Evaluation of different devices for automated estrous detection in dairy cows

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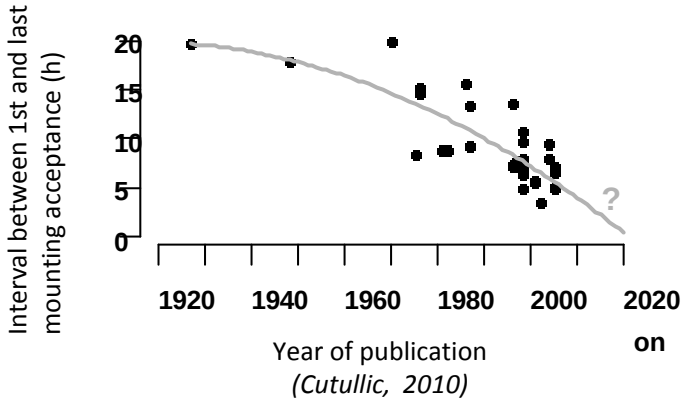
Context of the study

- A reduced estrous expression in high producing dairy cows
- Estrous detection: a time-consuming and delicate task
- Considerable technological advances in automated estrous detection

  (pedometer, activity recorders, progesterone assay on-line,...)



(Cutullic, 2010)

(Photo: UNCEIA)

Objectives of the study

1) Assess heat detection reliability of 3 automated detectors

P: Pedometer Afitag® (AFIMILK)

HT: Activity recorder Heatime-Ruminact® (MILKLINE)

HP: Activity recorder HeatPhone® (MEDRIA)

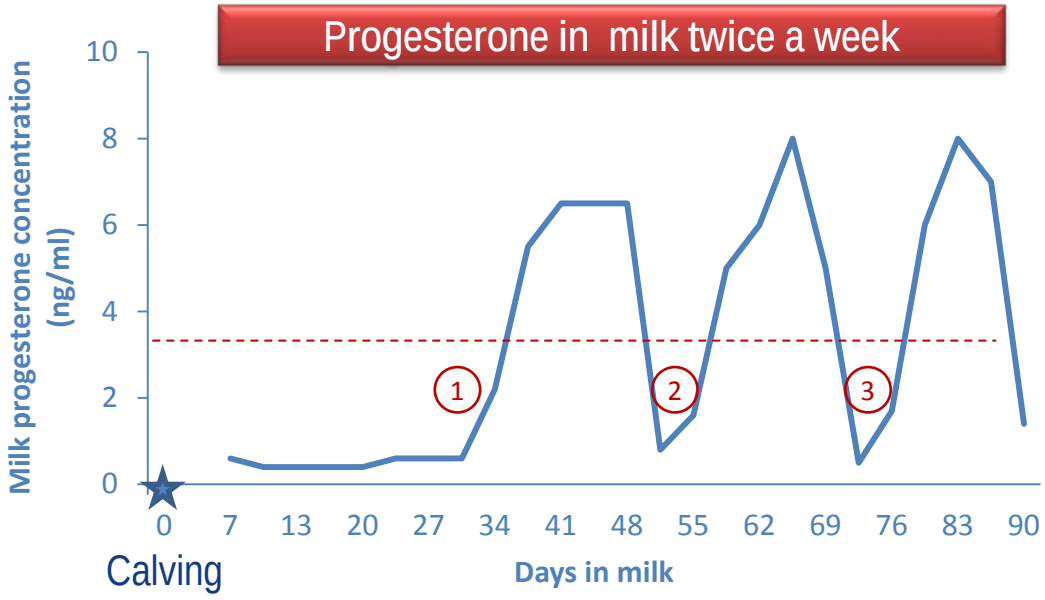
→ HP2: a new algorithm applied *a posteriori* on the collected data

2) Analyse factors influencing their reliability

ovulation, lactation rank, pattern of cyclicity, milk production…

Experimental design

- 63 Holstein cows fitted with the 3 detectors



→ Resumption of cyclicity

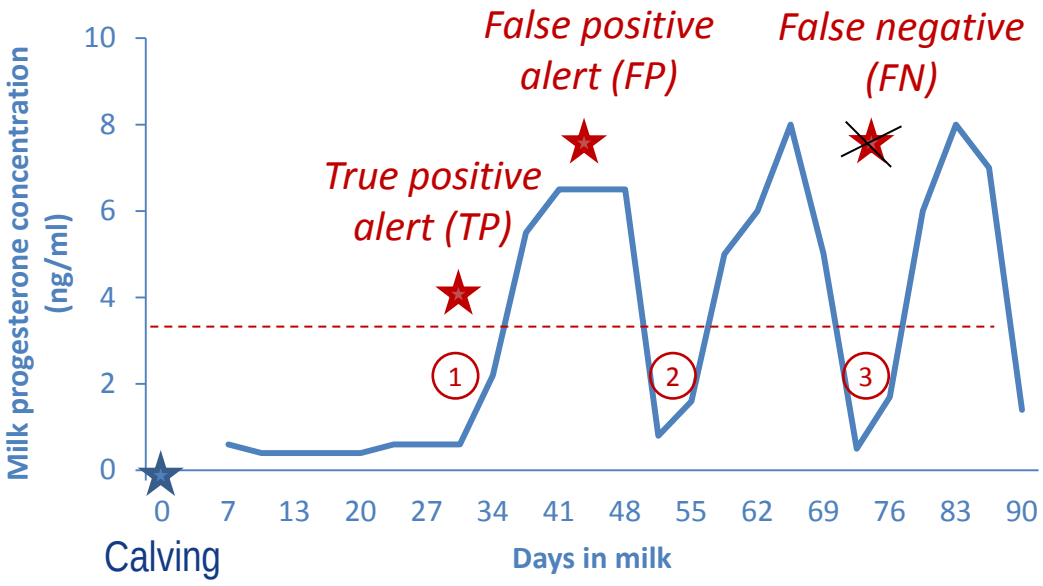
→ Ovulation period and rank

Expected estrous period

→ Pattern of ovarian cyclicity

Experimental design

Interpretation of estrous alerts of the 3 detectors



SENSITIVITY

$$SE = \frac{TP}{(TP + FN)}$$

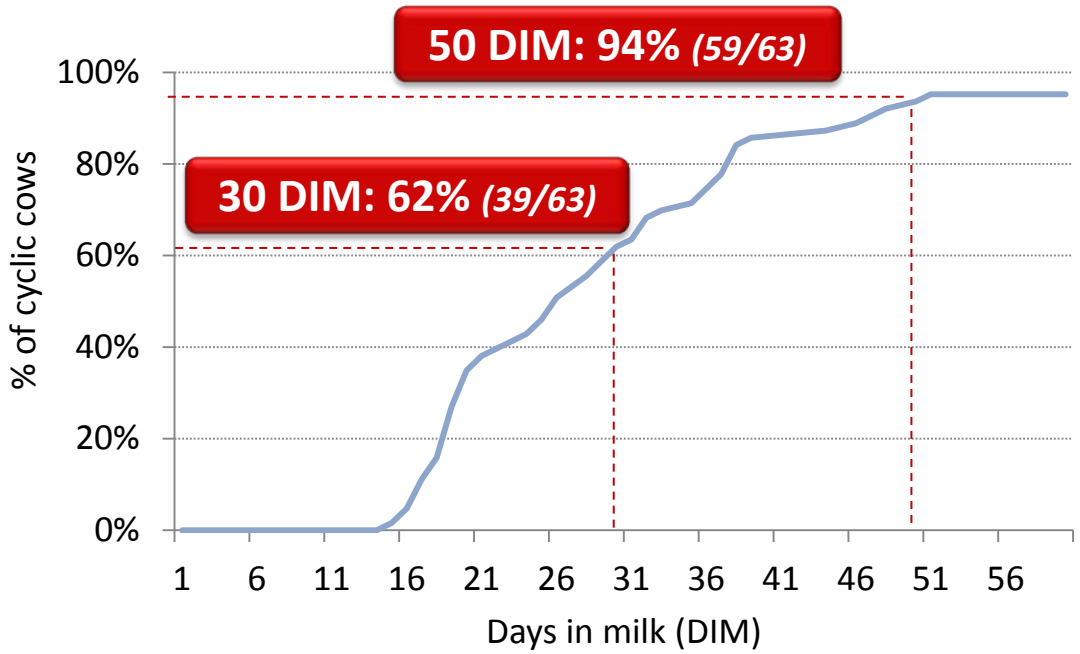
POSITIVE PREDICTIVE VALUE

$$PPV = \frac{TP}{(TP + FP)}$$

An expected pattern of cyclicity in dairy cows

The resumption of cyclicity

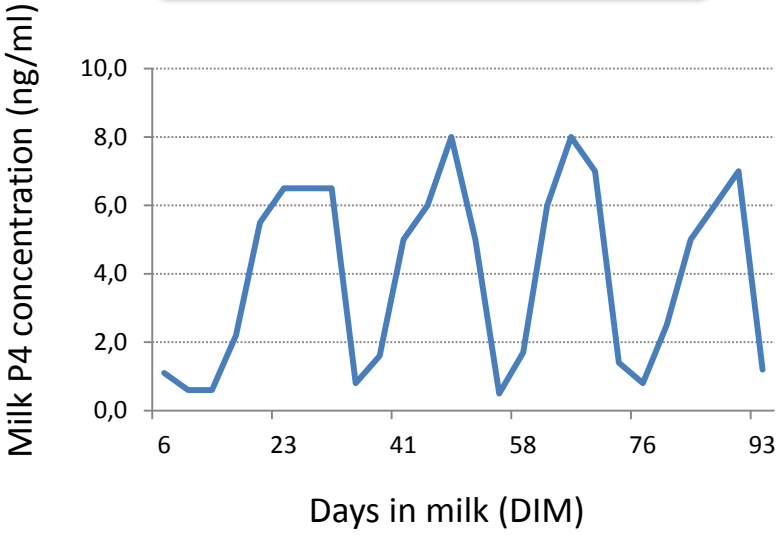
On average: 27.7 ± 9.8 DIM



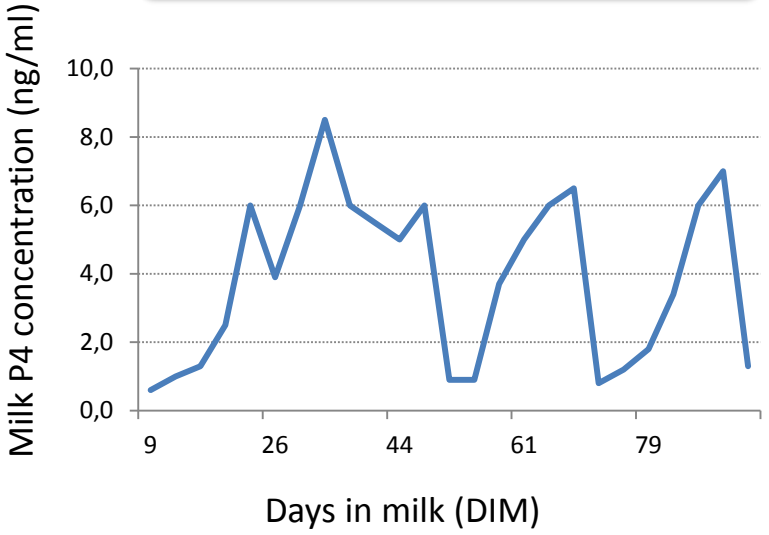
An expected pattern of cyclicity in dairy cows

The pattern of ovarian cyclicity

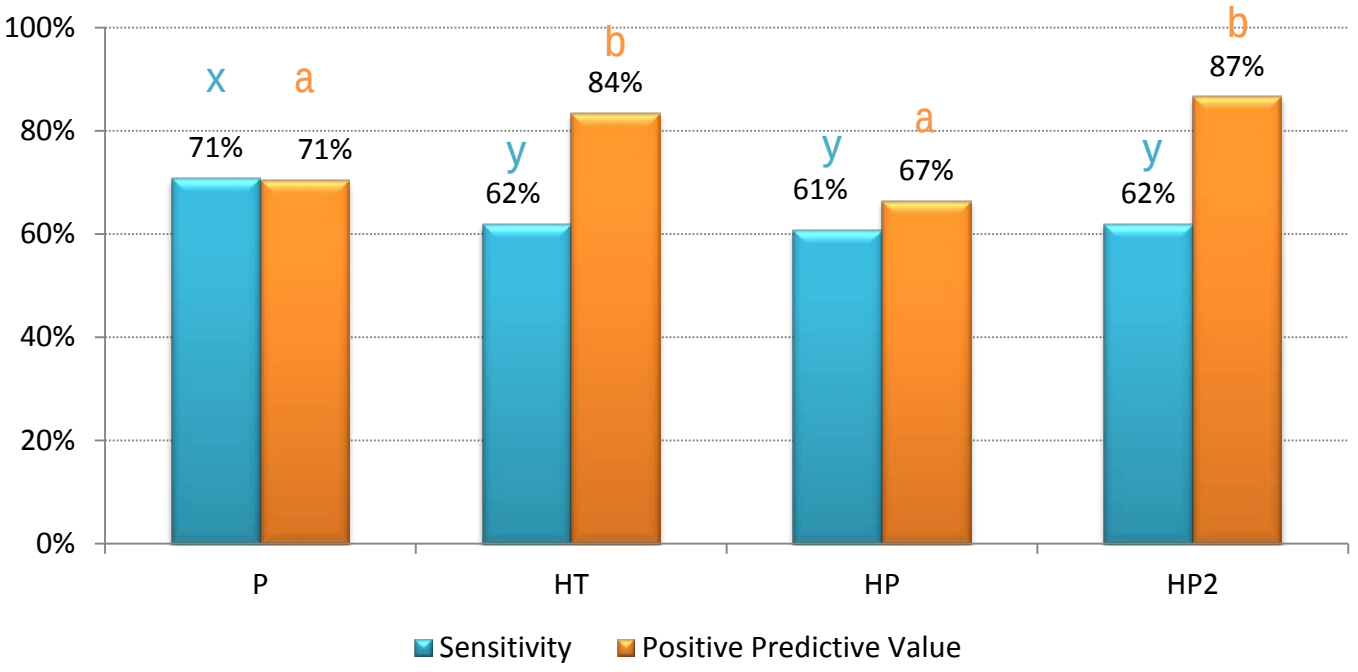
Normal: 60.3% (38/63)



Prolonged: 17.5% (11/63)

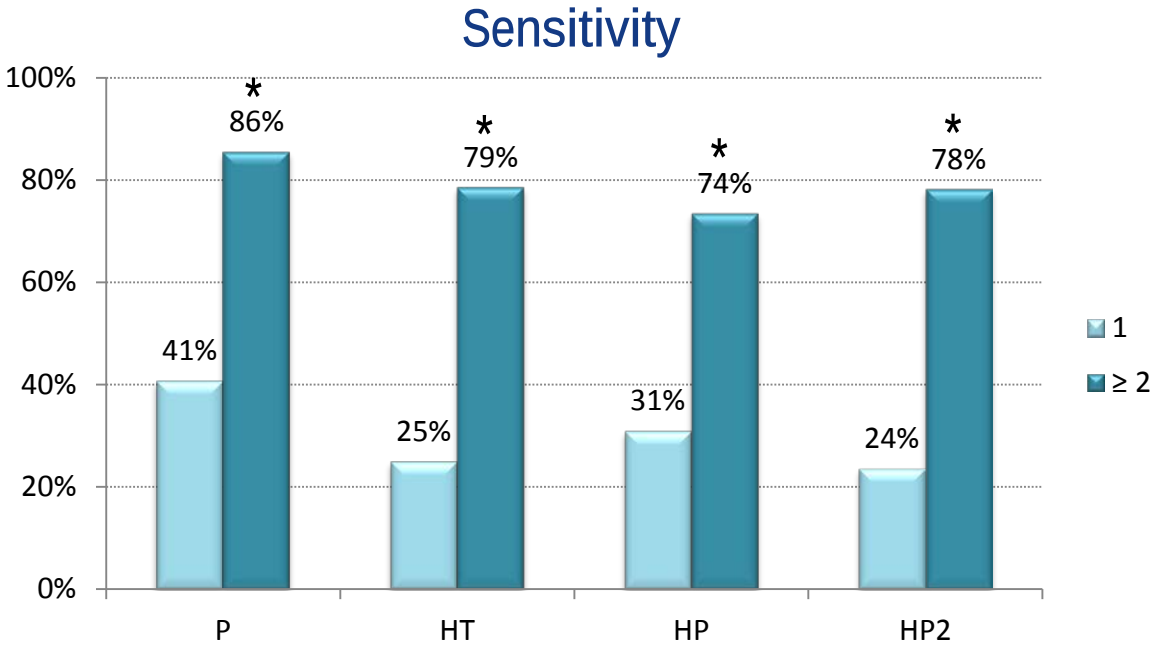


The pedometer : a higher sensitivity but a lower positive predictive value



n = 211 ovulations
On the operating period of all devices
a ≠ b; x ≠ z (p < 0,05, proc GLIMMIX, SAS®)

The detection of estrus mainly influenced by ovulation rank



n = 211 ovulations
From the univariate analyses; on the operating period of the studied device
*For each device, *: p < 0,05 proc GLIMMIX, SAS®*

Discussion – Conclusion

- Results consistent with the literature
  - Pattern of cyclicity and detection of estrus
- A sensitivity of detection comparable to visual observations, but a high rate of false positive alerts
- A poor reliability on the 1st ovulation
  - Probably due to weak expression of estrus and silent ovulation
  - A limited problem: out of the period of inseminations (> 50 DIM)
  - Risk for cows with a delayed resumption of ovarian cyclicity

Discussion – Conclusion

Are automated estrous detectors useful tools for reducing constraints without decreasing reproductive performances?

YES

- Automated and continuous estrus detection
- Great performance after 50 DIM

With conditions:

- Combine alerts and visual observations
- Cost-benefit ratio to investigate

Thank you for your attention