The good practices in artificial insemination: straw handling and its consequences on semen quality

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Responsible artificial insemination (AI) organizations strive to ensure that semen sold has the potential to achieve acceptable levels of fertility when used in herds of fertile cows and heifers. Accordingly, straw handling by the inseminator should be limited, in order to reduce the damages to the semen quality. This study tested different conditions of handling before AI: (1) straws are kept out of the liquid nitrogen during 0-5-10-15 sec before thawing (Time condition); (2) straws are kept out of the liquid nitrogen 0-3-6-9 times during 5 sec before thawing (Frequency condition); (3) or straws are kept in vapour nitrogen (instead of liquid) during 24-48 h before previous described handling conditions and thawing. The semen tested were provided by 5 bulls (Belgian blue and Holstein bulls), 3 straws per bull for each condition. The motility (using CASA system- computer assisted sperm analyser), the viability, the acrosomal integrity and the mitopotential (using flow cytometer) were measured. Data were analysed by analysis of variance. Semen quality was not significantly affected by straw handling (Time and Frequency conditions) under liquid nitrogen storage. After 24 h in vapour nitrogen storage condition, the acrosomal integrity and the mitopotential level significantly decreased even without additional straw handling, while keeping the straws during 48 h in vapour nitrogen with additional handling (the straws were kept out of the tank 9 times during 5 sec) decreased the semen quality for all the measured parameters. The results of this study suggest that caution should be taken before AI by the users, especially if the straws are maintained under atmospheric vapour of nitrogen instead of liquid nitrogen immersion, to preserve the fertility potential of the bulls. Thanks are due to Mathilde Macors for her technical assistance during the experiment.

Performance and oxidative status of beef cows facing short nutritional challenges during lactation

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The performance and plasma oxidative status of 16 Parda de Montaña suckler cows were analysed in response to a 4-day restriction in months 2, 3 and 4 post-calving, in order to evaluate their strategies to cope with undernutrition throughout lactation. Prior to restriction and after the challenge, the cows received a diet meeting 100% of their energy requirements (7.0 kg DM hay, 2.7 kg DM concentrate). In the 4-day challenge, the diet met 55% of cow requirements (6.2 kg DM hay). Dam and calf live weight (LW), dam milk yield (MY, weigh-suckle-weigh technique) and plasma malondialdehyde (MDA) were measured twice the week before the restriction (basal), daily during the 4-d restriction and on the first 2 days of realimentation. Basal dam LW, milk yield and MDA concentrations decreased from month 2 to 4 ($P<0.001$), implying that decreasing performance after peak production reduced the oxidative status. Dam LW dropped immediately on the first day of restriction and did not recover by day 2 of realimentation in any month. Milk yield also dropped during restriction, and thereafter recovered the basal values by day 2 of realimentation in months 2 and 3 but not in month 4. The percent reduction of MY during restriction increased through lactation (-11.4, -16.0 and -21.0% in months 2, 3 and 4, $P<0.001$) and recovery was lower in month 4 than the rest (+3.5, +1.6 and -9.8%, $P<0.001$). Calf gains decreased during restriction in months 2 and 4 and did not fully recover during realimentation, but remained unchanged in month 3. Plasma MDA, indicator of lipid peroxidation, fell to a minimum at the start of restriction, increased sharply to a maximum in days 3 or 4 of restriction and returned to basal values in realimentation in all months. The difference between maximum and minimum MDA concentrations increased as lactation advanced. Although other indicators of nutritional status and inter-individual variations remain to be analysed, these preliminary results indicate that the patterns with which beef cows cope with short but severe nutritional challenges change throughout lactation.

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Theatre Session 68

Performance and oxidative status of beef cows facing short nutritional challenges during lactation

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In extensive production systems diet quantity and quality can vary widely both in the long and the short term.

How do suckler cows respond to short nutritional challenges in different stages of lactation?

MATERIALS & METHODS

16 adult Parda de Montaña cows:
calving date Oct 20, calving LW 643 kg, calf birth LW 44 kg

Nutritional challenges:
4-day diet restriction to **55%** requirements:
6.2 kg DM hay

Diet for **100%** energy requirements: 110 MJ ME/d
7.0 kg DM hay + 2.7 kg DM concentrate

lactation week	1	2	3	4	5	6	7	8	9	10	11	12	13	14
diet	100%				55%	100%			55%	100%			55%	100%
Challenge nº					**CH1**				**CH2**				**CH3**	

day	-4		-2		1	2	3	4	5	6
diet	100%				55%				100%	
	basal				challenge				refeeding	

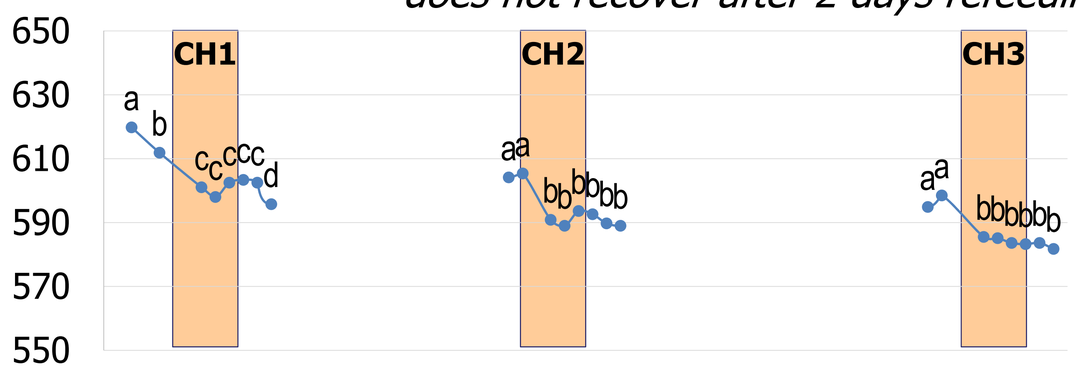
Daily measurements
- dam and calf live weight (LW)
- dam milk yield (MY): weigh-suckle-weigh technique
- dam oxidative status - plasma malondialdehyde (MDA): UPLC-FLD

RESULTS

- Decreasing LW, MY and oxidative status throughout lactation
- Immediate RESPONSE to undernutrition in all challenges → but RESILIENCE decreases through lactation

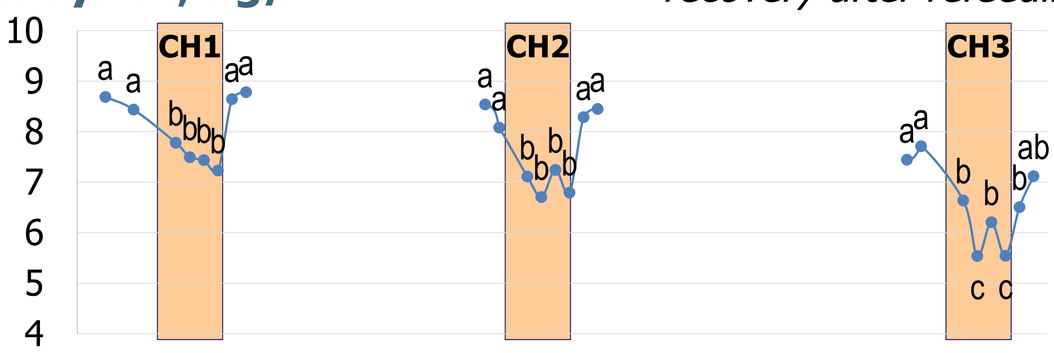
Cow weight, kg

does not recover after 2 days refeeding



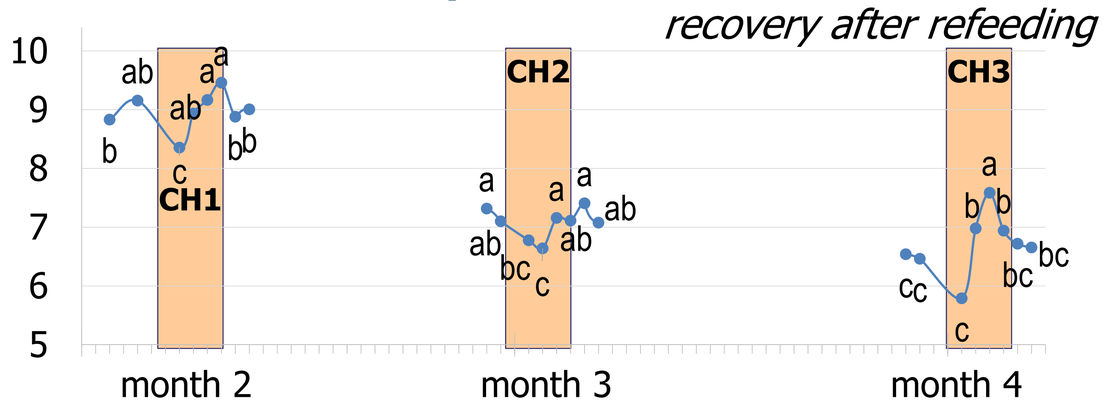
Milk yield, kg/d

recovery after refeeding



Oxidative status, MDA µM

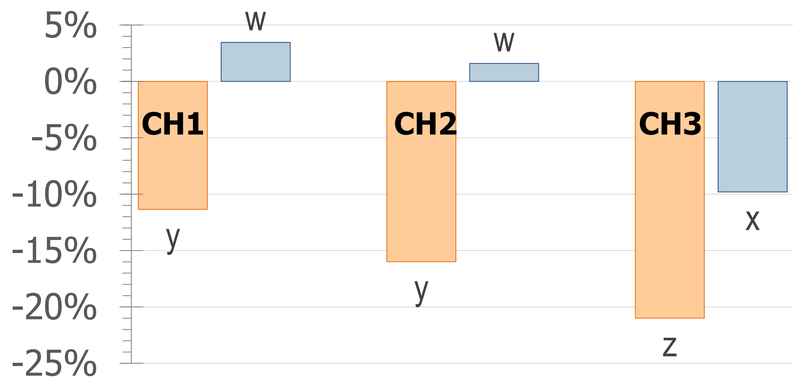
drop and rise during challenge recovery after refeeding



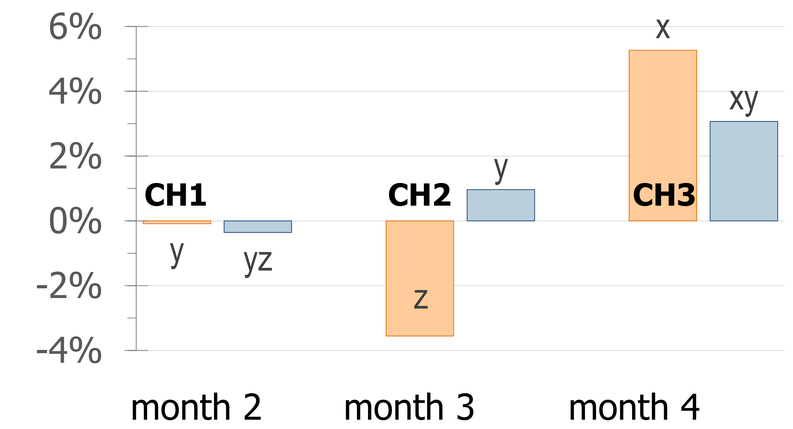
a, b, c, d denote differences among days within challenge (P<0.05)

Δ challenge / basal Δ refeeding / basal

Δ Milk Yield, %



Δ MDA, %



w, x, y, z denote differences among periods (P<0.05)

- Greater changes in response to challenge and less recovery from month 2 to 4

CONCLUSIONS

- The patterns with which beef cows face a short but severe nutrient restriction change throughout lactation.
- Their ability to cope with the challenge and maintain performance declines as lactation advances.

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