

**ifce**  
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**ifce** |  
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du **cheval**  
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les Haras  
nationaux



le Cadre  
noir



**INRA**  
SCIENCE & IMPACT

**Antelliq**  
A MSD/Merk company

# Using a microchip to detect temperature variations before parturition in mares



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# Introduction

Gestational length in mares is highly variable: from 320 to 360 days (Silver, 1990)

## Methods used nowadays around parturition

### Mammary secretions analysis:

- Ca & Mg titration
- pH

(Cash et al., 1986, Ley et al., 1989)

### Behavioural changes:

- Budget time modifications
- specific behaviours

(Shaw et al., 1988, McGrevey, 2012)

### Physical signs:

- relaxation of sacrosciatic ligaments
- mammary hypertrophy
- waxing of teat

(Martin et al., 1996, Canisso et al., 2013)

## Body temperature used as an indicator of the onset of parturition for...



### Cows

Ricci et al., 2018  
Geiser et al., 2014

### Ewes

Laburn et al., 1994  
Nabenishi, Yamazaki, 2017



## But for horses, results are contradictory



- not usable as a predictor Cox, 1969 ; Jeffcott, 1972
- potentially used as a predictor Shaw et al., 1988 ; Cross et al., 1992 ; Korosue et al., 2012

# Aim of the study

Predict the onset of parturition in mare using  
**Temperature**



# Material and methods

## *Animals*

**2018 & 2019  
Mid-March to April**

36 foalings occurred between 7pm and 7am

Aged of 8.0 ±2.7 years old



**39 Anglo-Arabian type mares**

13 primiparous  
26 multiparous

Water *ad libitum*  
Forage and concentrates (INRA requirements) distributed twice daily

Access to pasture in group 3 times per week

# Material and methods

## *Temperature recording*



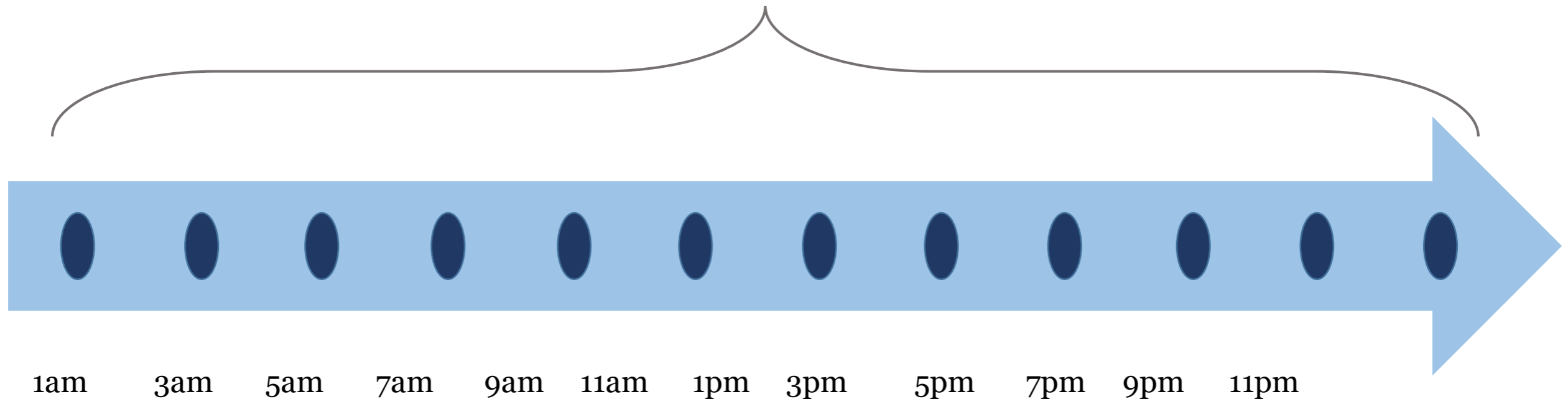
Equipped with RFID 13mm identification chip  
(Thermochip, Antelliq a MSD/Merk company)

Placed intramuscularly in the neckline

# Material and methods

## *Temperature recording*

12 recordings a day at 2 hours intervals



At least **5** days before parturition ( $24 \pm 12.0$  days)

# Material and methods

## *Temperature recording*

**Manually recorded using GPR+ (Global Pocket Reader Plus, Destron™)**





# Results

## *Linear mixed model*

Modelisation : body temperature ~ lme(fixed effects, random effect)

**Fixed effect**  
Horse & Day

**Random effect**  
Time of the day

High inter-individual variability

Differences between the day of foaling (do) and control days (from 5 days before d-5 to the day before d-1)

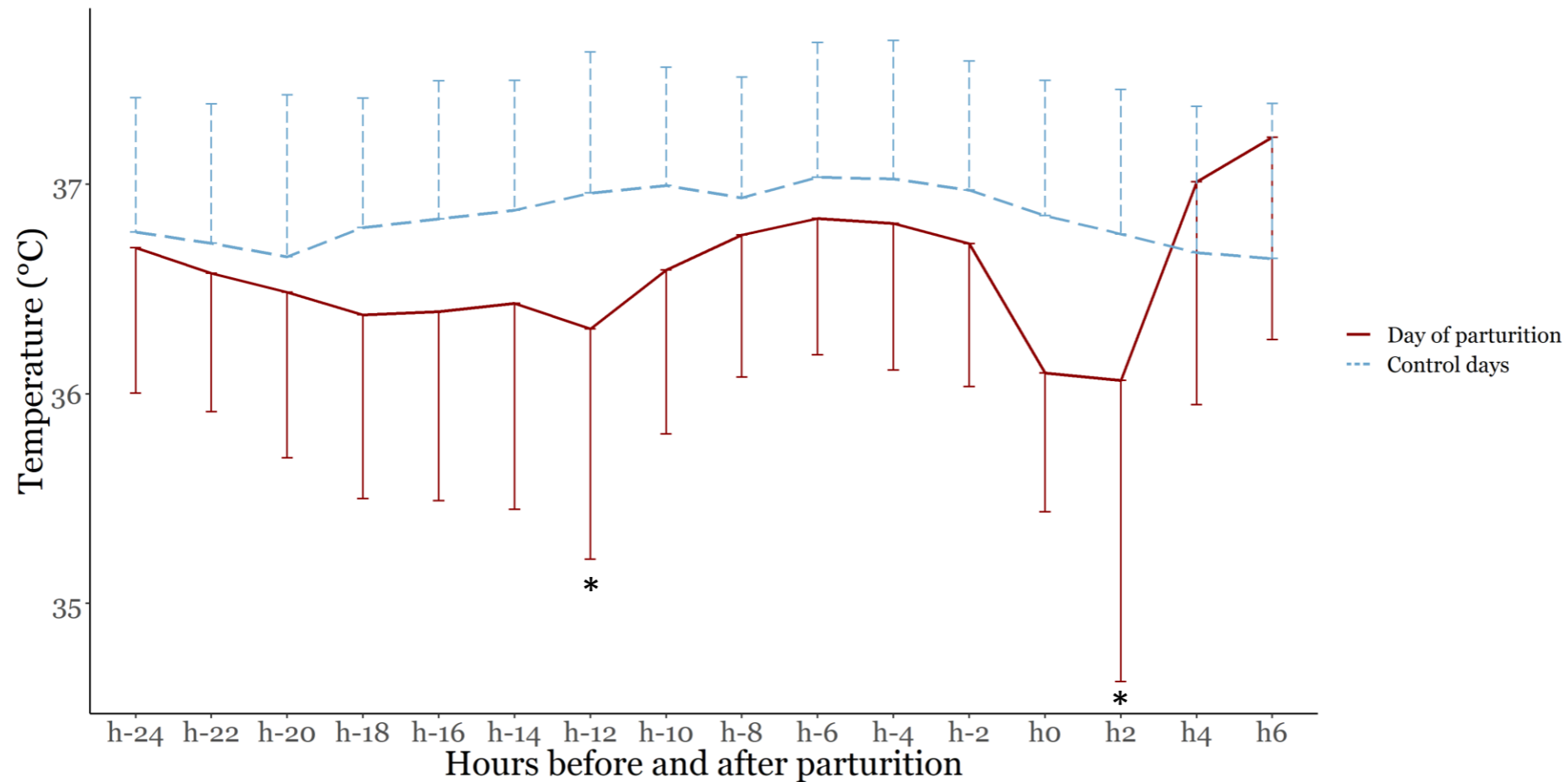
Factor	Amplitude(°C)	Std. Error	p-value
d-1	0.22	0.03	< 0.001
d-2	0.30	0.03	< 0.001
d-3	0.36	0.03	< 0.001
d-4	0.31	0.03	< 0.001
d-5	0.30	0.03	< 0.001

# Results

## *Means comparisons*

Comparison between  $d_0$  and  $d_{1-5}$  at each time set

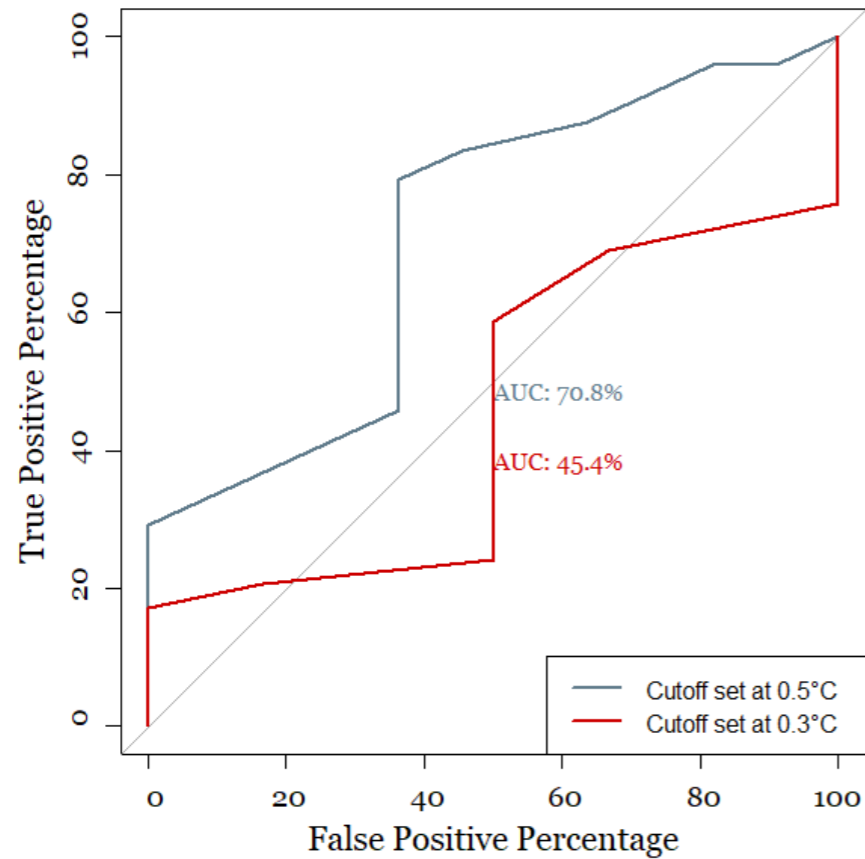
2 time sets significant ( $\alpha = 1\%$  \*)



# Results

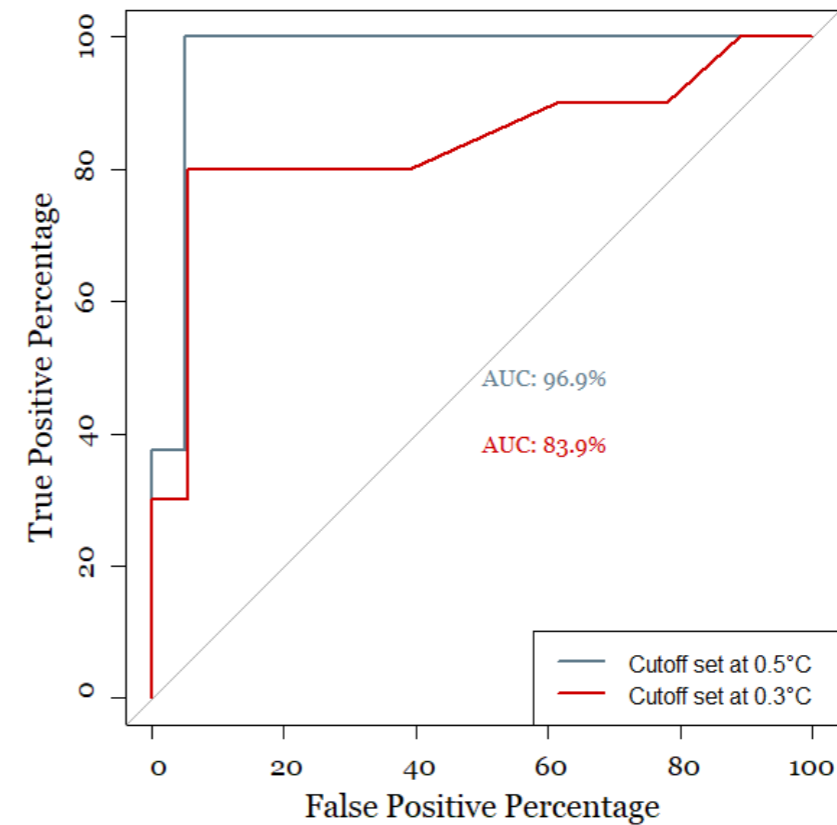
## ROC curves

ho



Decrease observed for 80% of the population

h-12



Decrease observed only for 50% of the population

# Discussion

## *Calculation*

- Difference between measured temperatures



→ **Good predictor**  
 (Korosue et al., 2012)

- Temperature rhythm (phase, amplitude)  
 Circadian rhythm can be altered around parturition

**Ewes**  
 Nabenishi, Yamazaki, 2017

**Hamster**  
 Scribner and Wynne-Edwards, 1994



# Conclusion



Have to be associated with other indicators to be reliable





# Acknowledgements

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