

Comparison of two gold standards for evaluation of a mastitis detection model in AMS

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Mastitis detection in AMS

- Mandatory visual control of milk
- Not possible with automatic milking
- Rely on sensor systems



Automatic mastitis detection

- Electric conductivity
- Milk color, temperature
- Bio-sensors (milk enzymes)
- Somatic cell count (OCC)



How good is a detection system?

- Sensor type (inline, online)
- Detection algorithm
- Alert definition (what do we want to detect?)
- Gold standard
- How to link alert with gold standard
- Validation criteria (Se, Sp, FAR, SR)

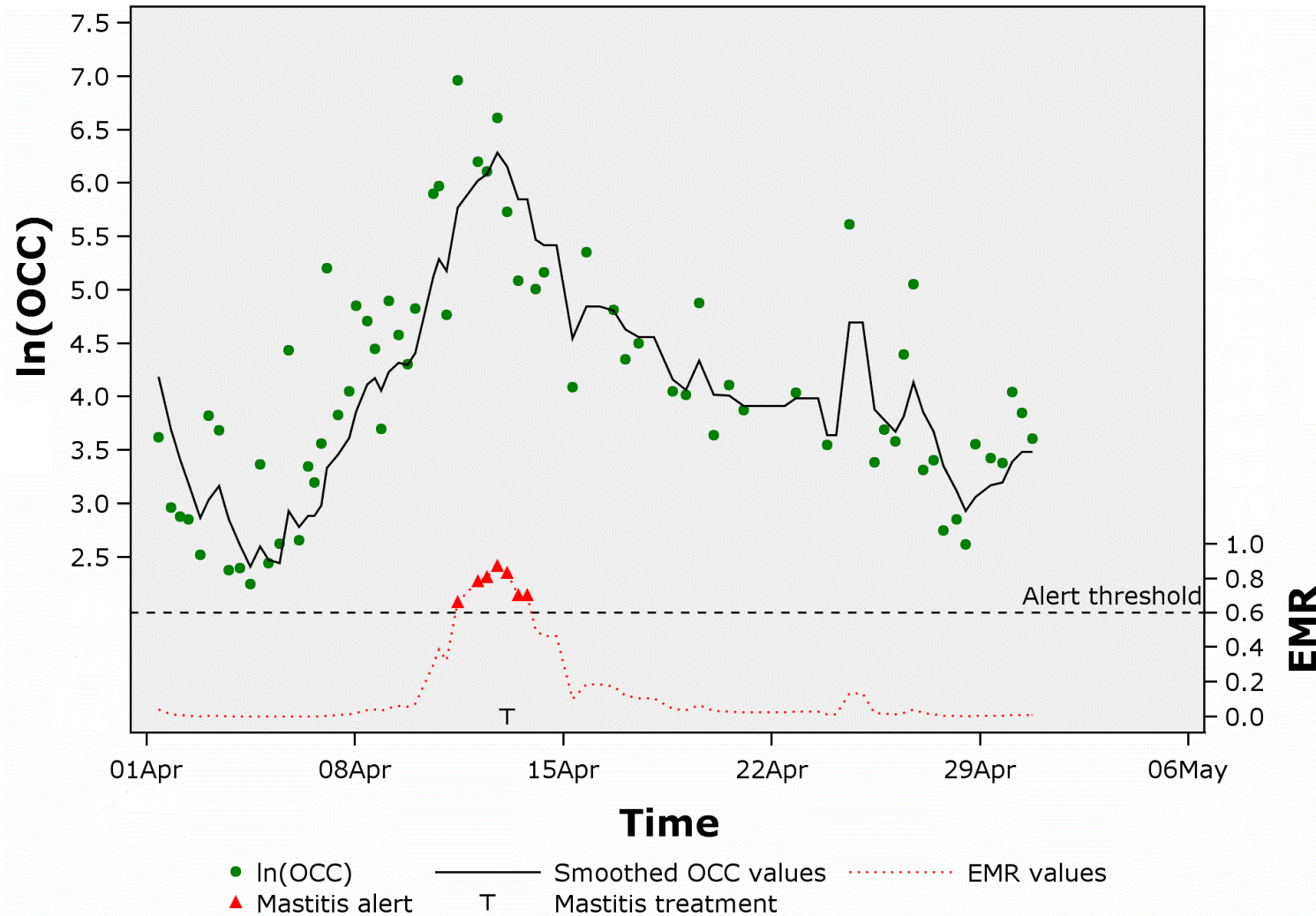
Study objectives

- Suitability of qPCR results as gold standard (cross-sectional study)
- Comparison with recorded mastitis treatments (case-control study)

Data

- 1 research and 5 commercial dairy herds
- 2,766 cow lactations (> 50 milkings)
- 321 recorded mastitis treatments
- 1,117 collected milk samples for qPCR

Detection algorithm output



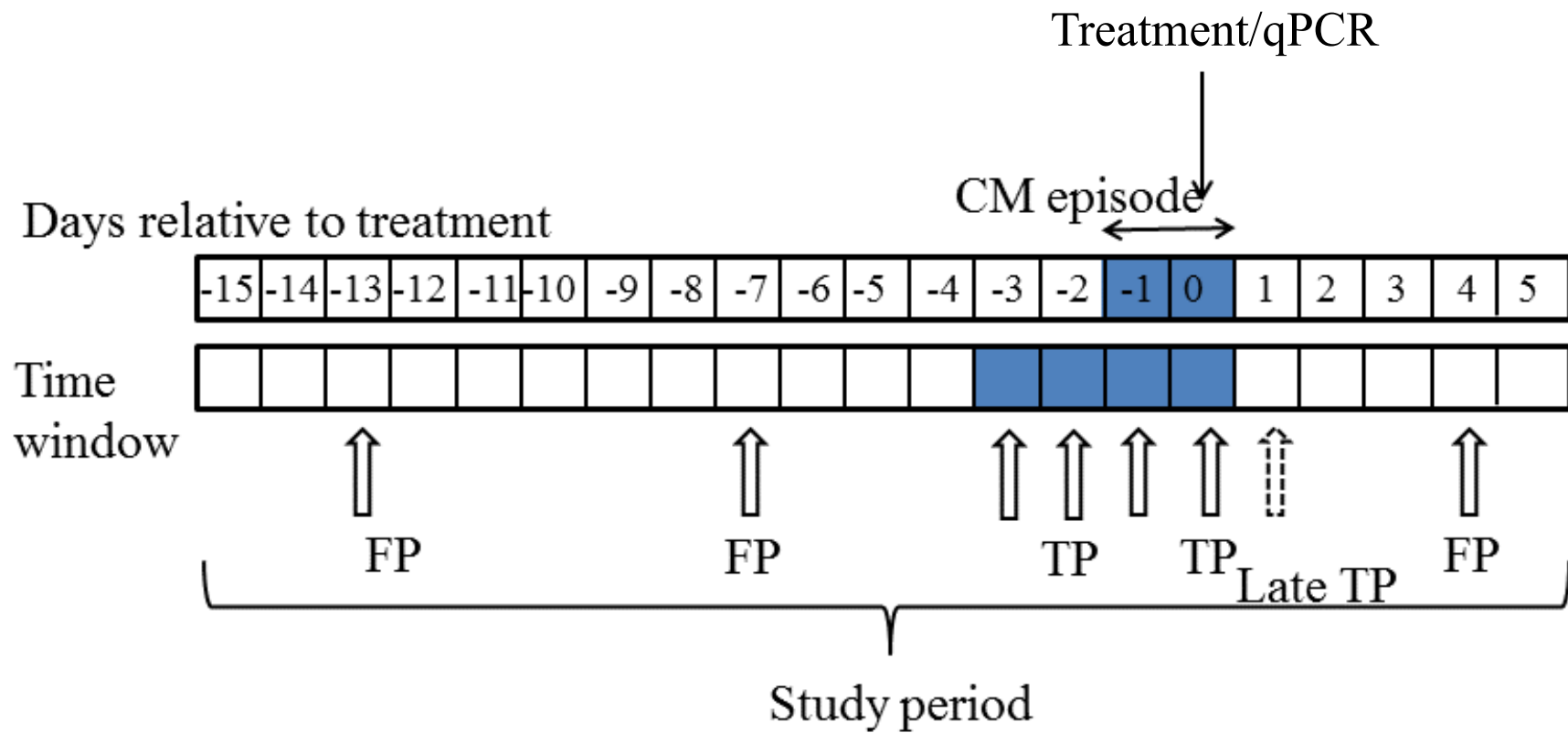
Validation setup

Thresholds

EMR: Relaxed and stringent

PCR: As recommended, Ct-value ≤ 37

Time window analysis



Validation parameters

False alert rate (FAR)

Number of false alerts per 100 milkings

Success rate (SR)

Proportion of true model alerts

Sensitivity (Se)

Proportion of detected mastitis episodes

Specificity (Sp), only PCR

Proportion of healthy cows not detected

Gold standards

Mastitis prevalence: 11.6 %

Proportion of positive PCR results: 34 %

Validation results

Validation parameter	Alert threshold			
	Relaxed		Stringent	
	Treatment	PCR	Treatment	PCR
False alert rate, %	0.6	0.4	0.6	0.2
Success rate, %	80	71	77	68
Sensitivity, %	91	25	78	8
Specificity, %	-	97	-	93

Take home messages

qPCR is:

- **not useful for validation purposes**
- **too sensitive – detection of non-viable pathogens**
- **costly but objective in nature**
- **more useful from a practical point of view**

Also:

- **qPCR and treatments may cover different aspects of mastitis**

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