

Repeatability of rumination time in individual dairy cows: An assessment of using rumination time in genetic selection for feed efficiency

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This talk is about ...

- Challenges of genetic improvement of feed efficiency
- Something about rumination activity
 - Why do cows ruminate?
 - How can we record rumination time?
- Objectives
- Materials and methods
- Results
 - Descriptive graphics
 - Repeatability and heritability
 - Phenotypic correlations
- Perspectives
- Conclusion

The Challenge – to improve feed efficiency

- Large economical gains from improving feed efficiency
- Improve feed efficiency – how?
 - Feeding
 - Management
 - **Genetic selection**
- Genetic selection -
 - Individual DMI recording – only in research herds > **few cows**
 - Find indirect methods of recording feed intake at cow level, applicable to commercial herds > **many cows**
 - Ruminantion time as indicator trait ? – How strong is it ?

Why do cows ruminate?

- To ...
 - Make feed particles smaller ...
 - Increase surface of feed particles > easier fermentation
 - Increase the density of particles – ease transport out of the rumen
- In turn ...
 - Secretion of saliva – buffer for the accumulation of VFA – maintain healthy rumen pH

How can we record rumination time?

- Rumination monitoring sensor
 - Records rumination time by sound (microphone)
 - Sensor placed on the left side of neck
 - Combined with activity sensor
 - Used as management tool

- Validation
 - Good correlations to reference methods on dairy cows Schirmann et al., 2009, Byskov et al., 2014



Objectives

- **Determine the potential of using rumination time as indicator trait of DMI**
- **Determine the potential for genetic selection for feed efficiency**

Assessment of potential through estimation of genetic and phenotypic parameters

Materials and Methods

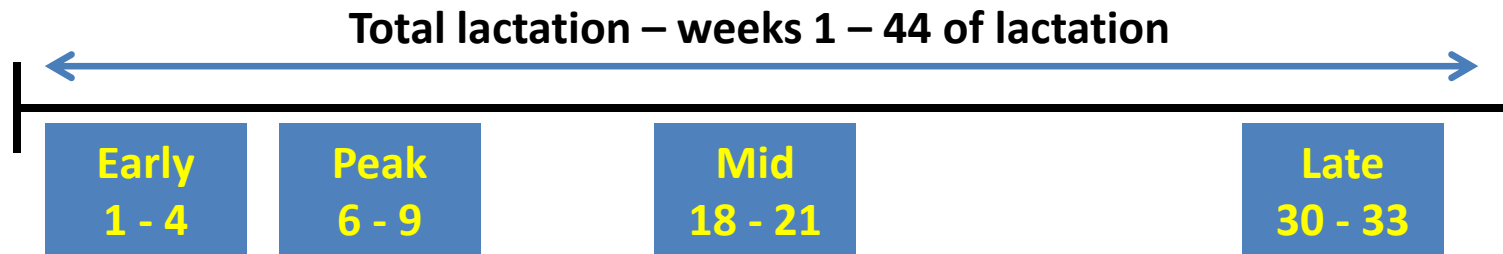
- Animals – cows milked in AMS (DeLaval)
 - Holstein and Jersey cows in 1. to 3. parity

No. cows	DMI		Rumination time	
	Holstein	Jersey	Holstein	Jersey
First parity	580	277	91	38
Later parity	422	212	85	41

- Feed
 - TMR: Insentec/RIC
 - max 3 kg of concentrate in milking robot
- Records
 - Weekly average of rumination time; DMI; Energy corrected milk
 - Weeks 1 – 44 of lactation
- Pedigree
 - 1,124 cows

Statistical analysis

- Four focus period during lactation

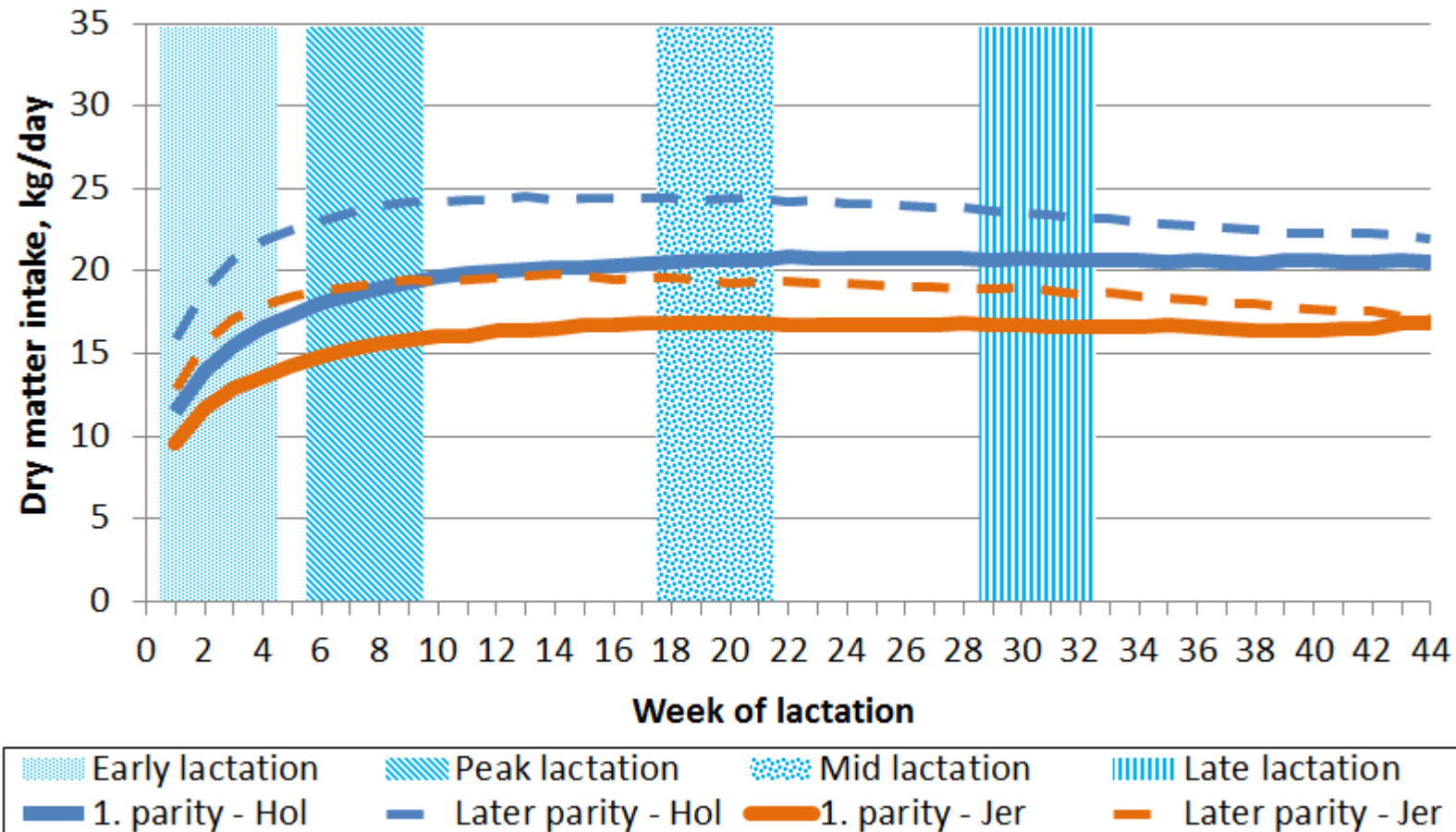


- Animal model

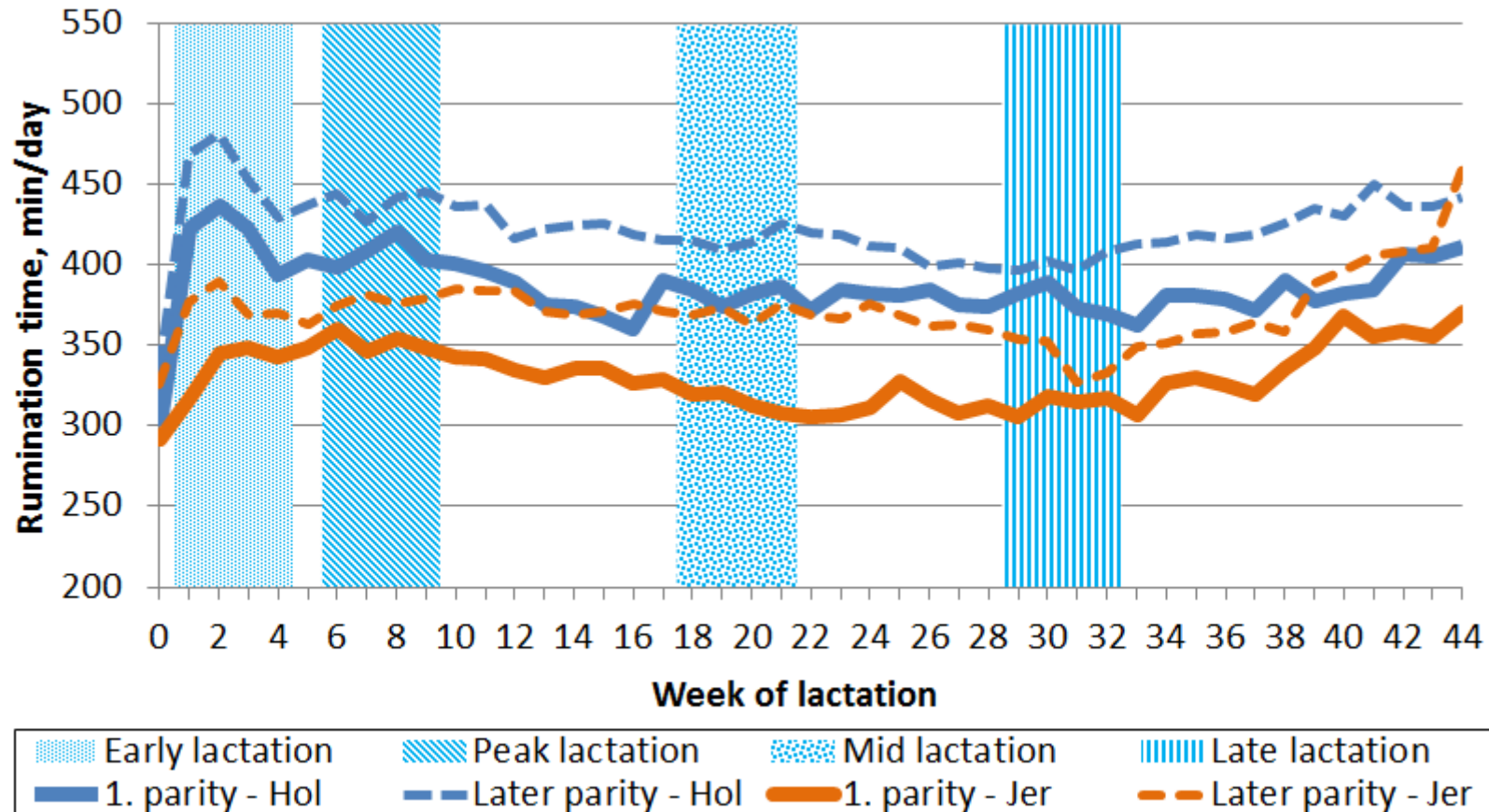
$$y = \mu + week_lactation + YearSeason + parity + breed + PE + animal + e$$

- DMU Package Madsen & Jensen 2010
 - Heritability: AI-REML
 - Correlations: Bivariate analysis

Results - descriptive



Results - descriptive



Results – Repeatability all cows

	Total	Early	Peak	Mid	Late
Week of lactation	1 – 44	1 – 4	6 – 9	18 – 21	30 – 33
All cows					
DMI	0.62	0.74	0.81	0.83	0.84
Rumination time	0.77	0.83	0.92	0.90	0.94
First parity cows					
DMI	0.62	0.72	0.80	0.81	0.83
Rumination time	0.76	0.82	0.92	0.92	0.95

- High repeatability for rumination time
 - Large variation between cows and small variation within cows
 - Highest repeatability in late lactation for both traits

Results – Heritability all cows

DMI

Period	Week of lactation	h^2	<i>SE</i>
Total	1 – 44	0.45	0.04
Early	1 – 4	0.30	0.05
Peak	6 – 9	0.32	0.05
Mid	18 – 21	0.33	0.06
Late	30 – 33	0.35	0.06

Rumination time

Period	Week of lactation	h^2	<i>SE</i>
Total	1 – 44	0.37	0.14
Early	1 – 4	NC	-
Peak	6 – 9	0.63	0.23
Mid	18 – 21	0.22	0.23
Late	30 - 33	0.42	0.26

NC – not converged

Results – Correlations all cows

DMI and rumination time

	Week of lactation	Phenotypic
Total	1 – 44	-0.15
Early	1 – 4	-0.05
Peak	6 – 9	-0.11
Mid	18 – 21	-0.15
Late	30 - 33	-0.11

- Correlations between DMI and rumination time
 - Weak and slightly negative phenotypic correlations
 - **Strange result – is something wrong???**
 - Is data abnormal?
 - or is it the small number of cows – so far?

Checkpoint

DMI and ECM

	Week of lactation	Phenotypic
Total	1 – 44	0.49
Early	1 – 4	0.25
Peak	6 – 9	0.40
Mid	18 – 21	0.35
Late	30 – 33	0.51

- Correlations between DMI and ECM – small data set
 - Positive phenotypic correlations
 - Results are as expected:
 - > no abnormality in data – but still few cows

Conclusion

- Intermediate heritability of DMI and rumination time
- High repeatability of rumination time
 - Large variation between cows
- The phenotypic correlation between DMI and rumination time was **weak and negative**
- Data collection must continue in order to get more certainty in the results
- A lot more data is required before the answer is clear
- Relationships with **efficiency traits** need to be studied further

Thanks
for your
attention

