Heatime-Ruminact™ : an innovative tool for monitoring and phenotyping cattle

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Introduction : CREAVIA bovine activity

1-<u>Reproduction techniques</u>
- 3.000.000 AI doses sold/year
- 1.000.000 AI/year
- 8500 embryo transfer

25 000 member farmers

2-<u>Bovine selection</u>
- Dairy (Holstein, Normande, Red Pied)
- Beef (Charolais, Parthenais, Rouge des Prés)
- 300 dairy bulls tested/year(Jocko Besne)

3-<u>Reproduction solutions for breeders</u>
- Calving sensors
- Heat detection : **Heatime™**
- Monitoring : **Heatime-Ruminact™**

Phenotyping

Heatime-Ruminact™ (HR)

BOX :
-**Cow history** : calving,AI, pregnancy test dates…
-Algorithm for **heat detection**
-Algorithms for **health disorders detection**

TAG :
- **Activimeter** : activity/2h
- **Microphone** : rumination time/2h

- Heat detection
- Health trouble detection
- Nutrition monitoring

Development — SCR PRECISE DAIRY FARMING

Distribution Europe — MILKLINE

Sell France — CREAVIA CRÉATEUR DE GÉNÉTIQUE

Informative value of raw data and alarms ?

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Plan

I- Evaluate HR performance for heat detection under field conditions.

A- Study 1 : HR detection compared with usual detection methods in dairy cows

B- Study 2 : Impact of HR use on reproduction results in commercial dairy herds

II- Informative value of HR rumination time ?

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I- Evaluate HR performance for heat detection in field conditions

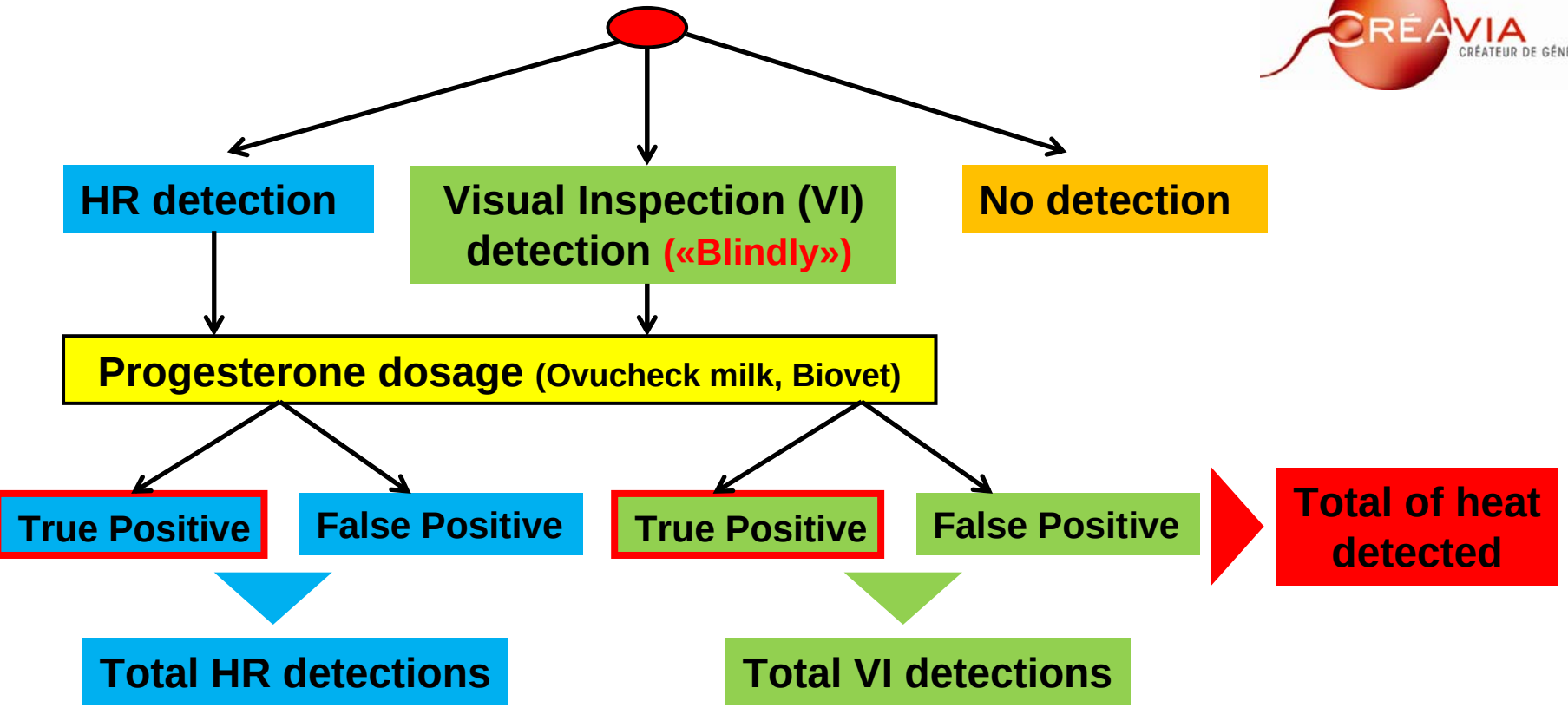
A- Study 1 : HR detection compared with usual detection methods in dairy cows (Philipot et al., 2010)

1- Material and methods

- **43 Holstein cows (MY=9000kg)**

- **Heat detection from calving until fecundation by :**
  - ✓ **Visual inspection (3 times/day)**
  - ✓ **HR (2 times/day, before milking) using manufacturer recomandations**

Decision tree for heat validation



Rate of Heat Detected (**RHD**) = $\frac{\text{True Positive}}{\text{Total of heat detected}}$

Reliability of the Method (**REL**) = $\frac{\text{True Positive}}{\text{Total of detections by the method}}$

2- Results and discussion

Detection method				
	HR only	HR&VI	V I only	Total
TP	16	71	27	114
FP	7	0	4	11
Total	23	71	31	

94 **102**

	HR	VI	
RHD (Rate of Heat Detected)	**76%** (87/114)	**86%** (98/114)	**P<0.1 (chi2)**
REL (Reliability)	**93%** (87/94)	**96%** (98/102)	**N.S. (chi2)**

- **HR detect less heats than a good VI (farmers sensitivity=57%(Holman et al., 2011)).**
- **HR reliability is high**
- **16 heats are detected by HR only.**

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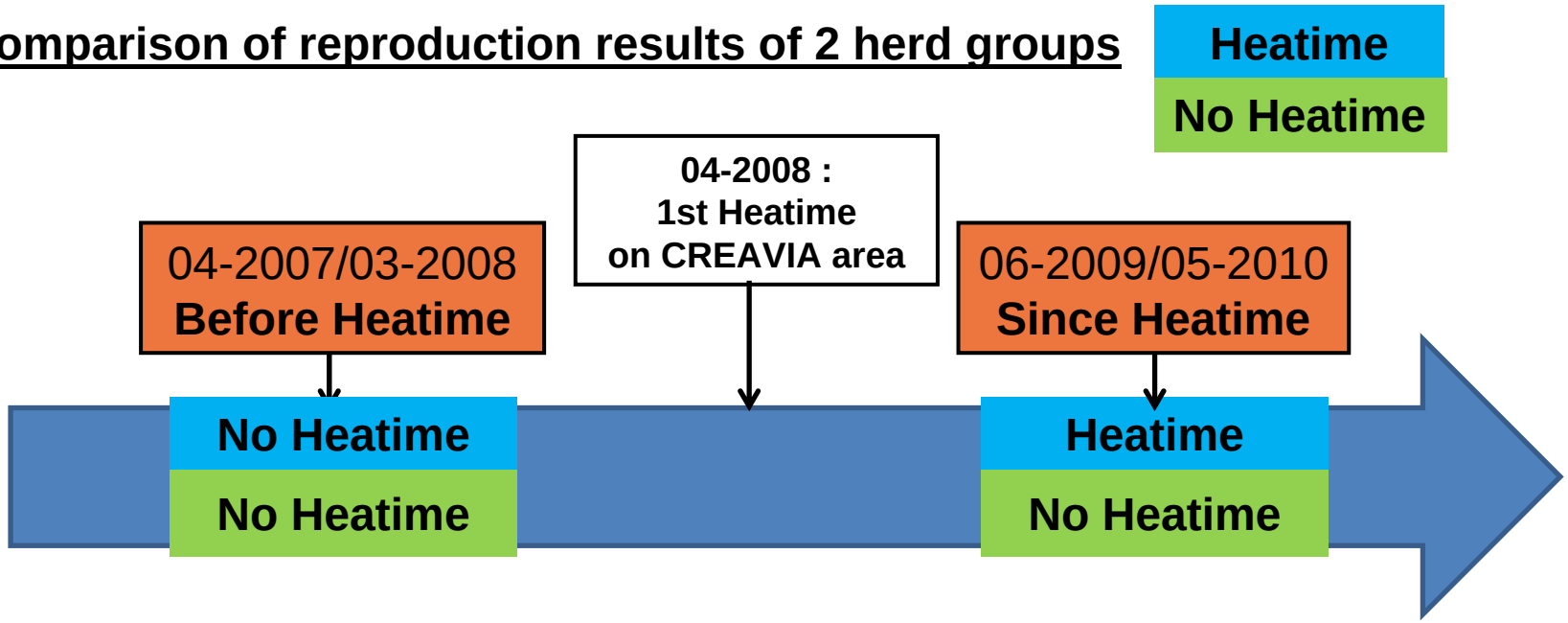
1- Material and methods

- **Comparison of reproduction results of 2 herd groups**



Statistical analysis : ANOVA (proc GLM, SAS)

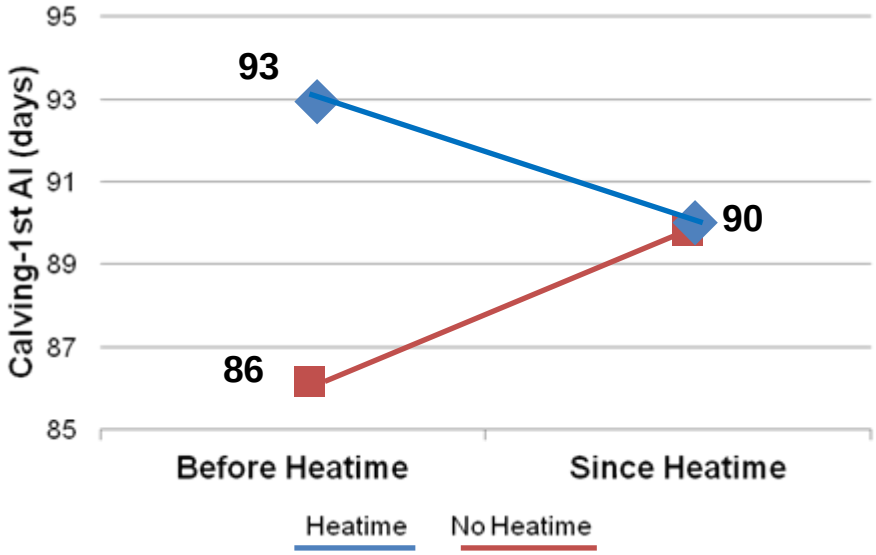
Model : $Yi = \alpha + Xi\ b + \varepsilon i, \quad \varepsilon \sim \text{Normal}(0, \sigma 2)$

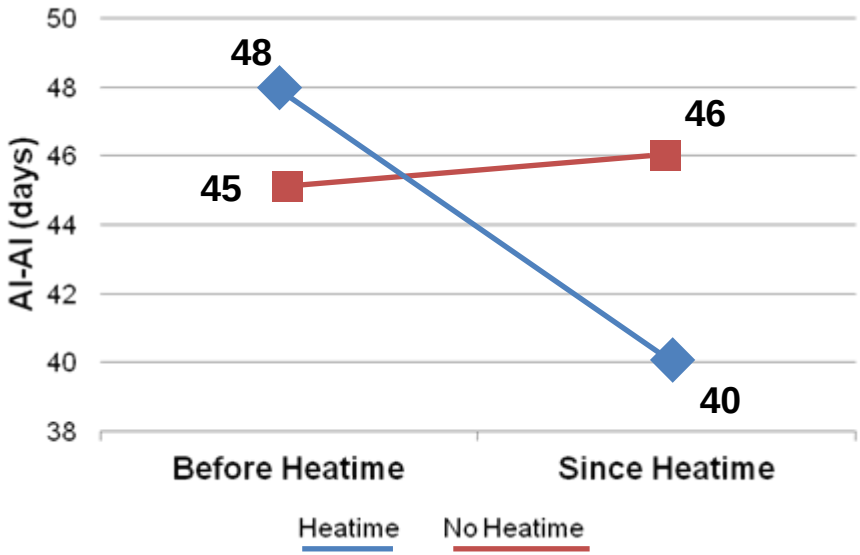
- Calving-1st AI
- AI-AI interval
- 1st AI pregnancy rate

- Parity
- Period
-Heatime equipment
-Period*equipment

2- Results

	No Heatime	Heatime
Number of herds	**1510**	**46**
Cows/herd	**49**	**57**
Average production (kg/cow)	**8320**	**8280**
Fertility Index	**0.67**	**0.66**





- **No effect of Heatime equipment on 1st AI pregnancy rate (40.5 vs 41.2, N.S.)**
- **Potential gain…16 days on calving interval**

Conclusion on HR for heat detection

- HR sensitivity = mean farmers sensitivity
- HR PPV ↗

HR can be used « without risk » for heat detection, alone or as a complement to VI

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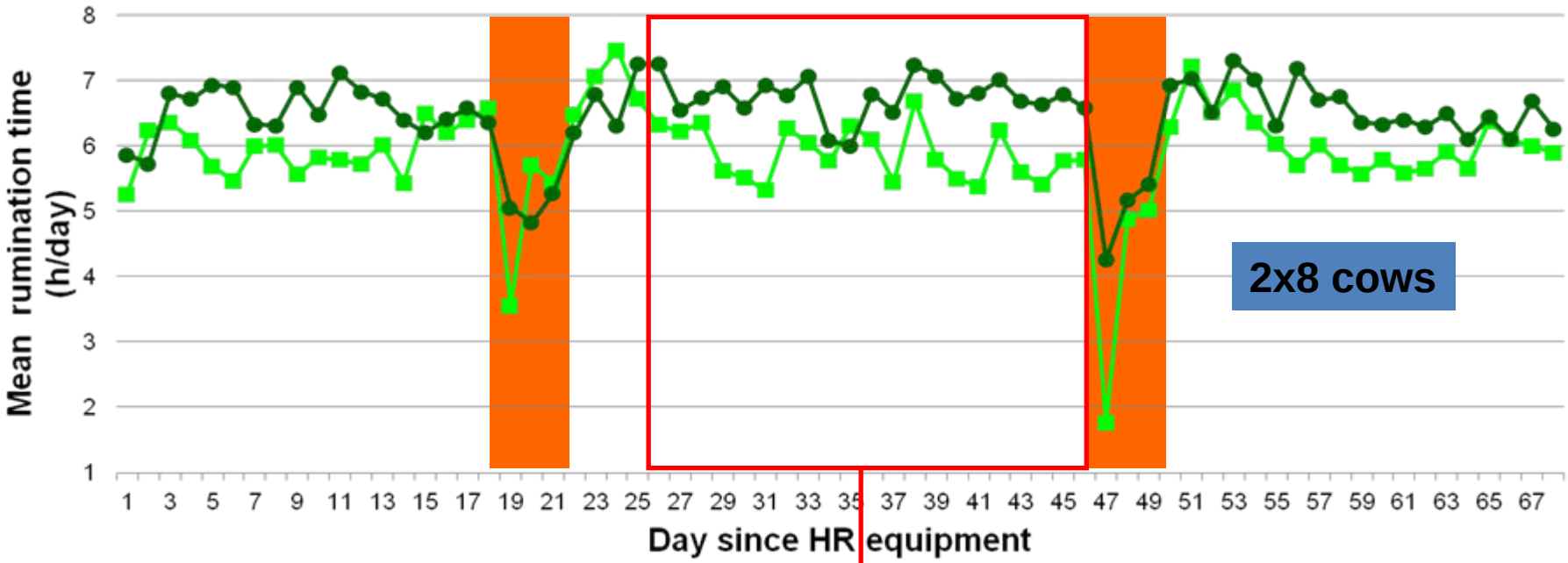


F/C : 70/30 (low risk of acidosis diet : LR)

F/C : 45/55 (high risk of acidosis diet)

F/C : 30/70 (3d acidosis challenges)

N=16	20 days mean rumination time/cow (h/day)
Mean	6.3
SD	1.5
Min	4
Max	9.6

Conclusion on informative value of HR rumination time

- **Important drop in mean rumination time during the 1st day of acidosis challenges : acidosis/SARA detection**

- **High variability of rumination times between cows : potential genetic improvement ?**

What could be the benefit to select animals on rumination time ?

Conclusion

1- Phenotyping

-High variability of rumination times between cows

- **Ex : CREAVIA/Oniris ongoing studies :**
  - **Relationship between rumination and food intake ?**
  - **Relationship between rumination and enteric methane emission ?**

2- Monitoring

-HR= sensitive and highly reliable system for heat detection

- **EX : CREAVIA/Oniris ongoing studies**
  - **Informative value of HR health alerts ?**

Acknowledgments

Financial & technical partnership

Studies partners

Thank you for your attention…

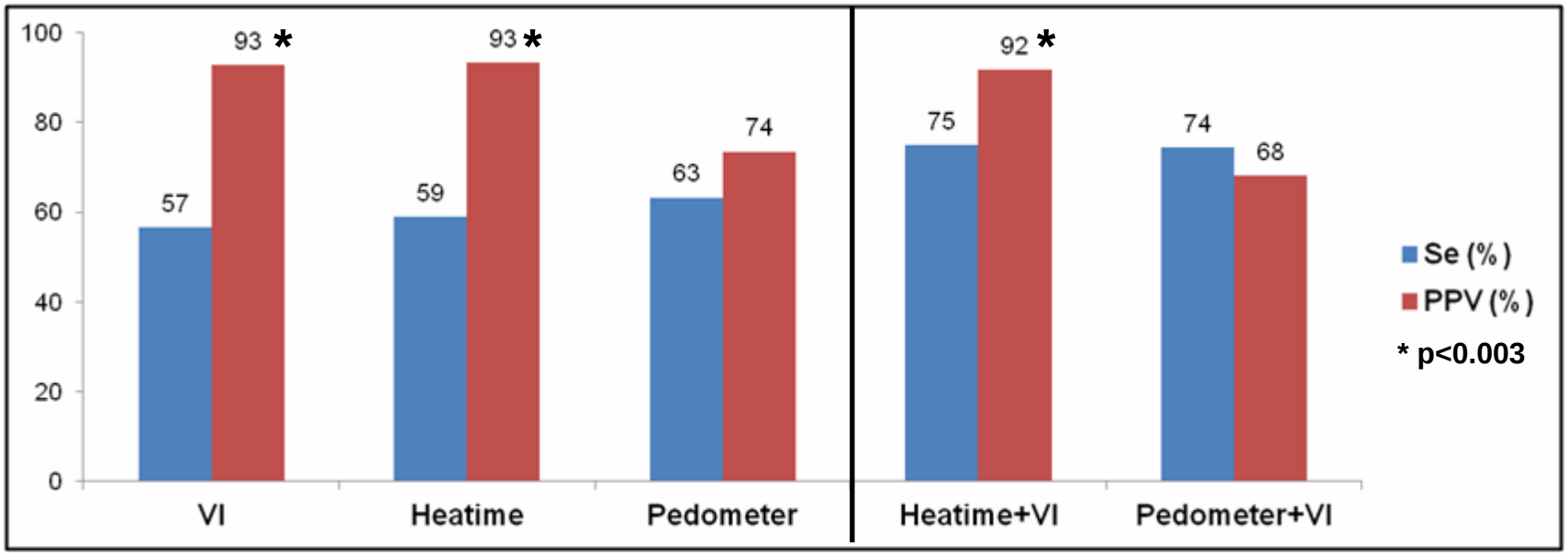
Comparison of oestrus detection methods in dairy cattle (Holman et al., 2011)

•67 Holstein cows (MY=11000kg)

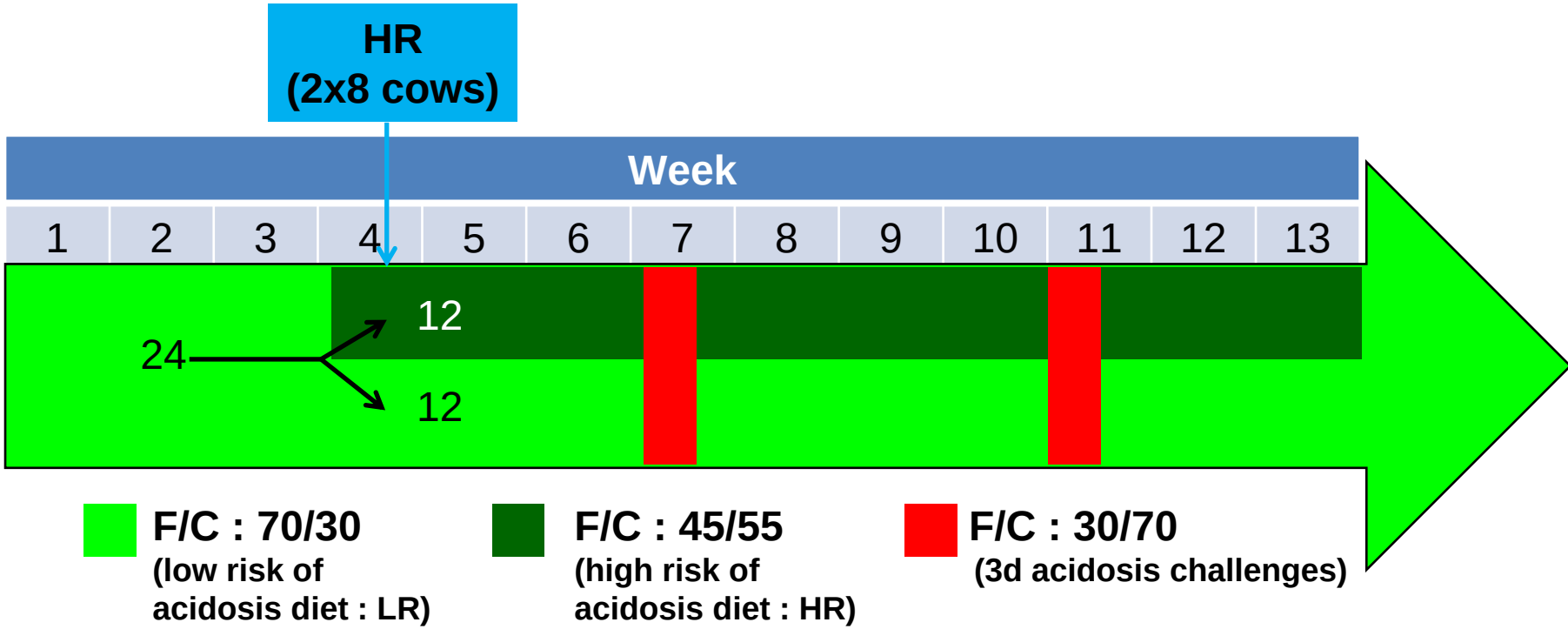
• Heat detection by :

- ✓ Visual inspection (6 times/day)
- ✓ Heatime
- ✓ Leg pedometer (Afitag, SAE Afikim)
- ✓ 2 methods combination

• Gold standard : progesteron dosage twice a week



•Sensitivity of VI, Heatime, Pedometer are equivalent
•PPV Heatime > PPV Pedometer
•Association Heatime+VI increase detection sensitivity



F/C : 70/30
(low risk of acidosis diet : LR)

F/C : 45/55
(high risk of acidosis diet : HR)

F/C : 30/70
(3d acidosis challenges)