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Feeding Concentrate in Early Lactation Based on Rumination Time

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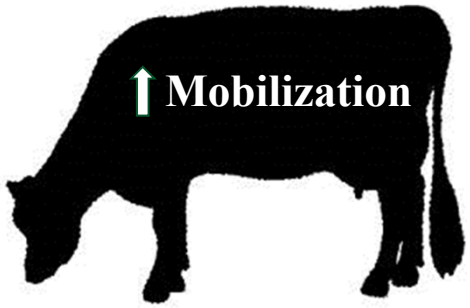
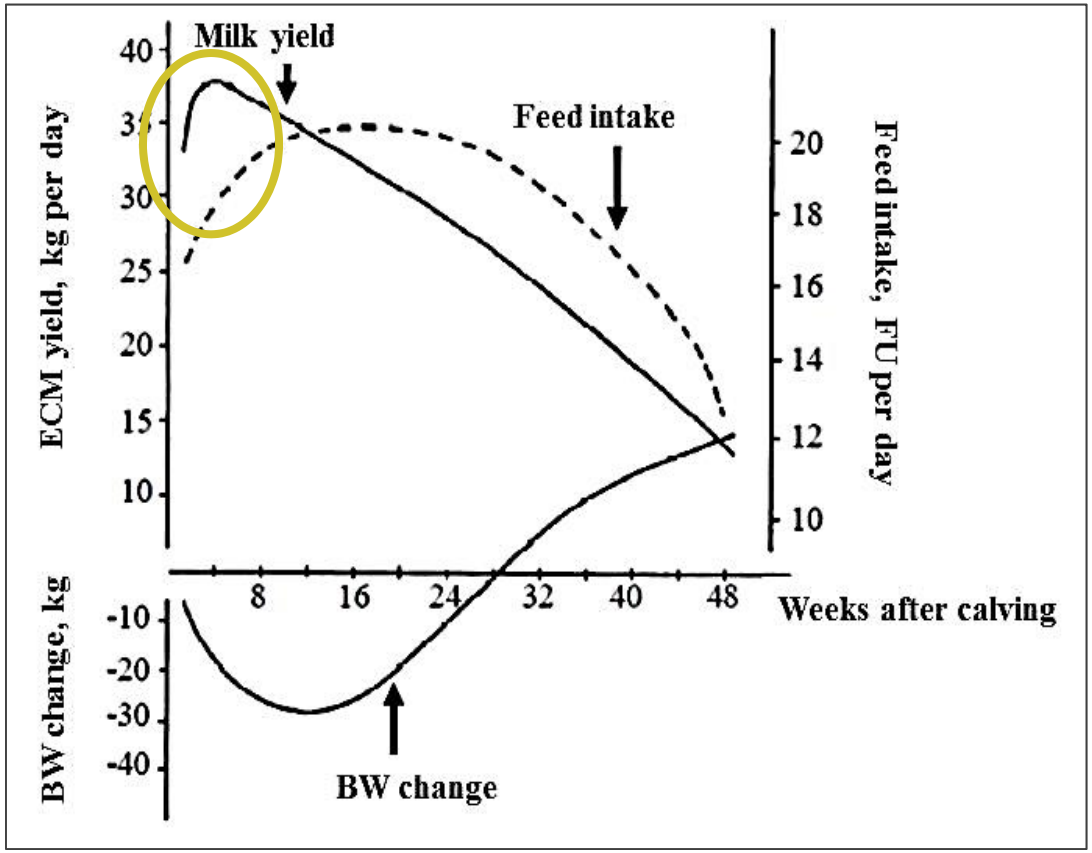
Dairy cows in early lactation



Feed intake

Milk production
Energy requirement



Modified from Nørgaard and Hvelplund, 2003

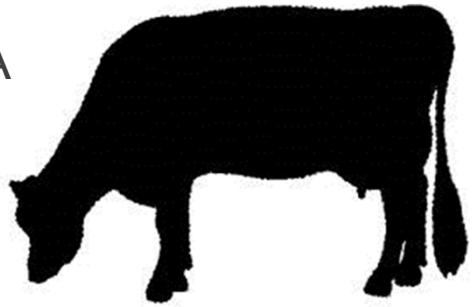
Individual variation between cows

- DMI varies up to 30 to 40% in the first week of lactation (Drackley, 1999)
- Milk production (Ingvartsen and Friggens, 2005)
- Mobilization - duration and magnitude (Bossen and Weisbjerg, 2005)

Genetic variation

Ketosis or SARA

Body condition score



Retained placenta

Metritis

Difficult calving

Individual adjustment of feed composition

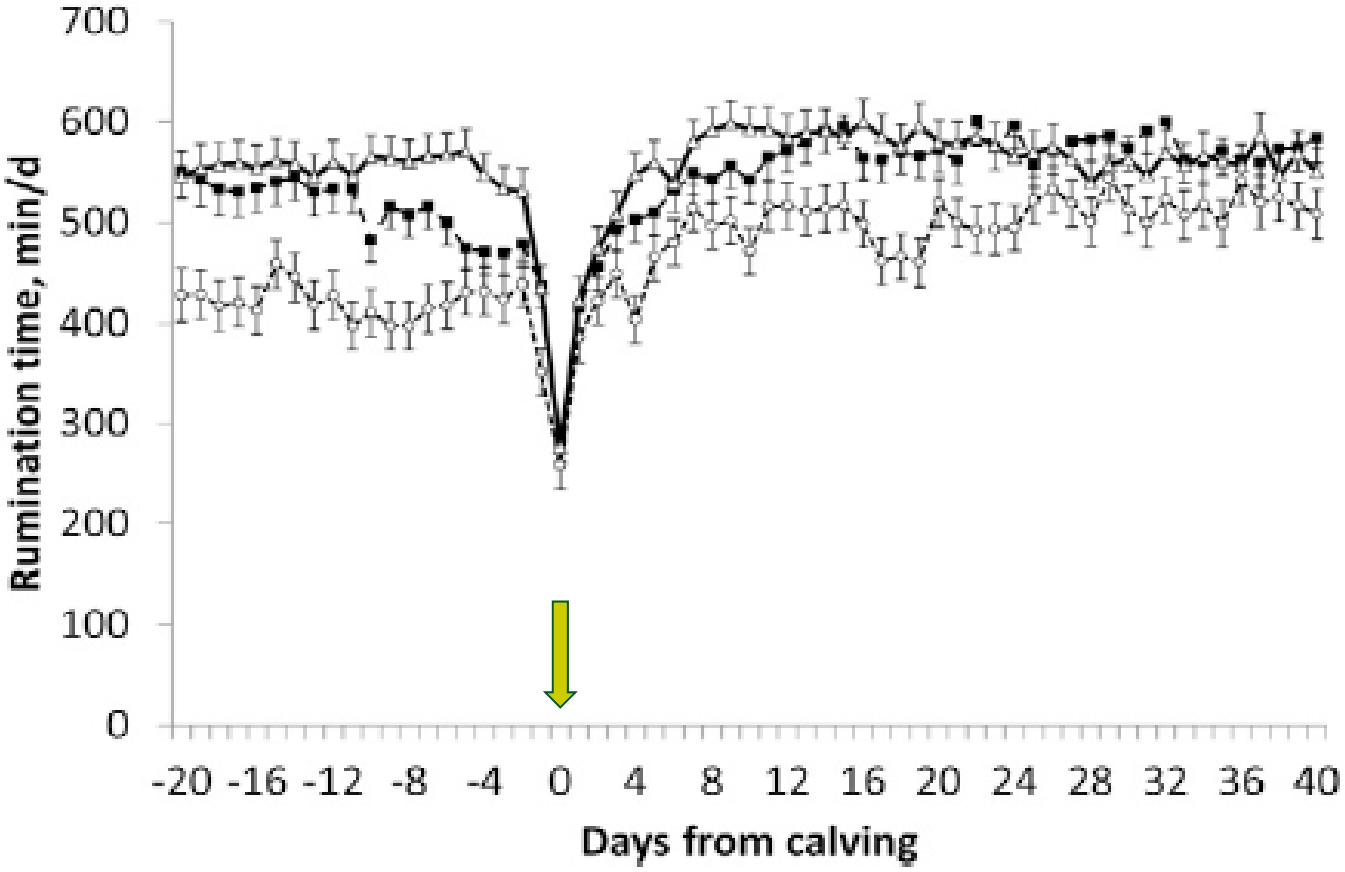
Individual adjustment

- Total mixed ration to all cows
- Individual feed allocation – Concentrate feeding
- Requires information on individual ~~feed intake~~

Rumination time

- Is driven by intake of structural NDF fiber (Mertens, 1997)
- Indicator of feed intake?
- Rumination monitoring system (**RMS**)

Large variation in rumination time in early lactation



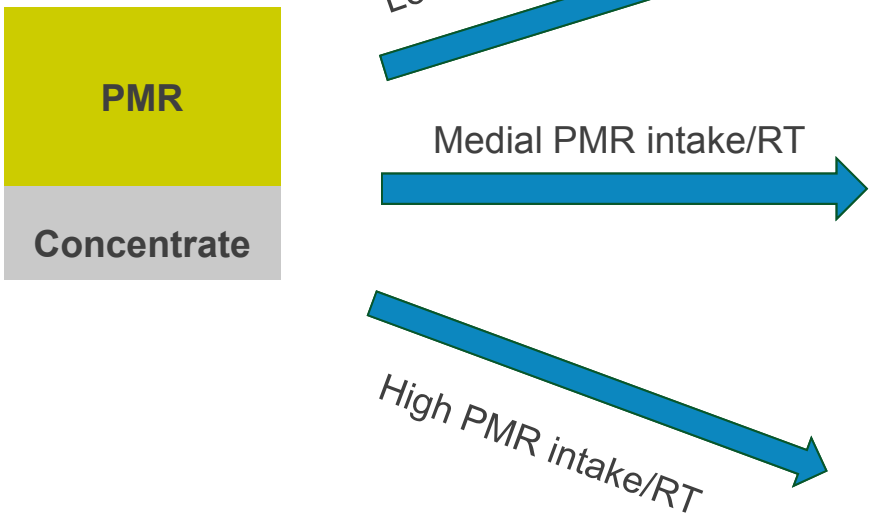
Soriani et al., 2012

Separate concentrate feeding in AMS

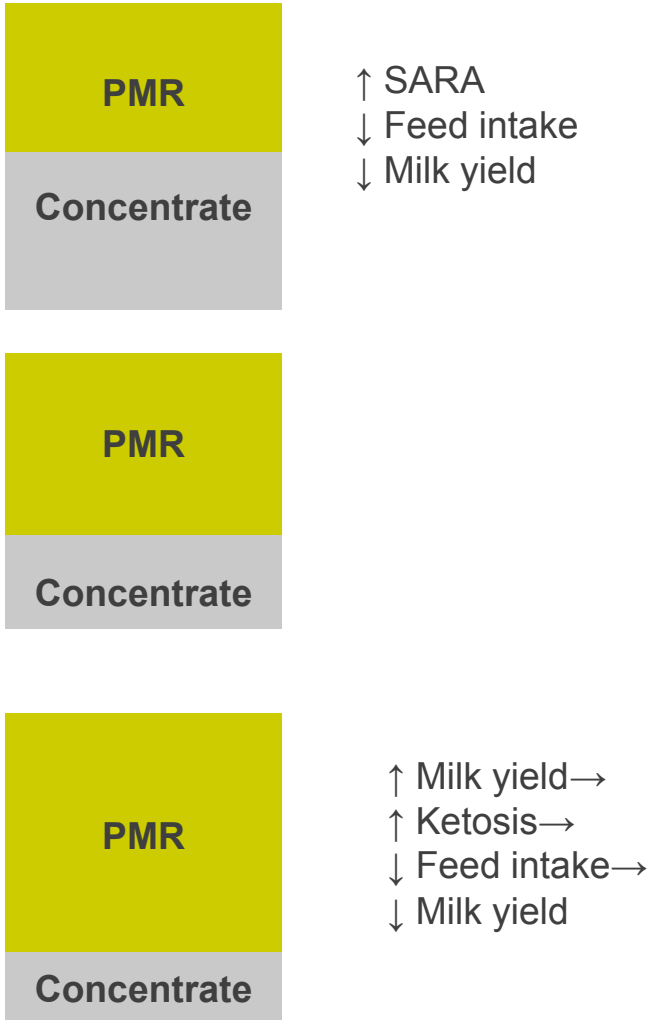
- Individual adjustment of feed composition
  - Separate concentrate allocation
- Automatic milk systems (AMS)
- Partially mixed ration (PMR) + concentrate feeding
- Early lactation - Concentrate stepped up at a fixed rate
  - 4 weeks for 1. parity cows
  - 2-3 weeks for later parity cows

Variation in PMR[1]:Concentrate ratio at different PMR intakes

Planned



Different sceneries



[1]Partial mixed ration

Objectives

- Compare the effect on milk production in early lactating dairy cows when allocating concentrate in the step-up period according to rumination time

Hypothesis

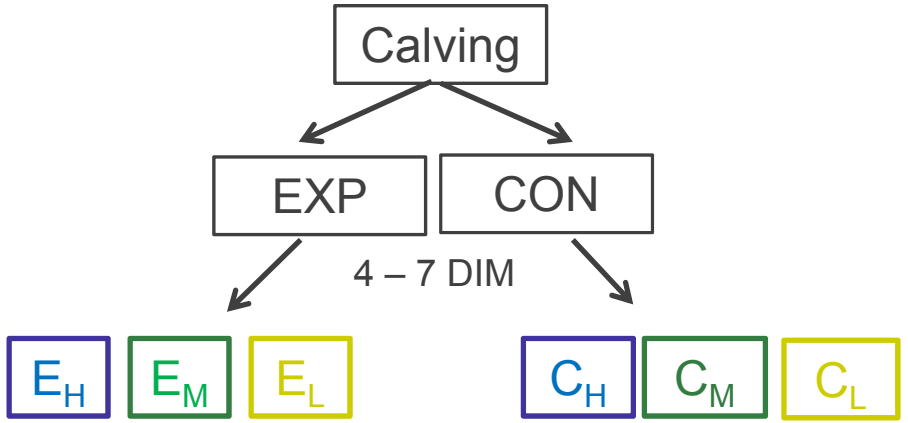
- Reduced variation in rumination time by adjustment of concentrate:
  - High rumination time → ↑ Concentrate allocation → ↓ intake of PMR
  - Low rumination time → ↓ Concentrate allocation → ↑ intake of PMR
- Adjusting concentrate allocation in early lactating dairy cows according to rumination time results in higher milk yield

Methods:

- Experimental design: Cows in early lactation
  - Comparative study within herd
  - 3 commercial Holstein dairy herds
  - Feeding:
    - Same PMR[1] *ad libitum* to all cows
    - Seperate concentrate feeding
      - Control – same concentrate to all cows
      - Experimental – concentrate according to RT

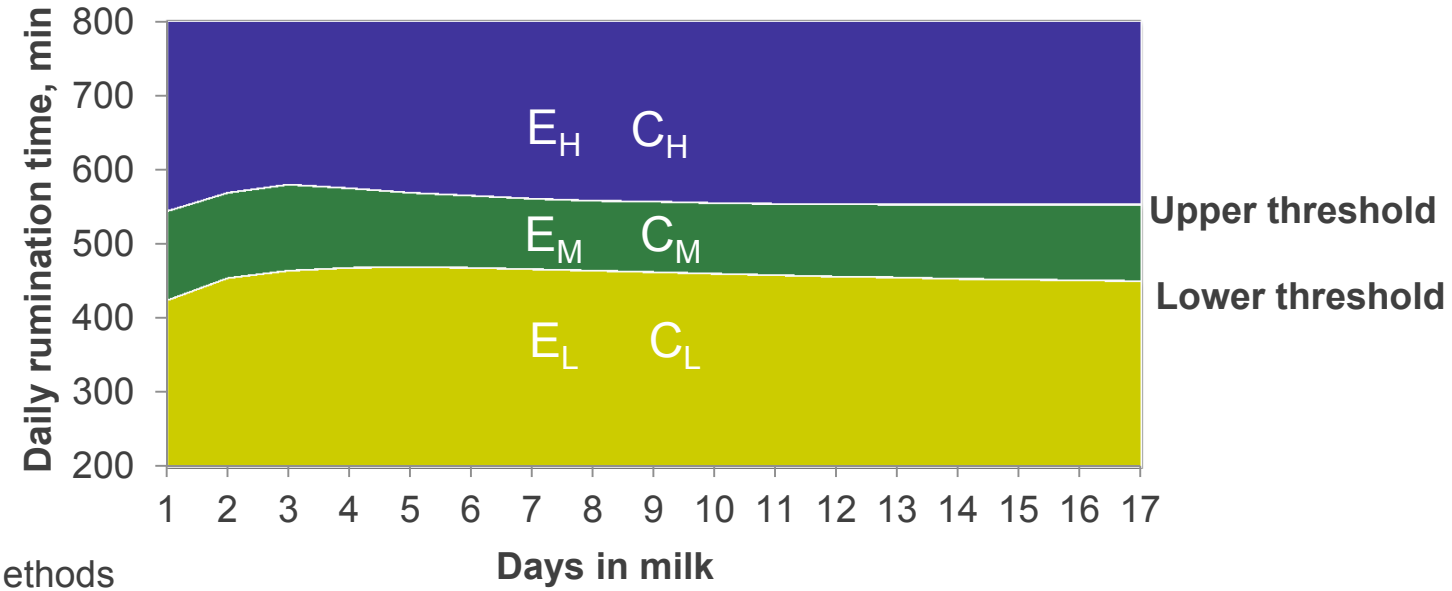
[1]Partial mixed ration

Assigning cows to treatments according to RT on day 4-7 DIM

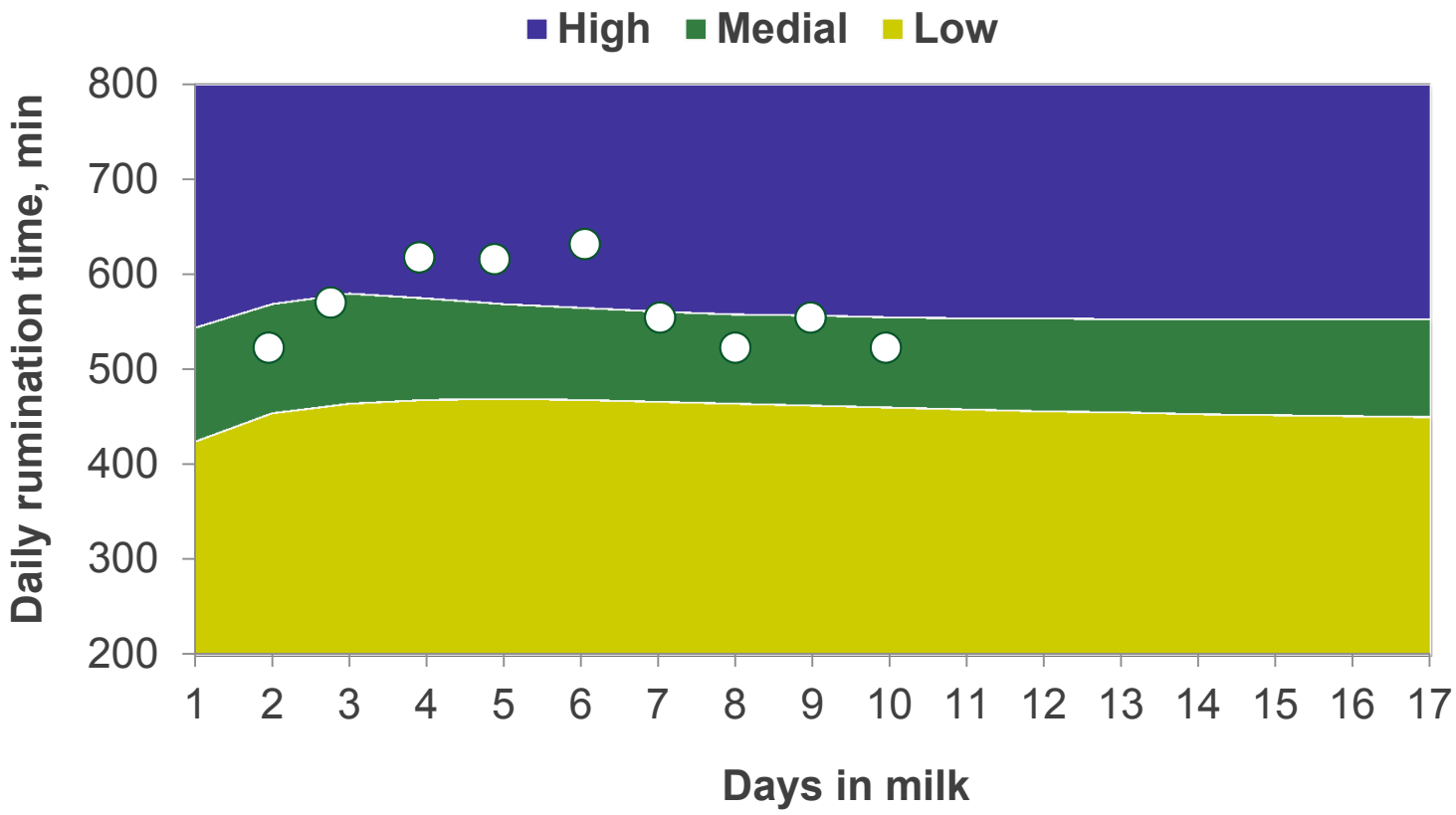


Treatments

E_H E_M E_L C_H C_M C_L

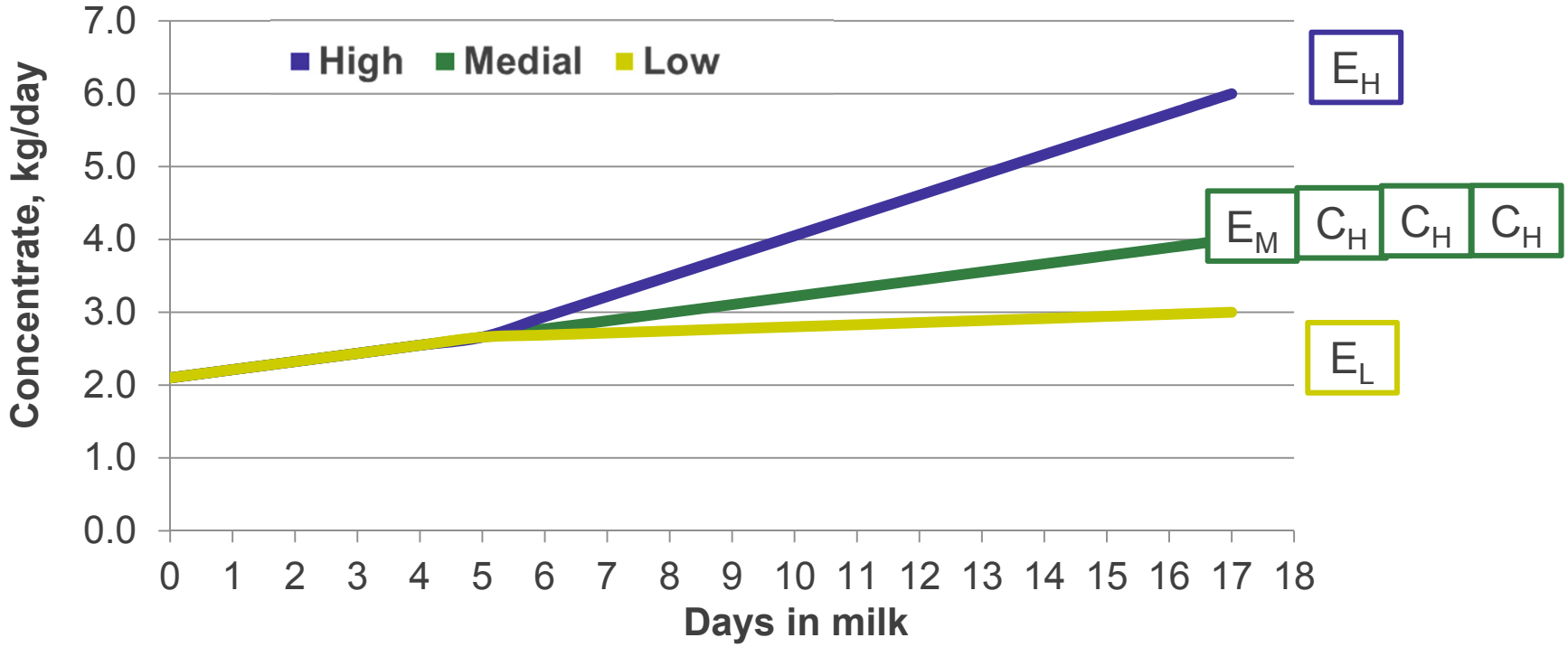


Principle for rumination group



High concentrate

Concentrate allocation rate: multiparous cows



Number of cows in the trial groups

Rumination early lactation	High		Medial		Low	
Rumination group	E_H	C_H	E_M	C_M	E_L	C_L
Primiparous	16	25	15	7	9	9
Multiparous	27	28	25	14	14	24

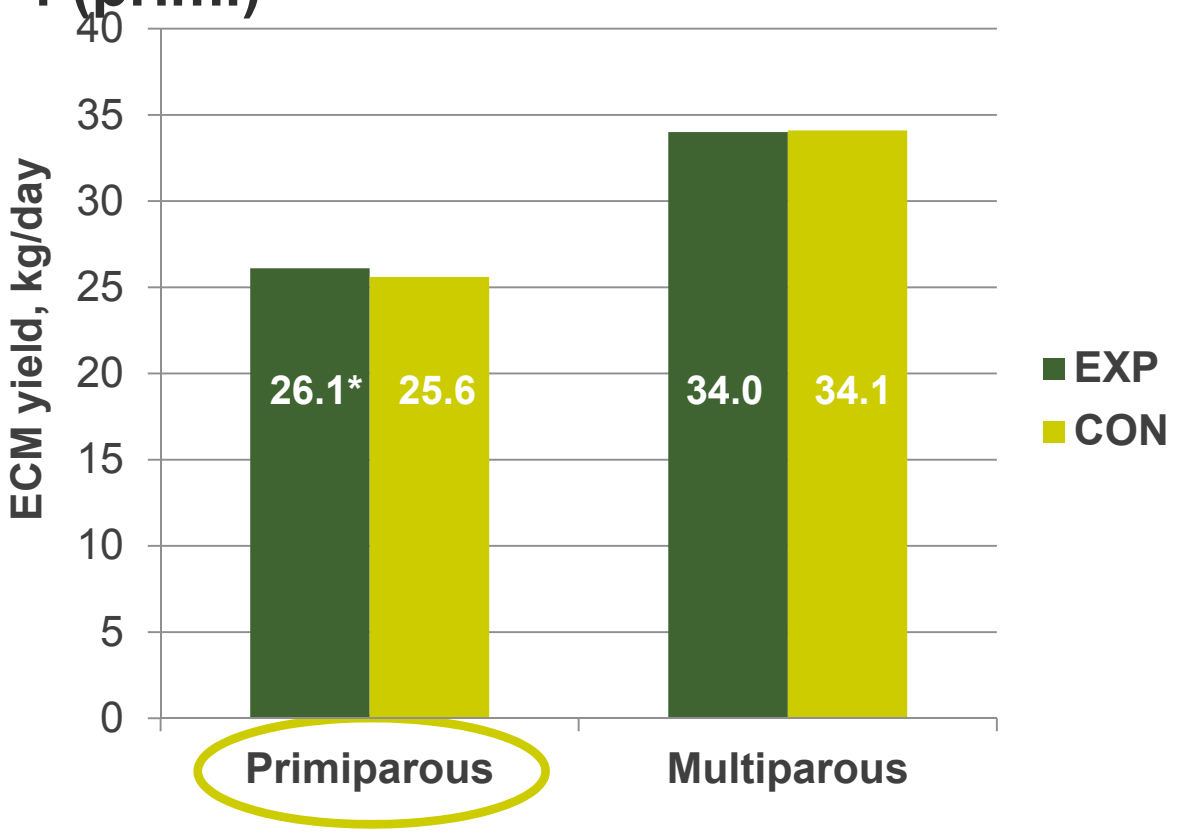
- Unequal distribution between rumination groups
  - Adjusted according to herd level
  - Adjusted threshold limits during trial

Statistical analysis

- **Model accounting for repeated recording within cow**
- **Fixed effects**
  - Model 1: Trial group (EXP vs. CON) Trial *DIM Trial*DIM x DIM
  - Model 2: Treatment group (C_H, C_M, C_L, E_H, E_M, E_L)
    treatment group × DIM and Treat*DIM × DIM
  - DIM and DIM × DIM
- **Random effects**
  - Cow within herd
  - Herd
- **Covariate**
  - Milk yield at 4 DIM

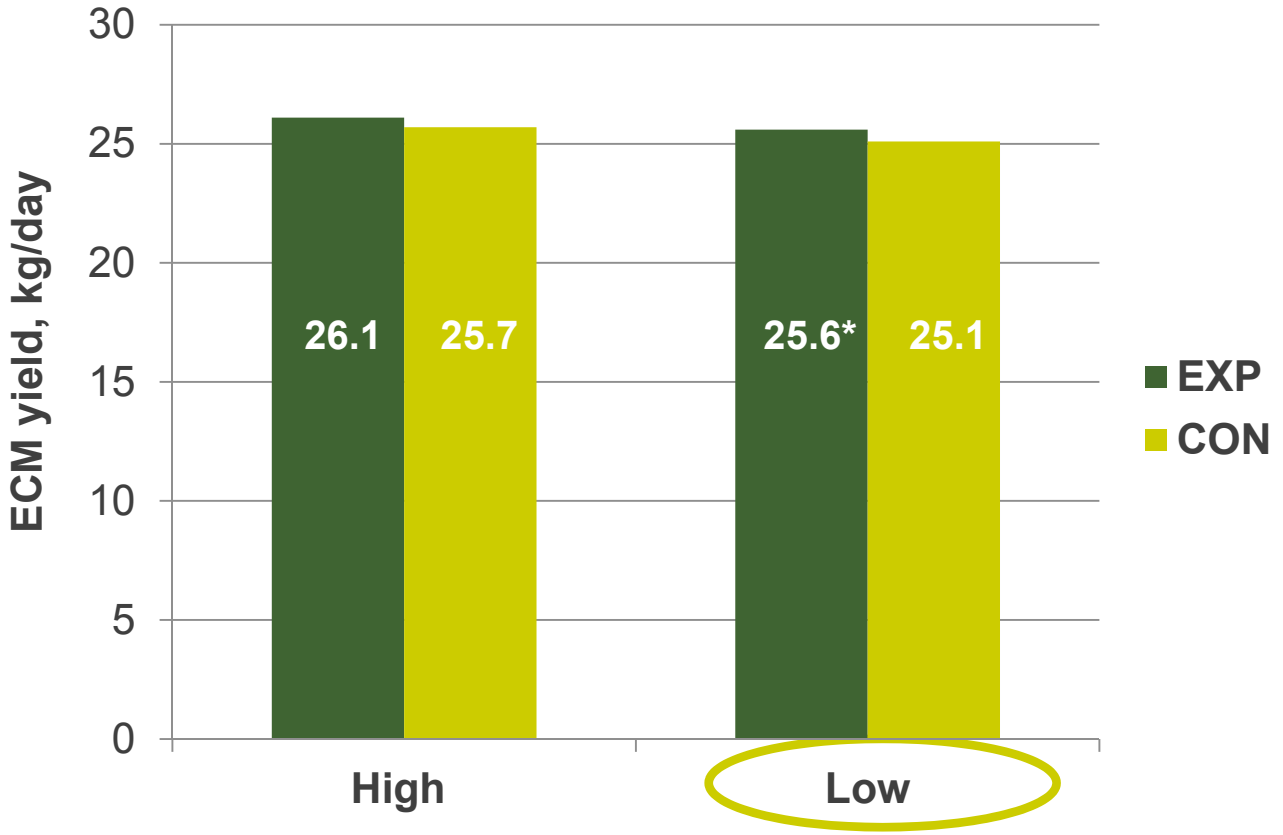
ECM yield response:
week 1 to 3 (multi)
1 to 4 (primi)

EXP	CON
E_H	C_H
E_M	C_M
E_L	C_L



Low concentrate allocation rate increase ECM yield in primiparous cows

EXP	CON
E_H	C_H
E_M	C_M
E_L	C_L



Conclusion

Effect on differentiated concentrate allocation according to RT in early lactation

- Primiparous cows yielded higher ECM
  - In the experimental group with differentiated concentrate allocation
  - Cows fed reduced amount of concentrate
- Multiparous cows no effect

Implications

Further testing of the method

- Larger scale of herds and cows
- Longer period – multiparous cows
- Combine with the milk yield recording
- Continuously checking of sensors

Further development

- Automated system to:
  - Validate rumination time
  - Allocate concentrate according to rumination time

Acknowledgements

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Per Pedersen

Thank you for your attention

Recording rumination time by RMS

- RMS
  - Records rumination time by a microphone
  - Regurgitation and chewing

- Data from RMS
  - Saves the data from the last 22 hours.
  - Data is downloaded from sensor to computer
  - Data displayed in min per 2-hour or 24-hour