



**Mole Valley**  
FARMERS

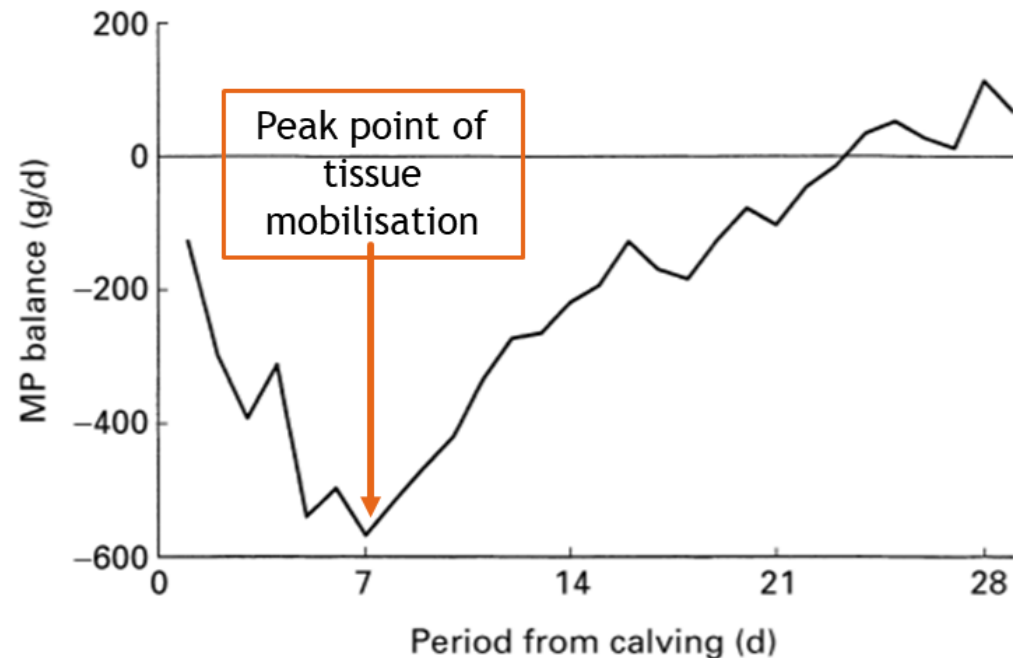


# Optimising the temporal distribution of dietary protein in early lactation dairy COWS

Inga Barnett  
[Inga.Barnett@sruc.ac.uk](mailto:Inga.Barnett@sruc.ac.uk)

# Early Lactation Challenges

- Dry matter intakes reduced
  - Negative Protein Balance
- Amino acids mobilised from skeletal muscles and uterine involution
  - Estimated that 7.6kg of body protein lost during first 4 weeks of lactation<sup>1</sup>

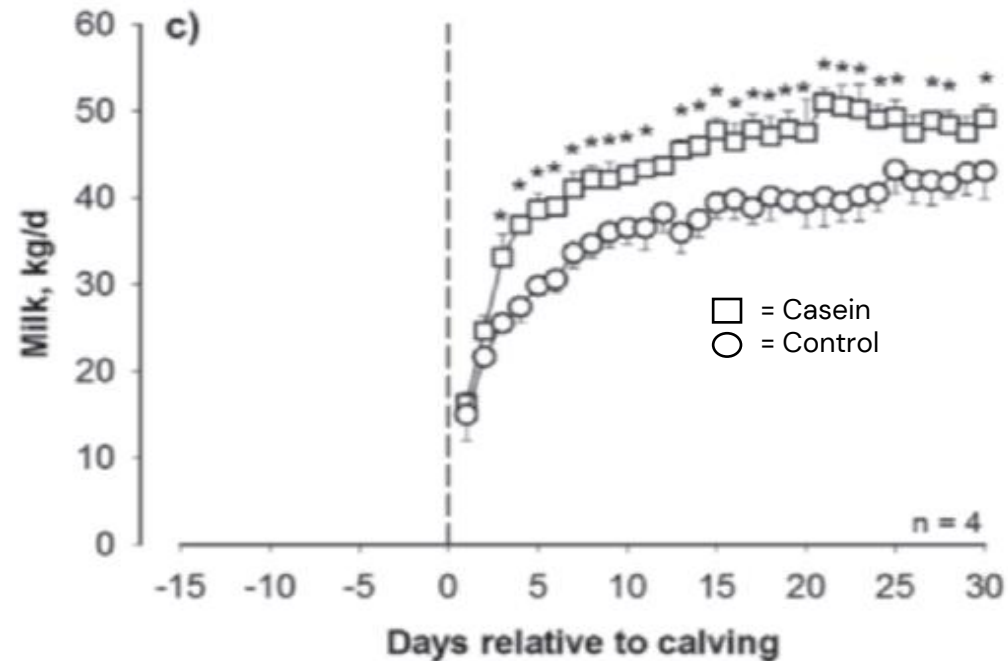
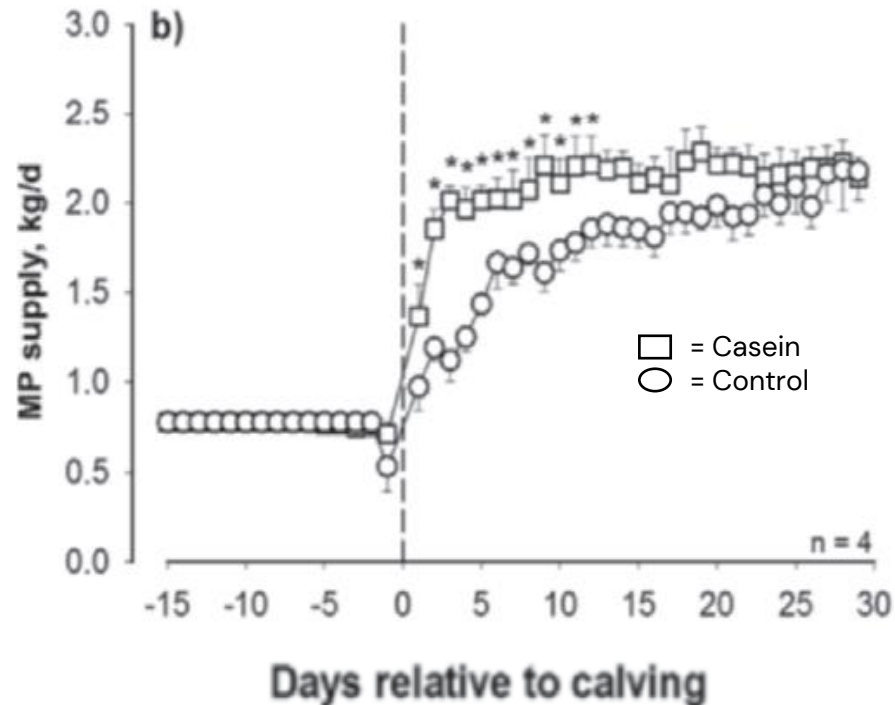


# Amino Acid Supply – Early Lactation



- Protein deficiency limits performance – constrains milk protein production due to limited EAA availability
- Abomasal Infusions:
  - Water (Control)
  - Casein (Treatment)
    - Day 1 = 360 g/day
    - Day 2 = 720 g/day
    - Day 3 to 29 = Declining rate

# Abomasal Protein Infusion – Larsen et al. (2014)



- **'Carryover Effect?'** – at 29 DIM, milk yield and lactose yields were still greater in cows treated with protein supplementation (Larsen *et al.*, 2014).

# Reynolds et al. (2019) – Rumen Drench in Early Postpartum



- Daily rumen drench of prairie meal and rumen protected amino acids – methionine, lysine and histidine
- First 4 days of lactation – fresh period
- 20 Cows assigned to either:
  - Water (Control)
  - Rumen Drench (Treatment)
- 12 week production period assessed

# Reynolds et al. (2019)



Table 1 Effects of 4 daily rumen protein doses immediately after calving on subsequent production of dairy cows.

	Control	Treated	SEM	Treatment	Week	Interaction
Dry matter intake, kg/d	26.1	26.8	0.568	0.364	0.001	0.383
Milk yield, kg/d	44.5	46.3	2.45	0.604	0.001	0.634
Milk fat, %	3.44	3.86	0.098	0.002	0.017	0.438
Milk protein, %	3.07	3.23	0.062	0.080	0.001	0.797
Body weight, kg	657	673	18.4	0.482	0.001	0.009
Day 7 plasma total protein, g/L	66.5	71.6	1.58	0.040		

- Treatment group –
  - Increased milk fat concentrations
  - Week 2 to 12 – milk protein tended to be higher
- Body Weight –
  - Treatment group: +32kg
  - Control: -3 kg

# Early Lactation Experiment

- Translating the effects of abomasal infusions into practical feeding strategies
- Commercially available feed sources and rumen protected amino acids

Hypothesis: Targeted protein supplementation in the first 14 days of lactation is more beneficial for milk protein yield and NUE compared with supplementing the same amount of protein evenly over the first 7 weeks of lactation.

# Cow Management



- Acrehead farm – loose cubicle housing
- 12 'Hokofarm' feed intake bins (Insentec BV, NL)
- 2 cohorts of 20 multiparous Holstein–Friesian cows
- Cows paired according to calving date
  - Each pair occupy the facility for 7 weeks
- Normal farm practices for dry cow management



# Dietary Treatments



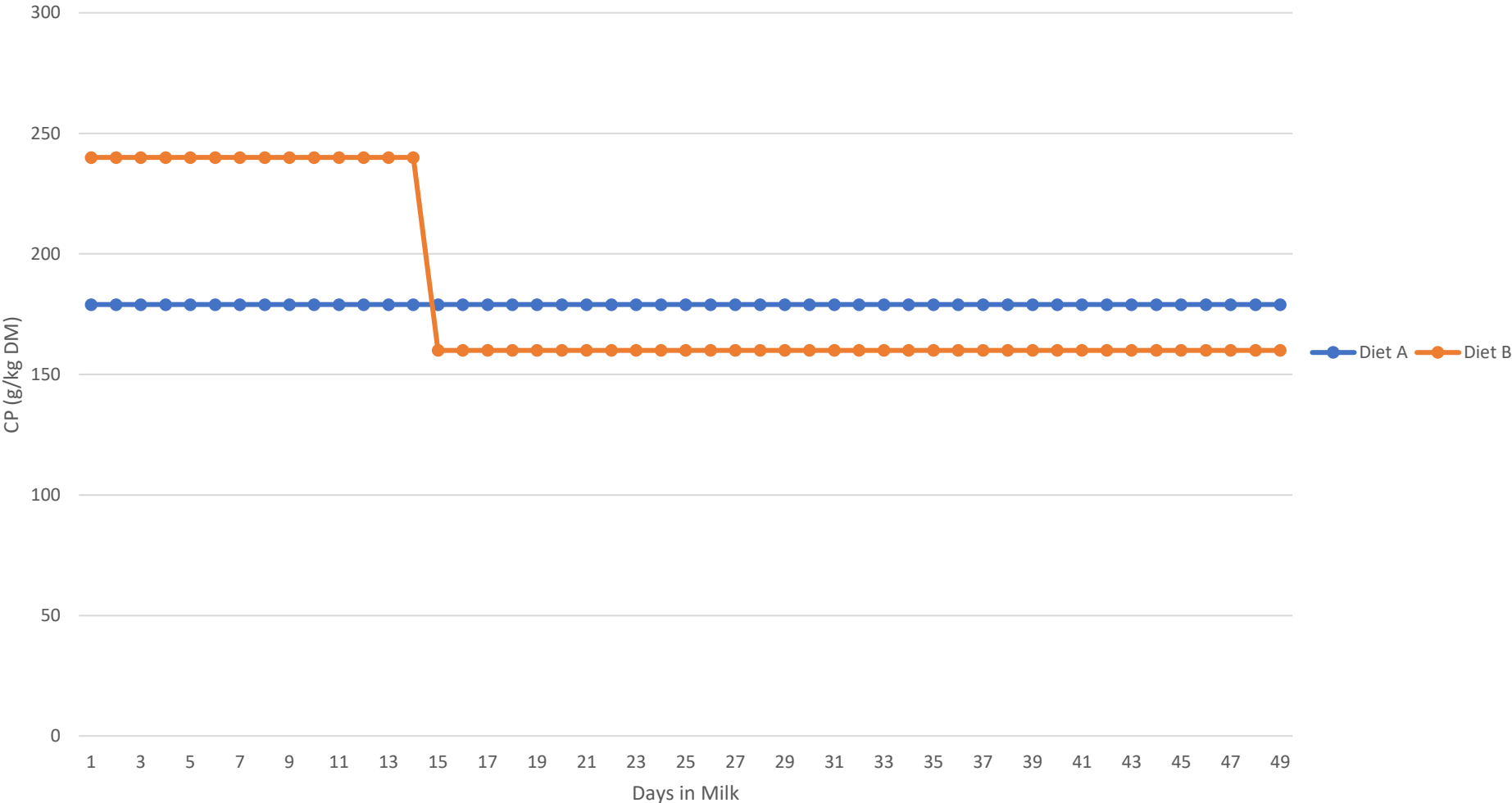
A. Medium dietary crude protein (gCP/kg DM) for 49 days of lactation.



B. High dietary CP for 14 days, followed by low dietary CP for 35 days.

	Milk protein yield	NUE
Hypotheses	$B > A$	$B > A$

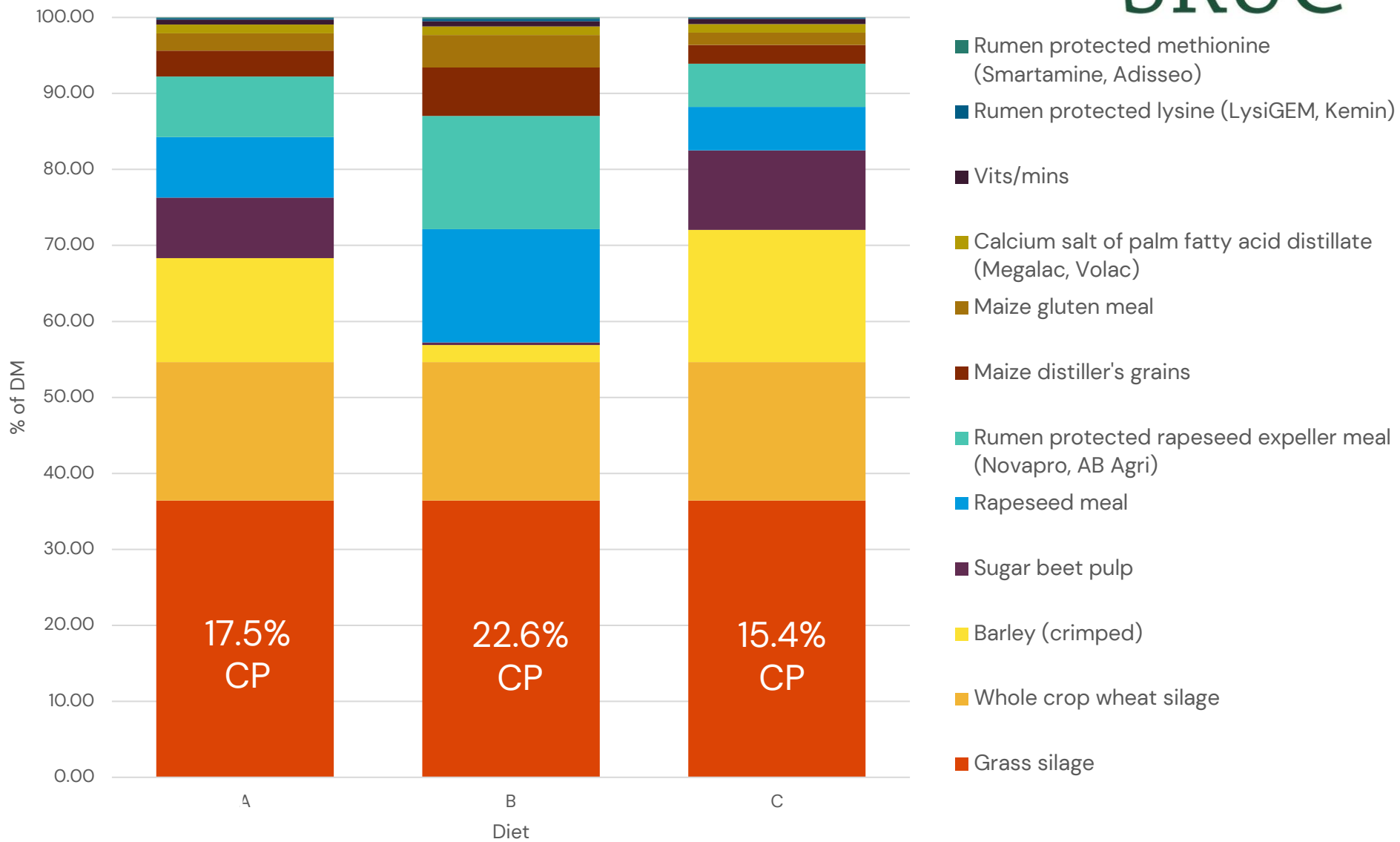
# Dietary Treatments





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# Ration Composition



# Measurements and Sampling



- **Body Weight** – weekdays at AM milking
- **Body Condition Score** – dry off, calving, day 14 and 49
- **Daily Feed Intake** – individually recorded via 'Hokofarm' feed intake bins (Insentec BV, NL)
- **Milk Yield** – 2x daily (08:00 and 20:00)

# Measurements and Sampling



- **Milk Composition**

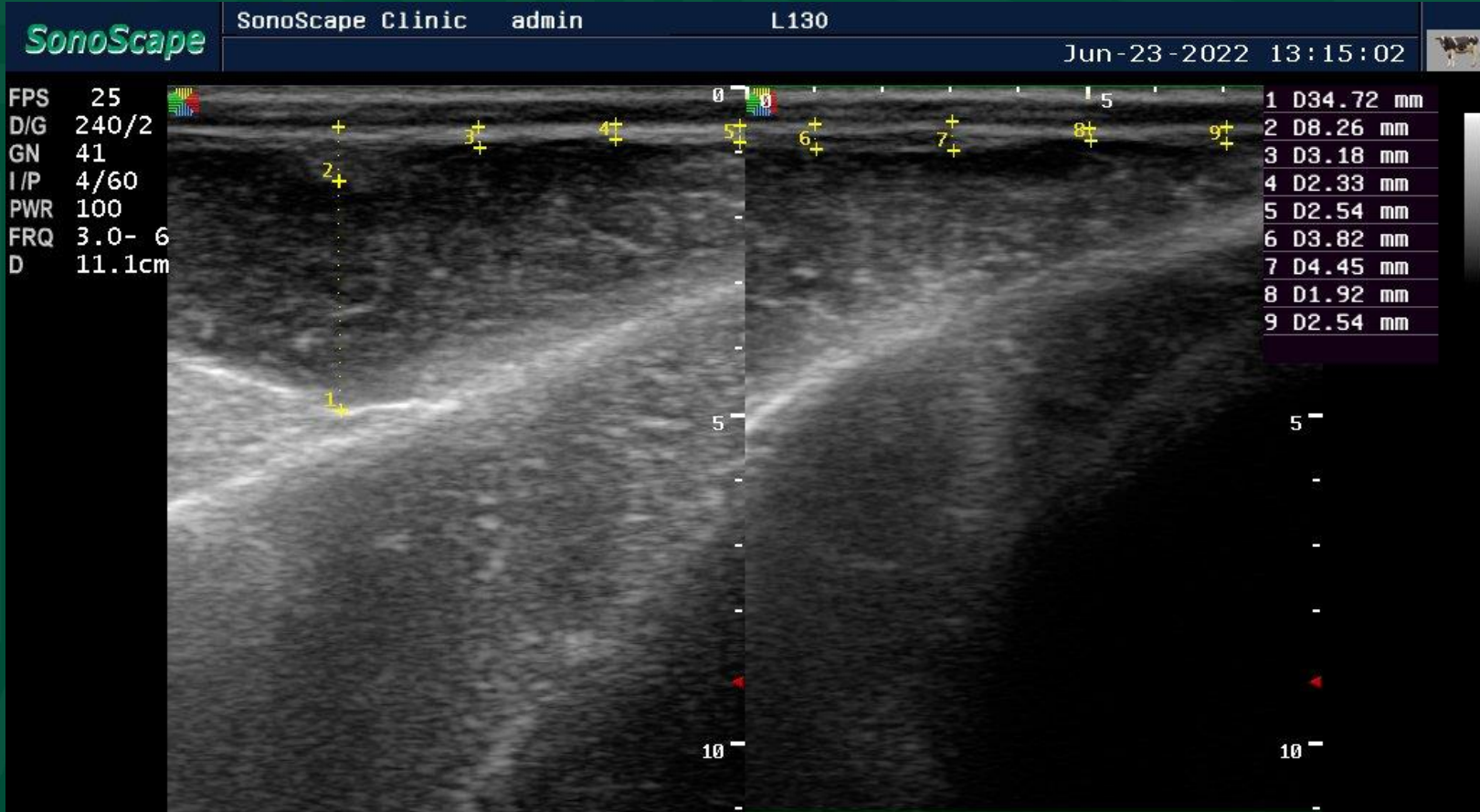
- Lactose, fat, urea, scc, crude protein by mid infrared spectroscopy (NML Ltd.)'
- Duplicate samples retained – casein and major whey proteins

- **Blood Sampling** – at calving, day 14, 49

- Metabolic profile
- Serum – 3-methylhistidine

- **Ultrasound Scanning** – late dry, day 14, 49

# Ultrasound Scanning



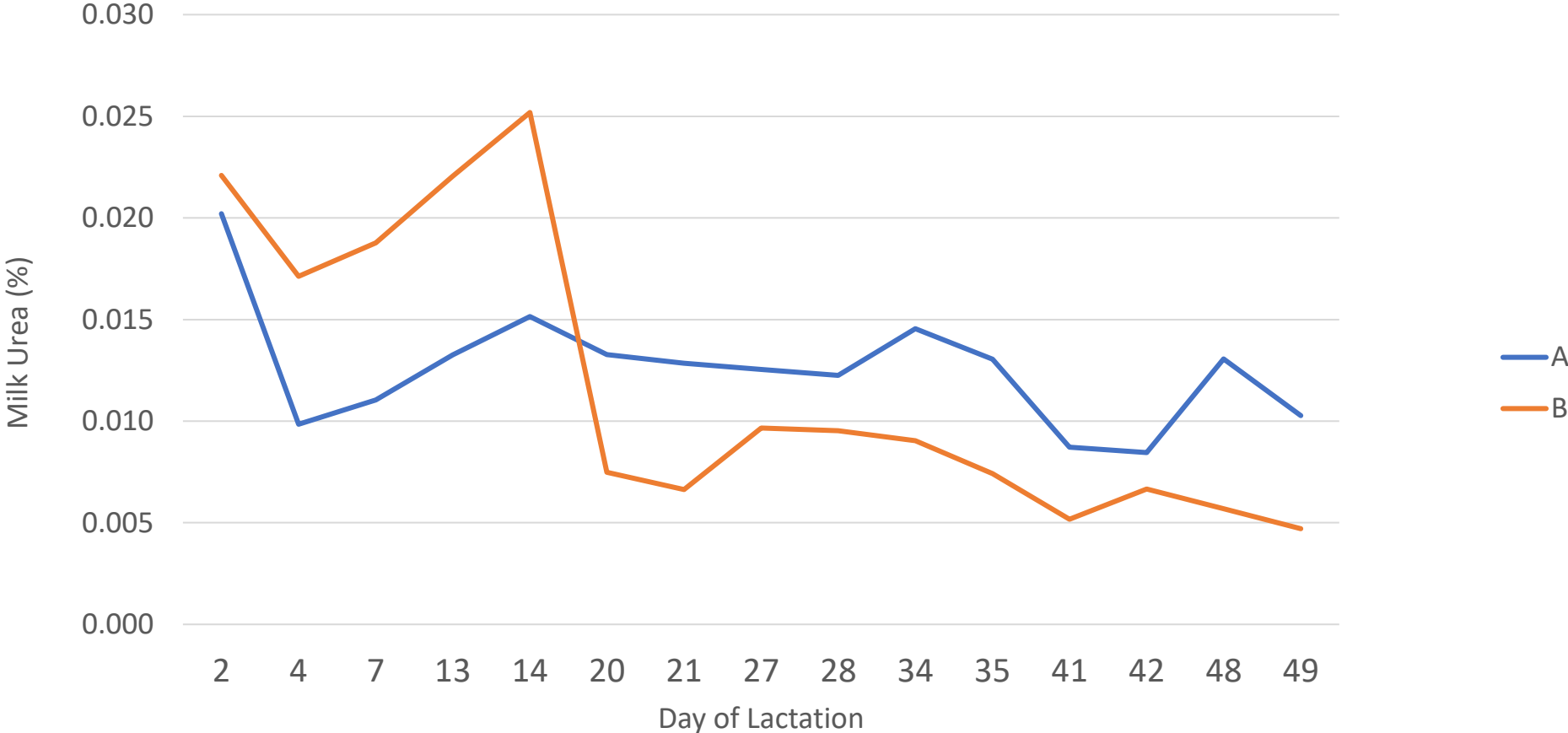
3<sup>rd</sup> Lumbar

13<sup>th</sup> Rib



CINE

# Milk Urea



# Acknowledgements



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