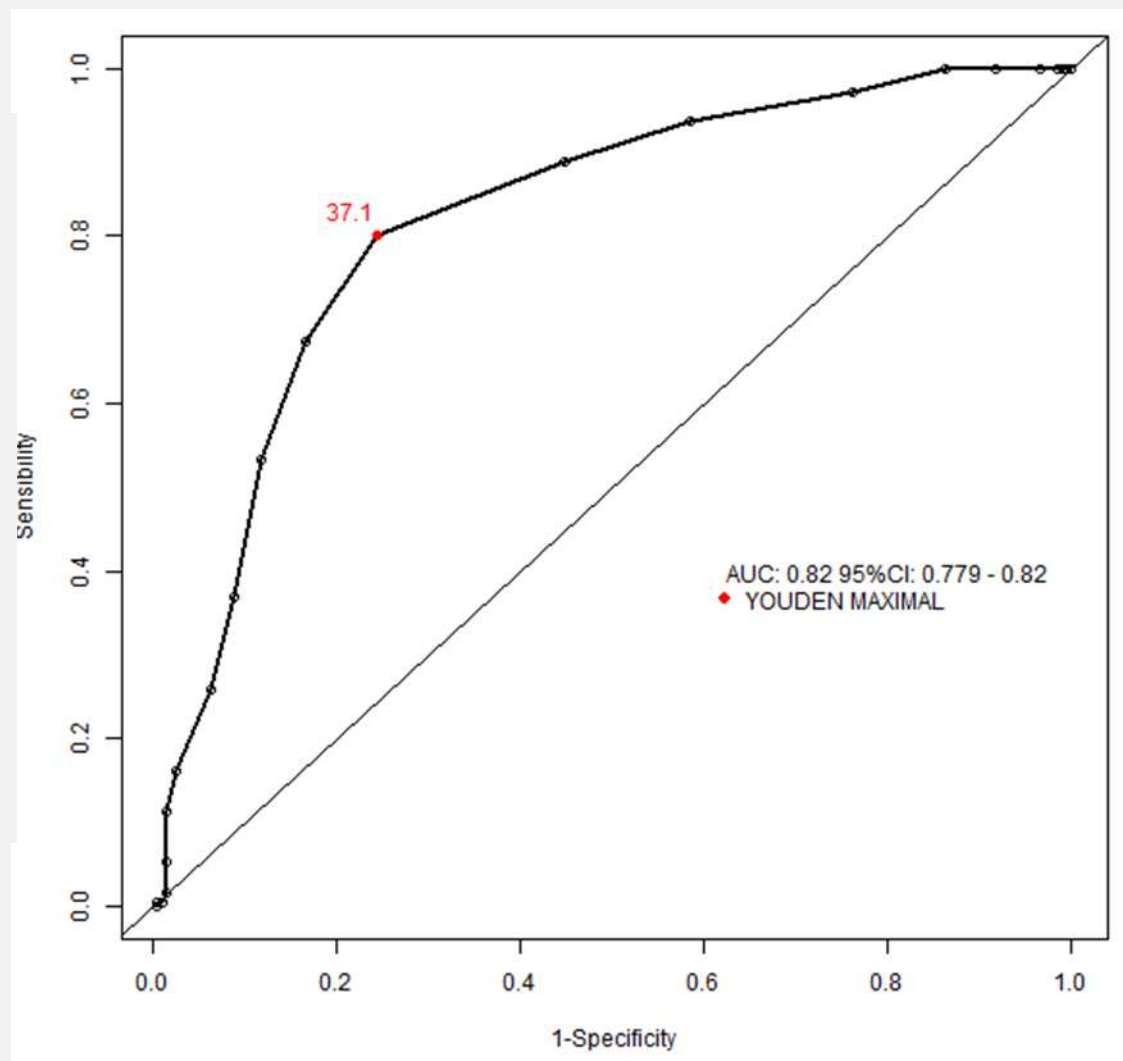
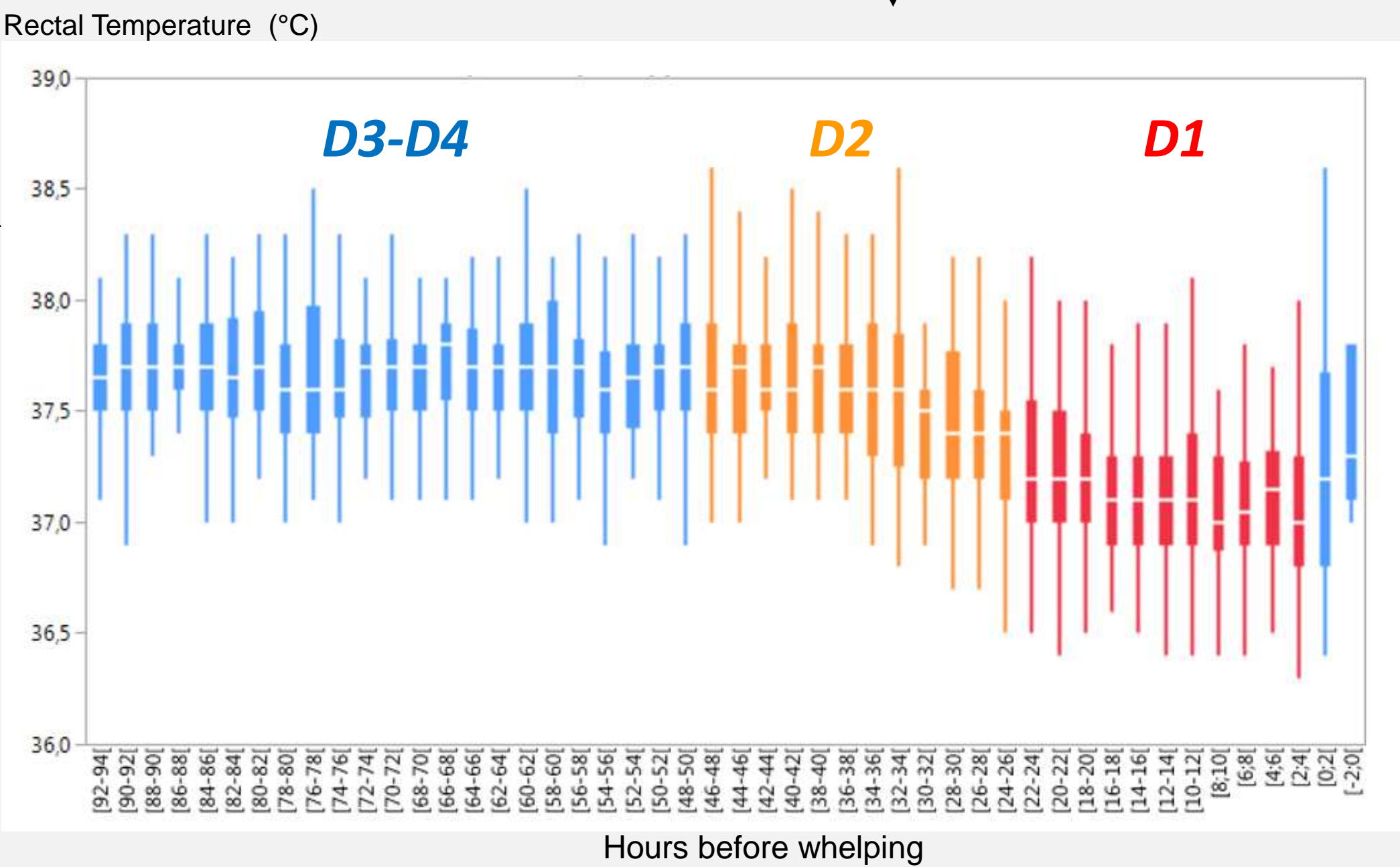


Fig.2. Definition of the best-cut off value of temperature for the prediction of whelping (ROC curve)

Best cutoff value to predict whelping in the following 24h
37.1°C
AUC=0.82
Sensibility=80.0%
Specificity=75.6%
Positive predictive value=76.7 %
Negative predictive value=79.1 %



DISCUSSION & CONCLUSIONS

- The body temperature is a very useful tool to take the decision to follow the pregnant bitch during the night or not. If body temperature is $\leq 37.1^{\circ}\text{C}$, the probability of whelping onset in the following 24 hours is high. A close monitoring of the bitch in this case is recommended.
- The influence of breed on rectal temperature and on whelping prediction remain to determined.
- The association of different methods of whelping prediction, like for example body temperature and progesterone assay, could improve the prediction values.