EXTENDED LACTATION IN DAIRY COWS

- THE REPROLAC PROJECT

J. SEHESTED, C. GAILLARD, T. KRISTENSEN, J.O. LEHMANN, L. MOGENSEN, G. MACIEL, M. VESTERGAARD

MORE LACTATION – HIGHER EFFICIENCY?

A typical DK cow is productive only 50% of it's life:

- 1. Calving: 26 mo of age
- Lactating: 27 mo (appr. 2.5 lactations)
- Dry: 4 mo
- Culling: 57 mo of age

Is extended lactation (EL) a solution?

BENEFITS AND CHALLENGES OF EL

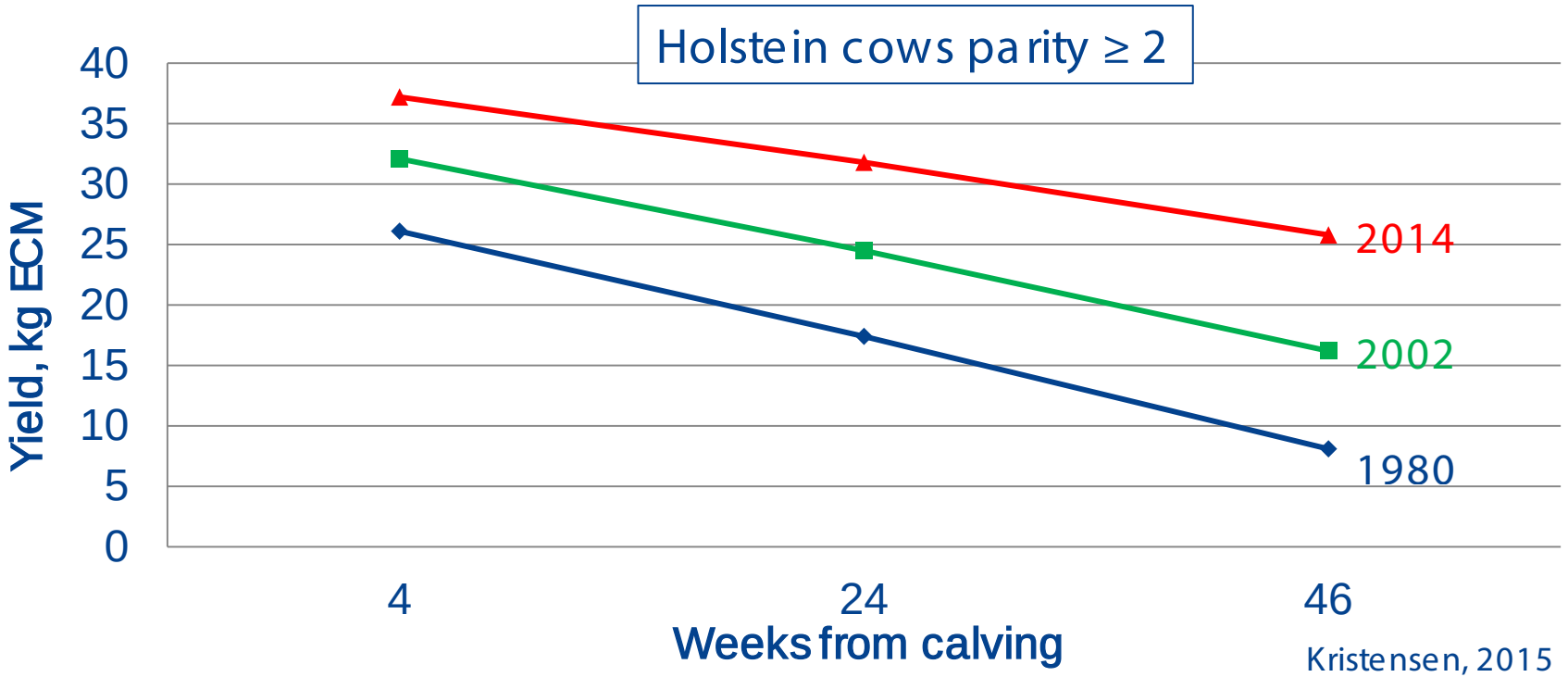
- Milk production and persistency of lactation
- Milk quality
- Reproduction (poster 16)
- Lifetime performance and longevity (poster 14)
- Herd level effects and efficiency (Theater 3 / Poster 17)

THE REPROLAC PROJECT

- **Aim:** to develop a new strategy for milk production that improves productivity, animal welfare as well as the economy of the farmer
- **Intensive "on station" study** with two feeding strategies in support of EL
- Extensive study on **4 private farms with** short and long lactations within farm

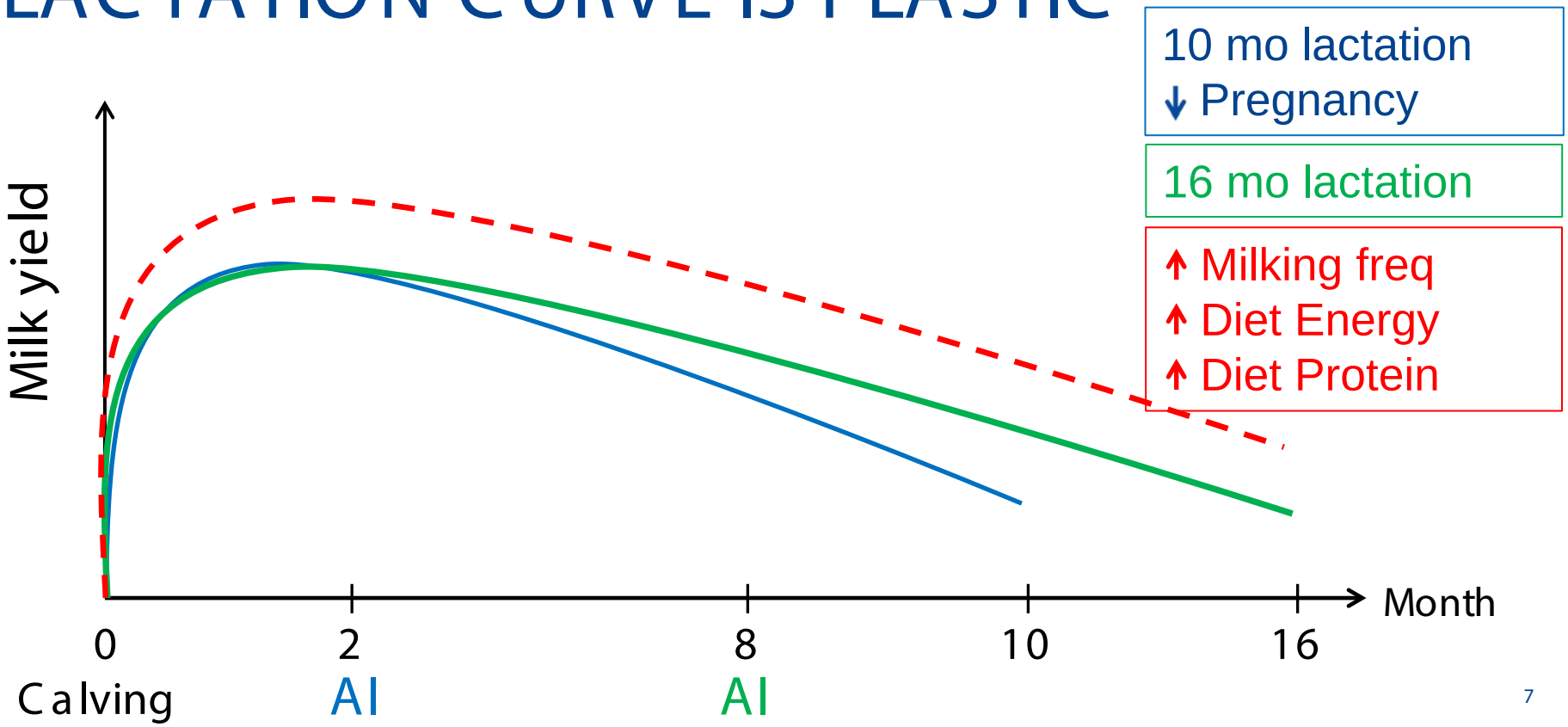
MILK PRODUCTION AND PERSISTENCY

YIELD HAS INCREASED – PERSISTENCY?

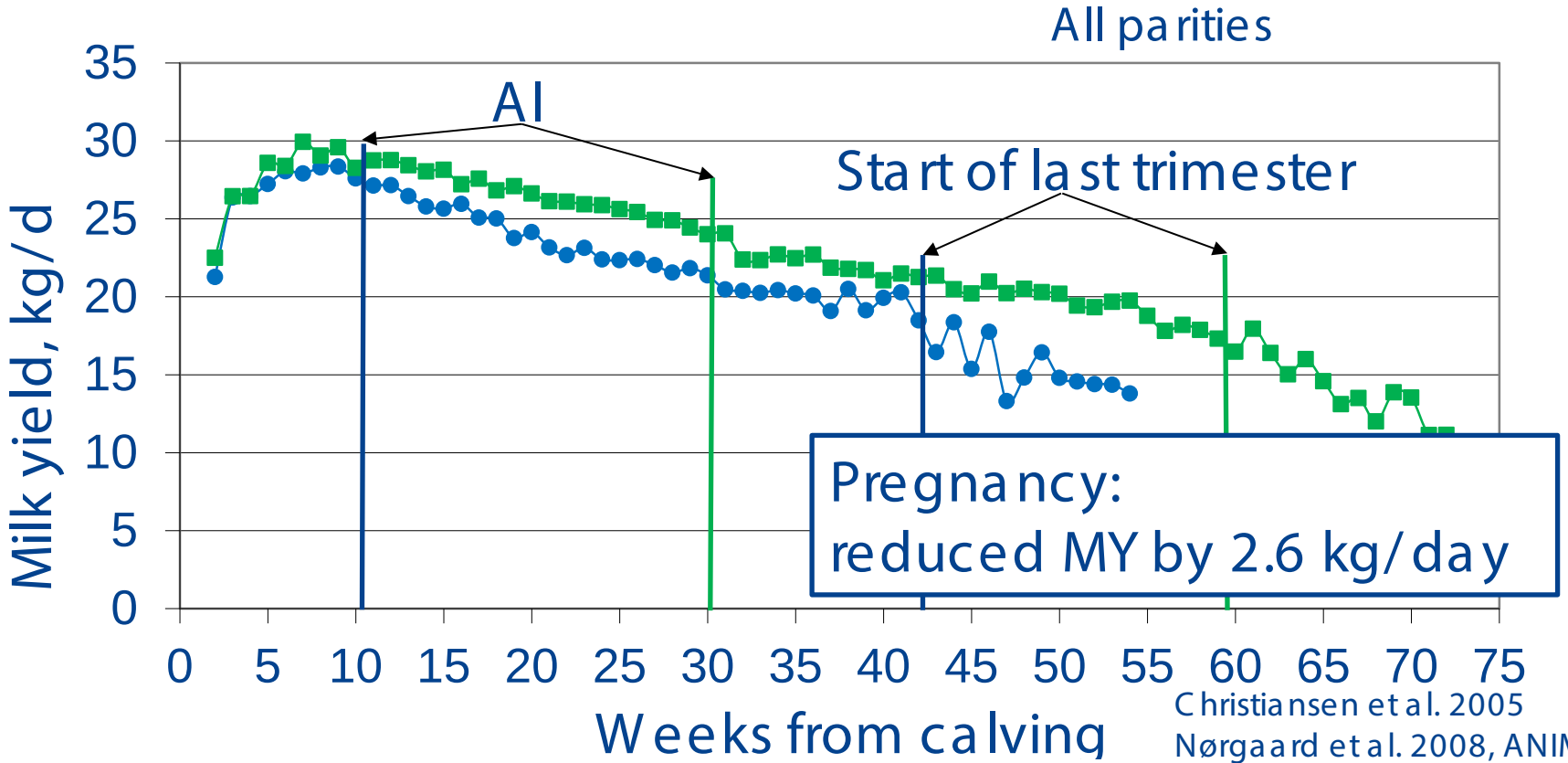


Kristensen, 2015

LACTATION CURVE IS PLASTIC

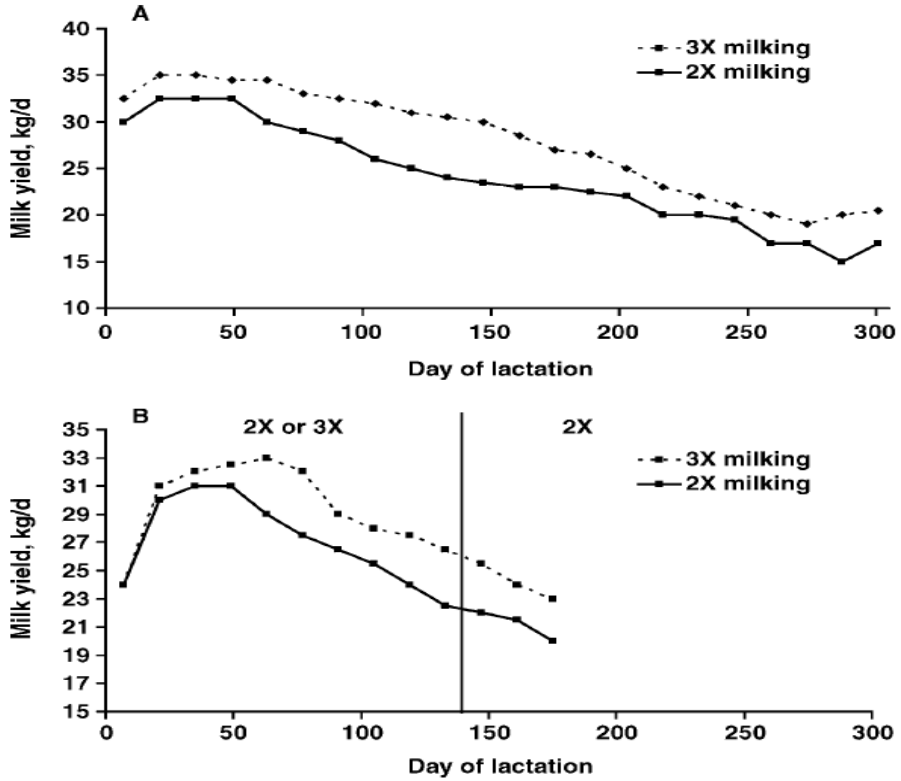


EFFECT OF PREGNANCY



Christiansen et al. 2005
Nørgaard et al. 2008, ANIMALc

2x VERSUS 3x MILKING



Wall and McFadden., 2008

Calving interval:
” 12 mo
18 mo

Milking freq
” + 2 x

IS 305-D LACTATION MANAGEMENT STILL OPTIMAL ?

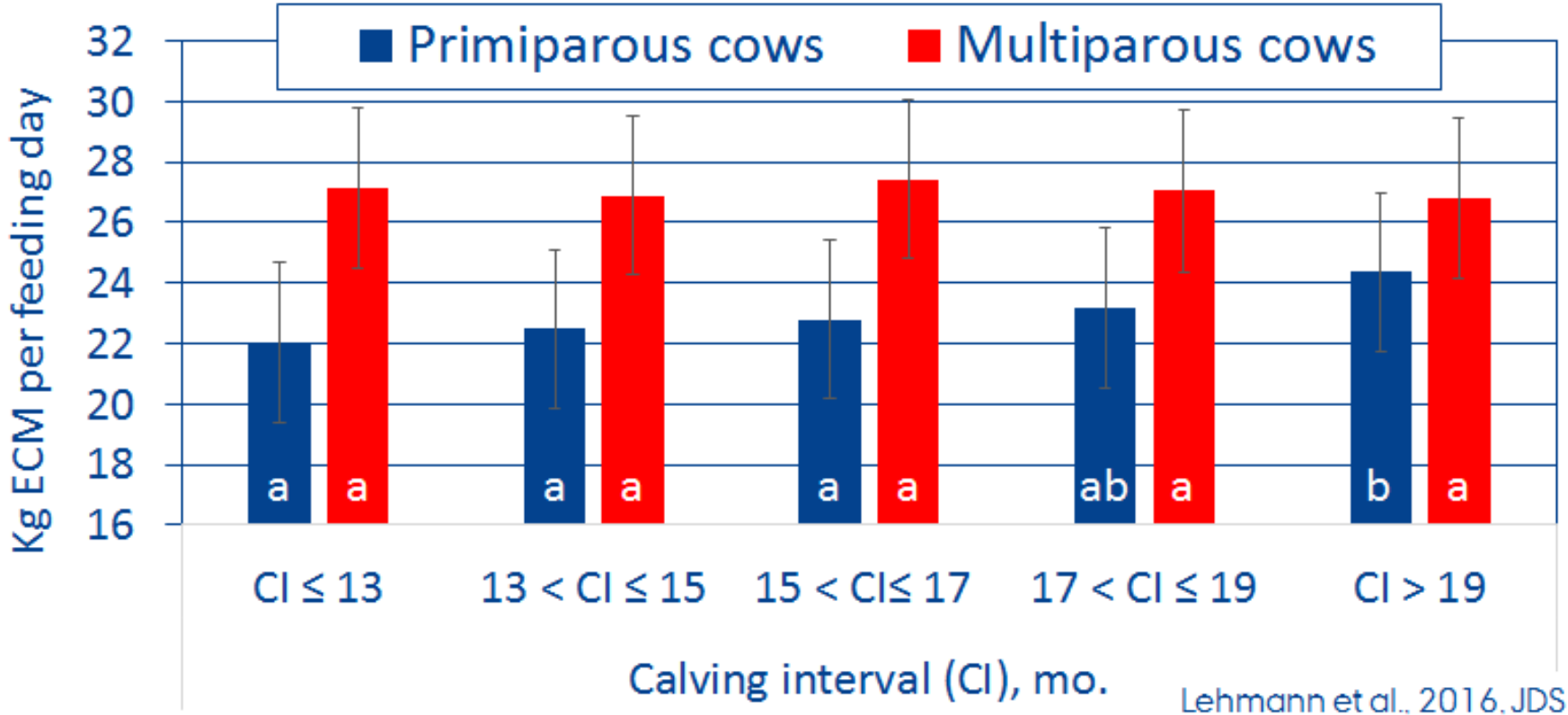
- Production ” or ↑ with EL (Arbel et al. 2008)
- Profitability ↑ with EL (Arbel et al. 2008)
- Efficiency expected to ↑ with EL
- Welfare concerns reg. dry-off at high yields (Zobel et al., 2015)

REPROLAC: 4 PRIVATE FARMS WITH EL

	Herd 1	Herd 2	Herd 3	Herd 4
Annual cows	157	93	154	132
Lactations	480	181	434	284
Breed	Holstein	Holstein	Crosses	Jersey
Feeding system	TMR fed ad libitum			
Kg ECM /ann. cow	12,315	10,209	7,842	7,849
Planned CI, mo	13 / 16	14 / 17	15 / 18	13 / 16

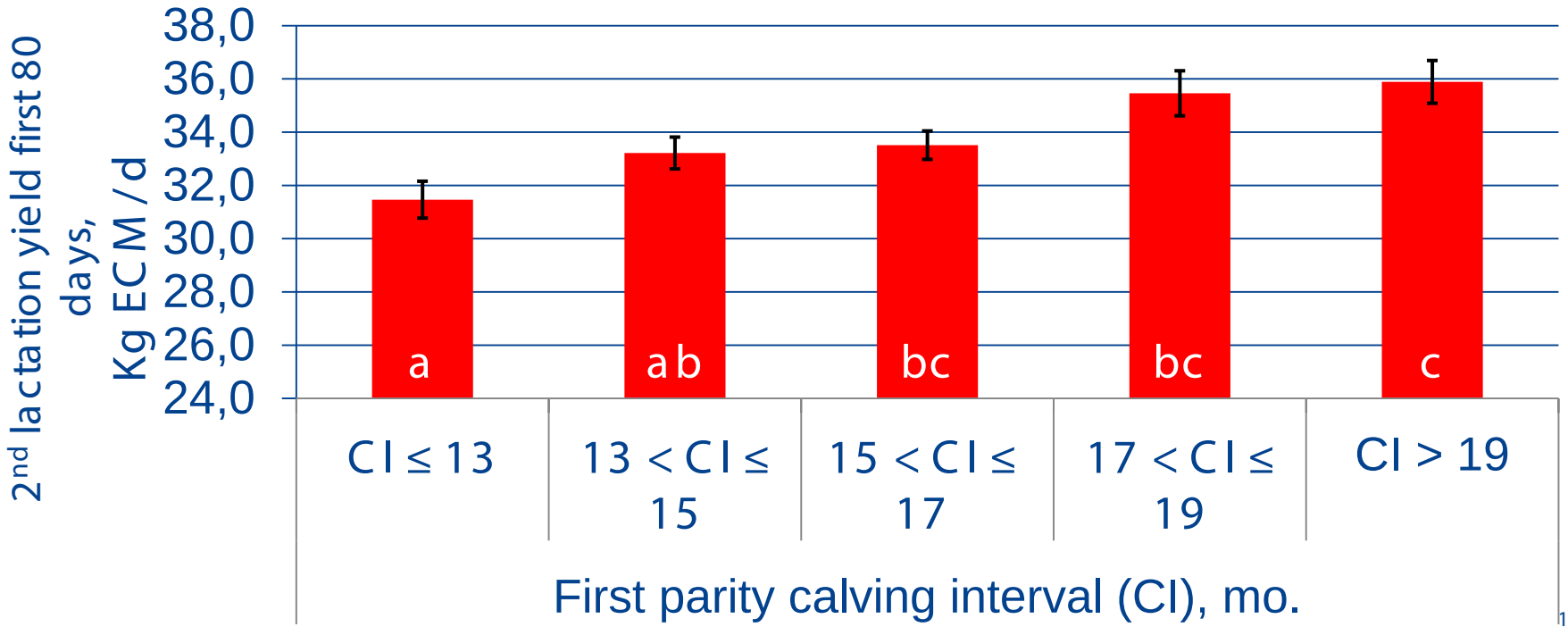
Lehmann, 2016

ECM PER FEEDING DAY IS MAINTAINED



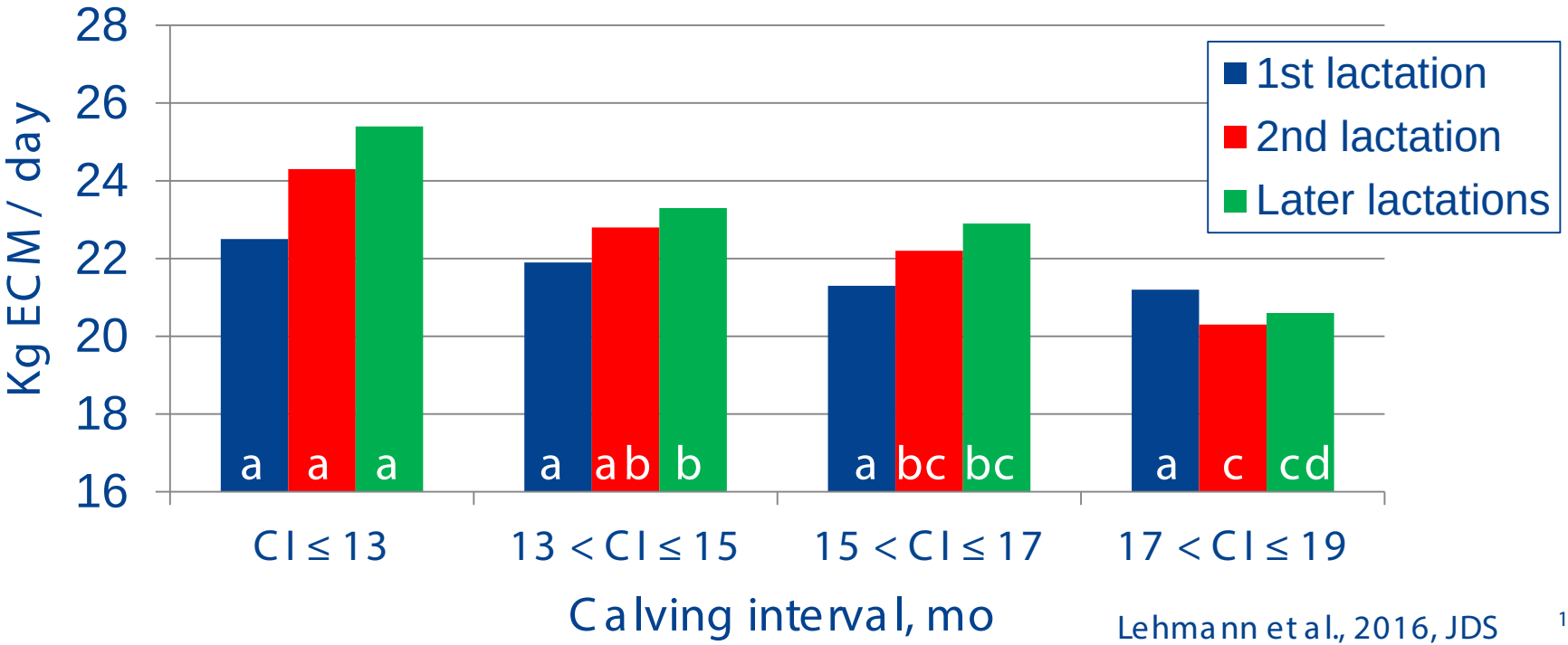
Lehmann et al., 2016, JDS

2ND LACTATION YIELD INCREASE WITH CI



Lehmann et al., 2016, JDS

LATE LACT. YIELD: 45 DAYS BEFORE DRY OFF



Lehmann et al., 2016, JDS

CULLING

Parity	1. parity		Older	
Lactation length	Short	Long	Short	Long
Culled, %	21	19	37	28

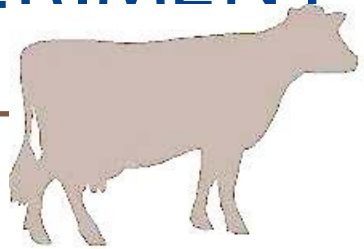
Lehmann, unpubl.

ON STATION EXPERIMENT

62 Holstein cows

Enter the experiment
2 months before calving
- Dry off pen
- Dry off diet

At calving



45 Multiparous & 17 primiparous

Feed bins

1 AMS

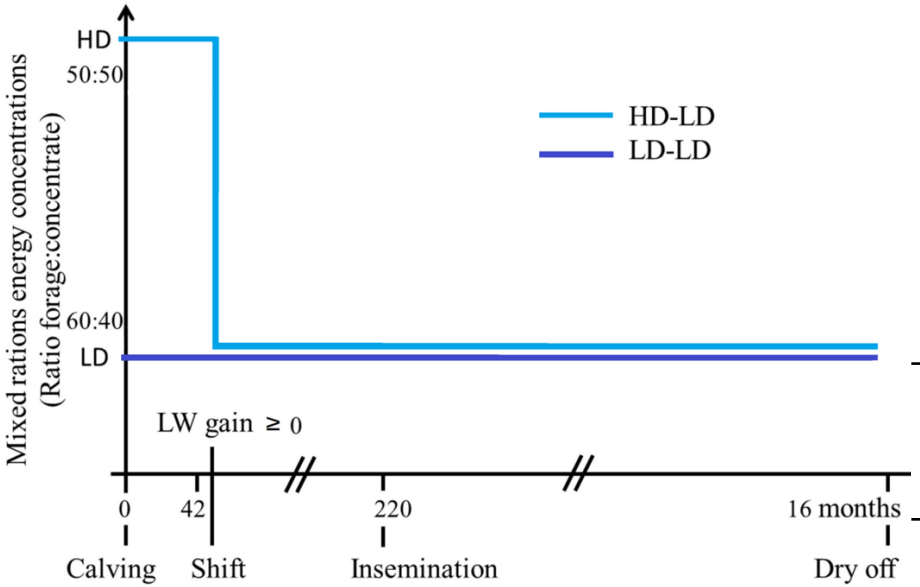
At 8 months

Insemination

AIM

16 months lactation

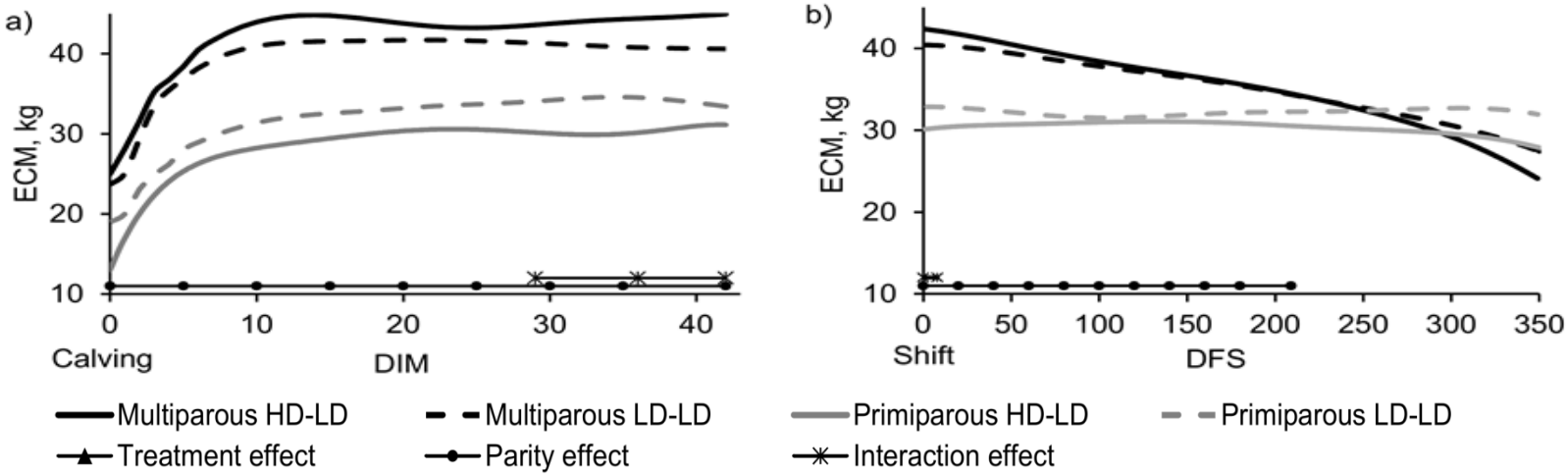
Feeding strategies



%DM	LD diet	HD diet
Barley	4.3	4.0
Wheat	-	15.8
Rapeseed Cake	17.2	15.8
Sugar beet pulp	8.6	7.9
Concentrates AMS	10.7	9.9
Grass/clover silage	31.1	23.7
Corn silage	27.9	22.2
E, MJ NEL/kg DM	7.49	7.81

Smaller difference of MJ NEL/kg DM: 4% instead of planned 10% units

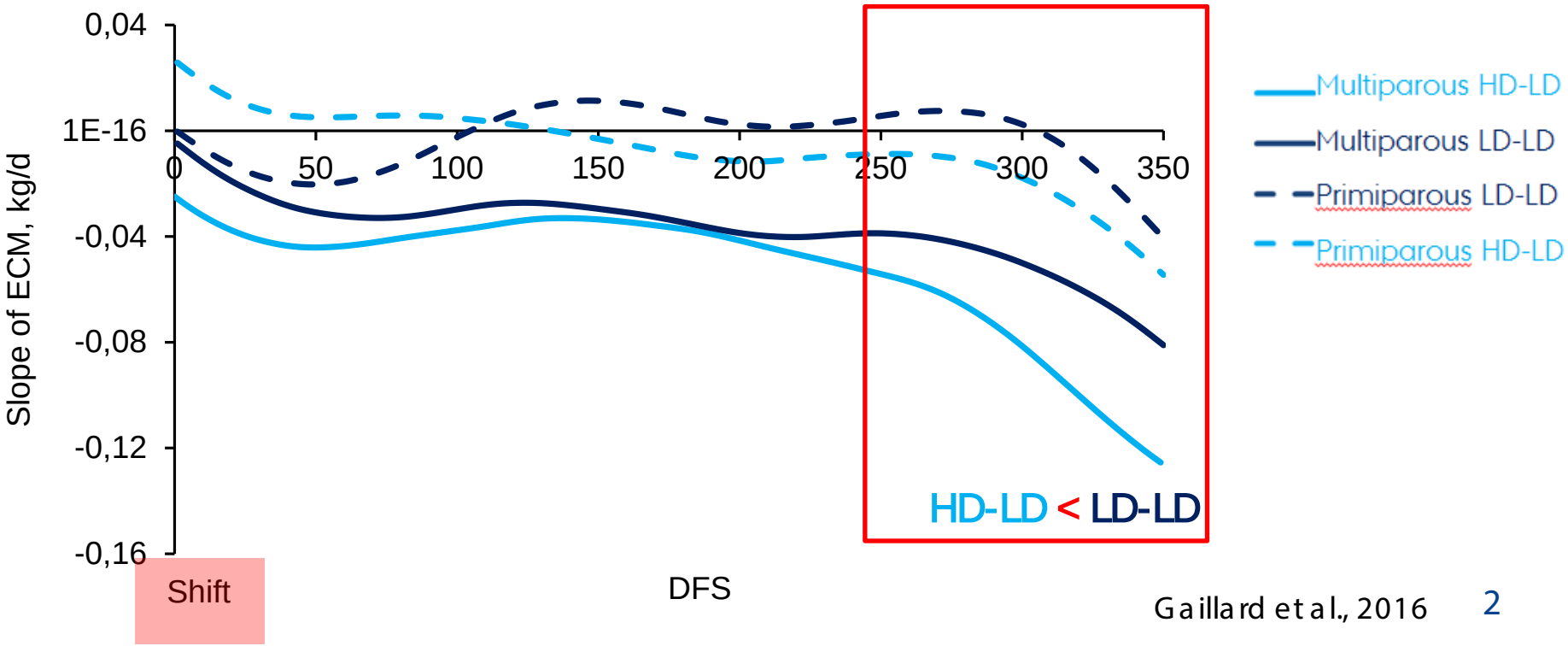
REPROLAC – YIELD AND PERSISTENCY



Parity	1. parity	Older
Kg milk per lactation	13,746	15,799
Kg milk per milking day	29.7	34.5
Milking frequency (AMS)	2.5	3.2

Gaillard et al., 2016

Persistency

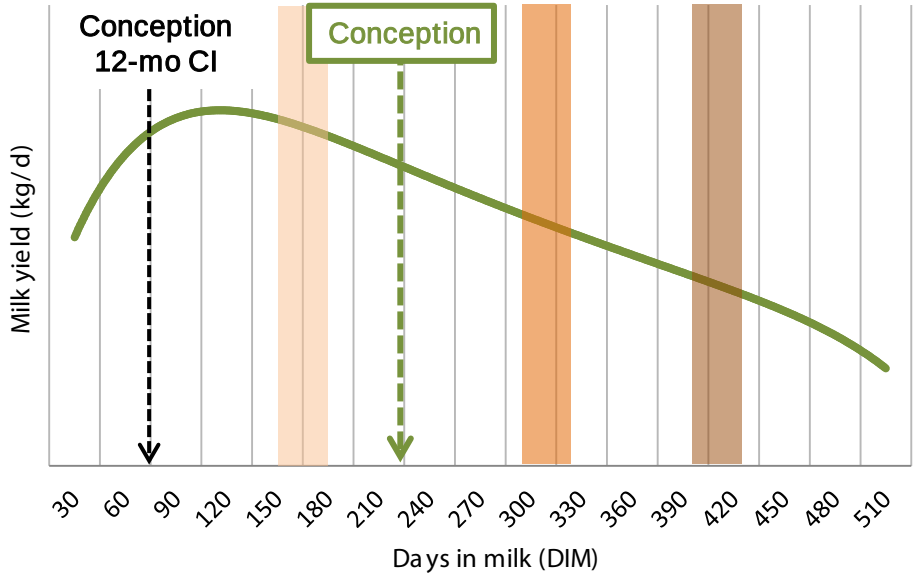


Gaillard et al., 2016

MILK QUALITY

ON STATION: MILK COMPOSITION

Aim: Investigate the quality of milk produced during extended lactation in relation to mid lactation



Milk sample collection:

P1:140 to 175 DIM

P2: 280 to 315 DIM

P3: 385 to 420 DIM

Maciel et al. 2016

ON STATION: MILK COMPOSITION

Composition	Lactation period			SEM	Significance		
	P1	P2	P3		Period	Feeding	Parity
Milk solids							
Lactose, %	4.81^{a}	4.75^{b}	4.73^{c}	0.01	***	**	NS
Fat, %	3.68^{c}	4.11^{b}	4.35^{a}	0.10	***	NS	NS
Protein, %	3.28^{c}	3.62^{b}	3.81^{a}	0.04	***	NS	NS
Casein, %	2.53^{c}	2.76^{b}	2.93^{a}	0.03	***	NS	NS
Casein:protein, %	77.1^{a}	76.3^{b}	76.8^{ab}	0.3	*	NS	NS

Maciel et al. 2016

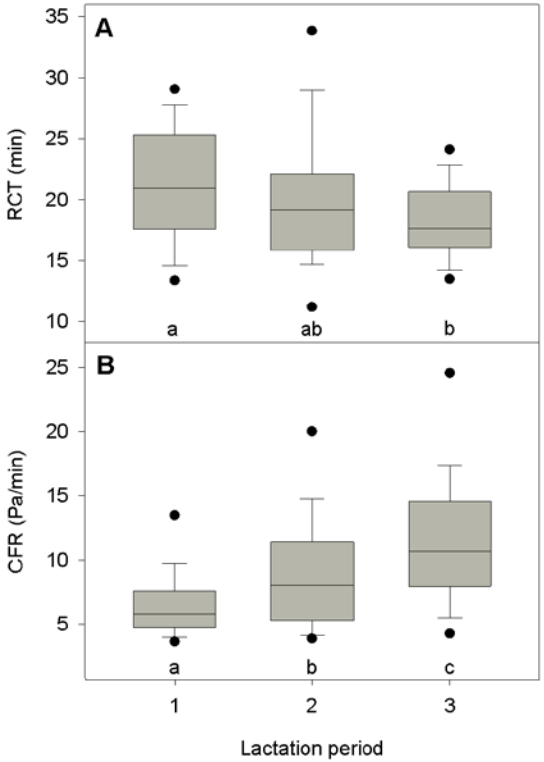
ON STATION: MILK COMPOSITION

Composition	Lactation period			SEM	Significance		
	P1	P2	P3		Period	Feed	Parity
Udder integrity indicators							
Conductivity, mS/cm	4.71	4.81	4.72	0.06	NS	NS	NS
pH	6.71	6.72	6.73	0.01	NS	NS	NS
Chloride, mg/L	875.3^{b}	907.4^{ab}	922.8^{a}	17.3	*	NS	**

Maciel et al. 2016

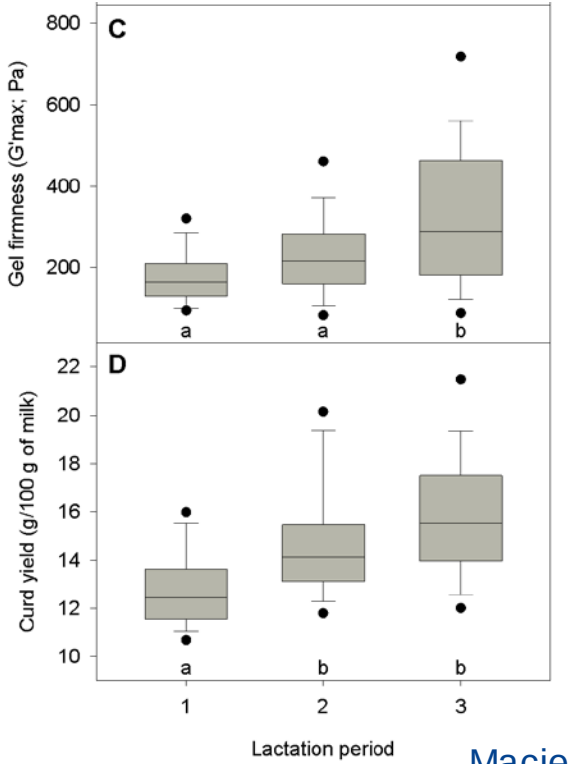
CHEESE-MAKING PROPORTIES

Coagulation time



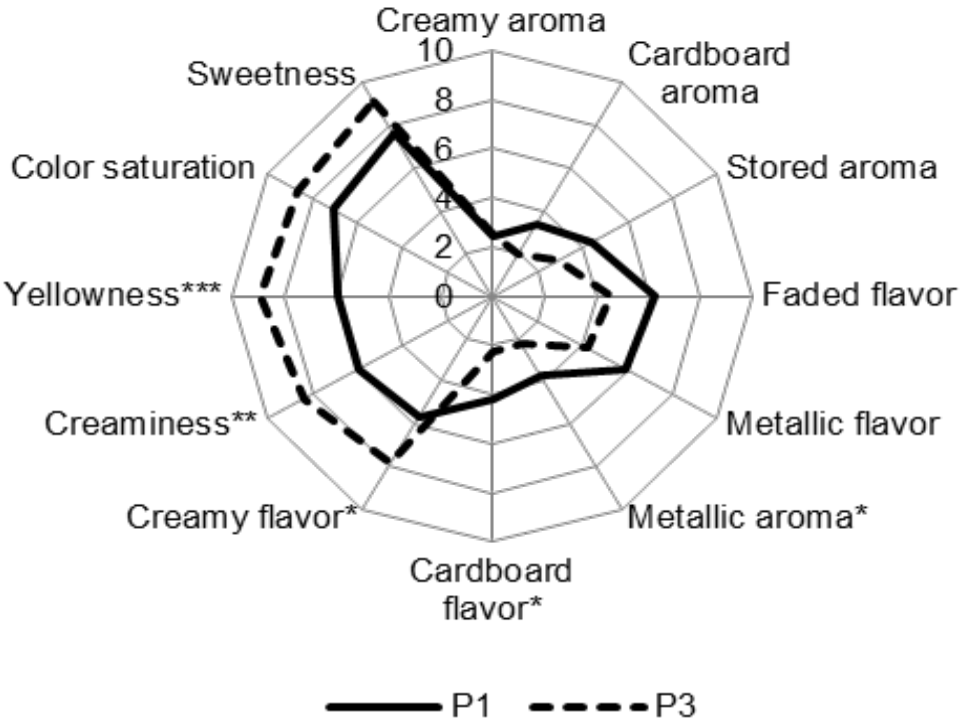
Gel firmness

Yield



Maciel et al. 2016

SENSORY QUALITY



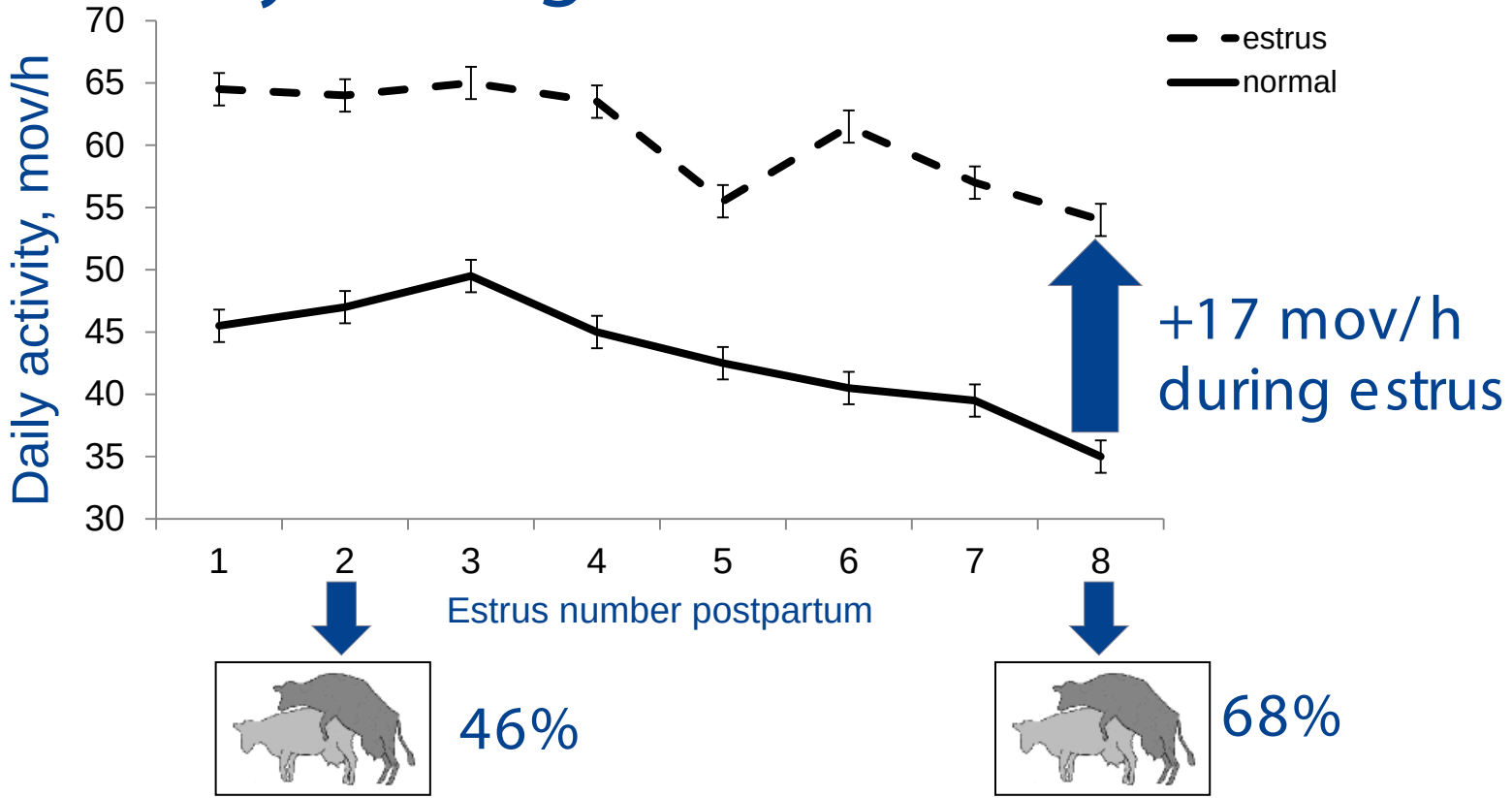
- No effect of diet
- Most parameters unaffected
- Changes were mainly related to increased fat and protein

Maciel et al. 2016

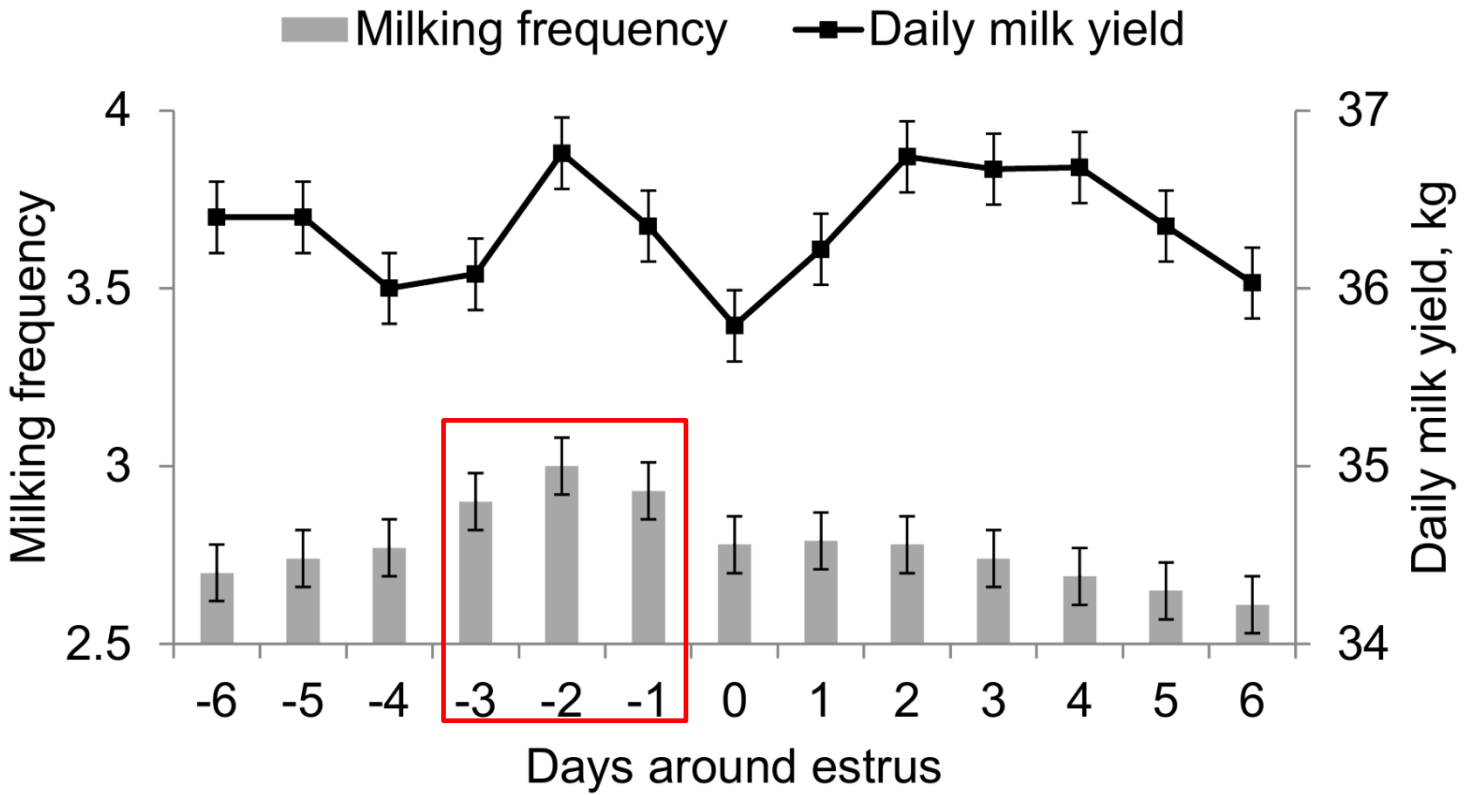
REPRODUCTION

See also poster # 23018

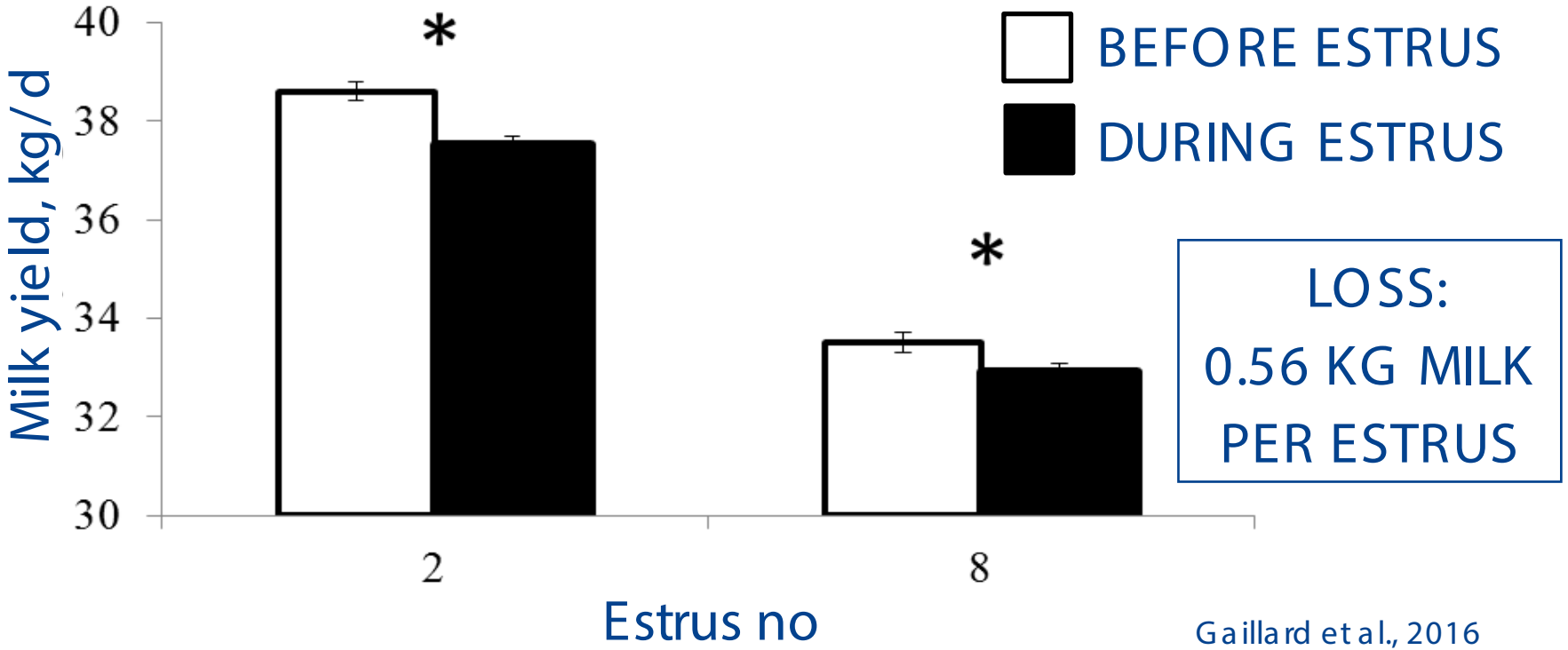
Activity during estrus



ESTRUS: YIELD AND MILKING FREQUENCY

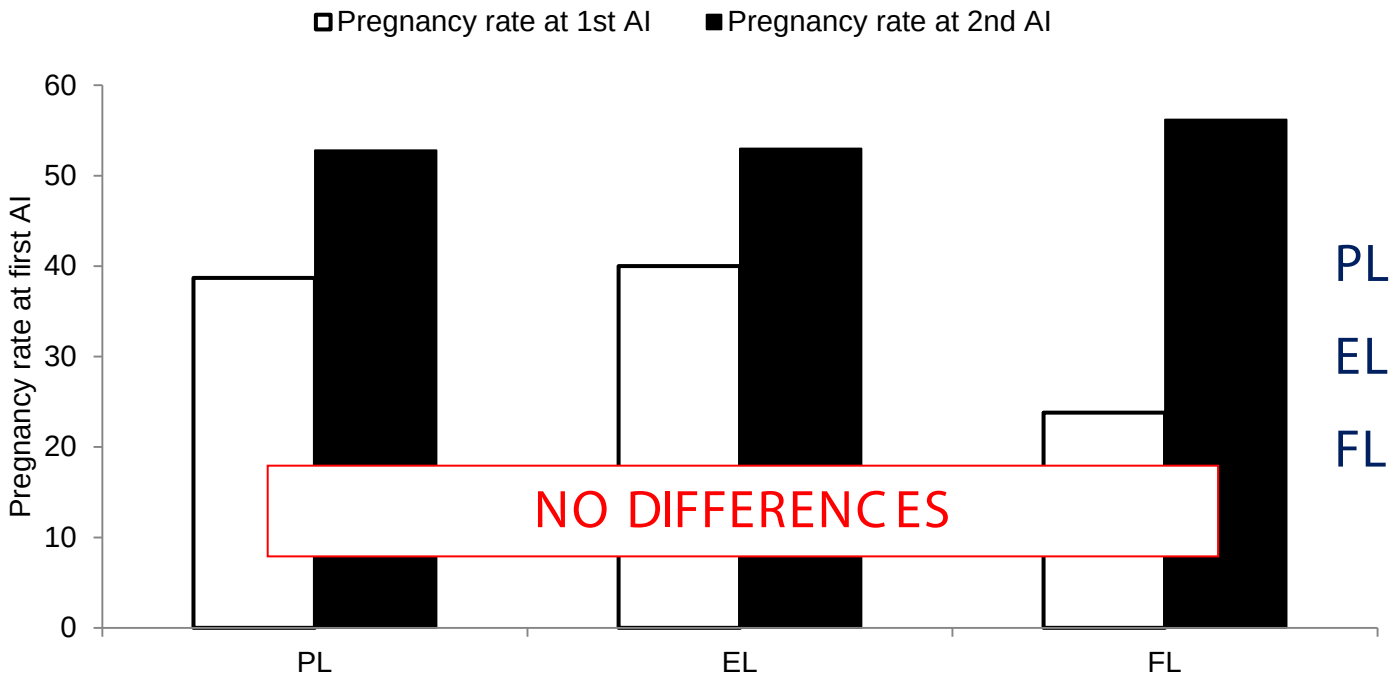


REPROLAC – ESTRUS AND MILK YIELD



Gaillard et al., 2016

PREGNANCY RATES



PL = Previous 10 mo

EL = Extended 16 mo

FL = Following 10 mo

Few animals: n = 62 n = 62 n = 38

SUM UP

- Milk production is maintained at high level ✓
- Milk quality is the same or slightly improved ✓
- Increased activity due to estrus ✓ - problem ?
- Reproduction uaffected ✓ **Poster 16**
- Lifetime performance and longevity **Poster 14**
- Herd level effects and efficiency **Theater 3 / Poster 17**

REPROLAC

Extended lactation in dairy production

in favour of climate, animal welfare and productivity

The Danish Council for Strategic Research

Arla

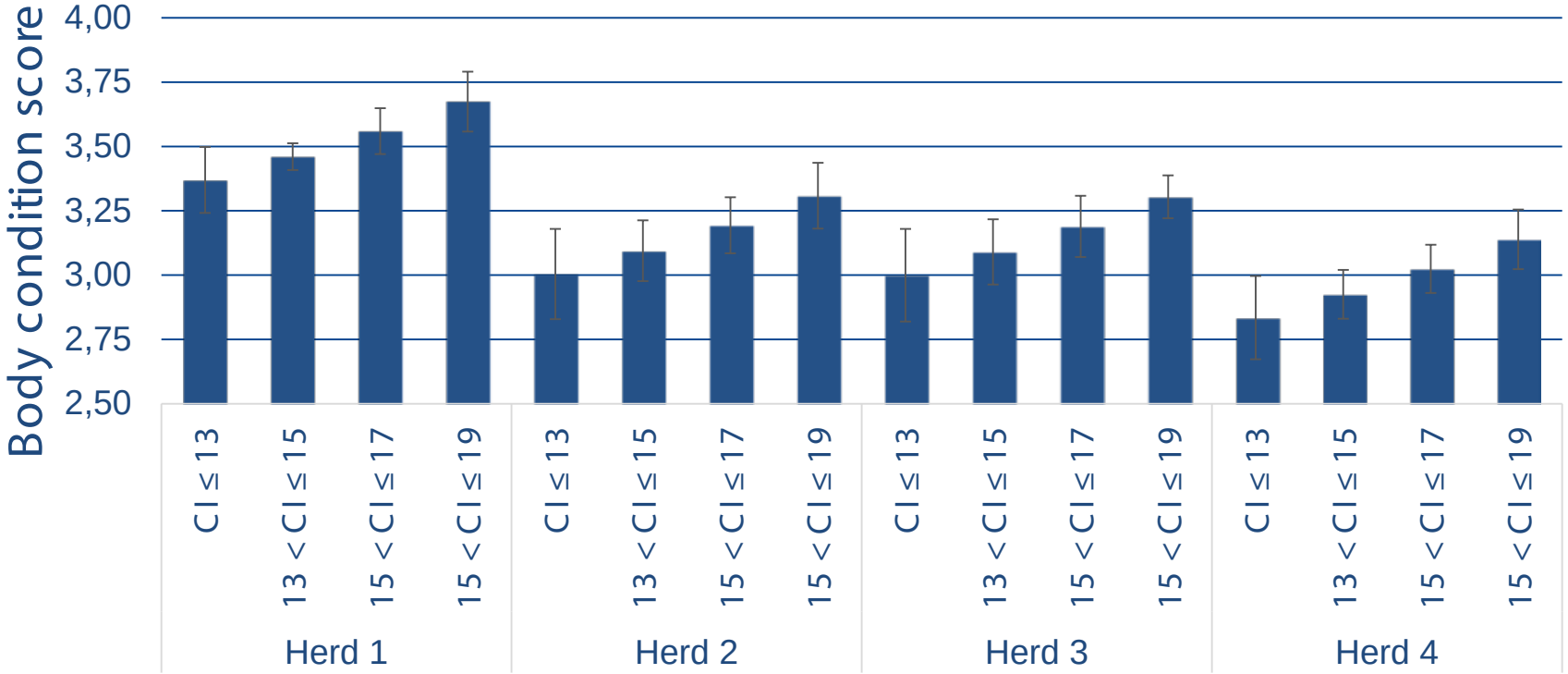
DKC Danmarks Kvægforskningscenter

AgroParisTech
INSTITUT DES SCIENCES ET INDUSTRIES DU VIVANT ET DE L'ENVIRONNEMENT
PARIS INSTITUTE OF TECHNOLOGY FOR LIFE, FOOD AND ENVIRONMENTAL SCIENCES

CAPES

EXTRAS

BCS AT THE CALVING FOLLOWING EL



Lehmann, 2016

SVENSK FORSØG FRA 90'ERNE

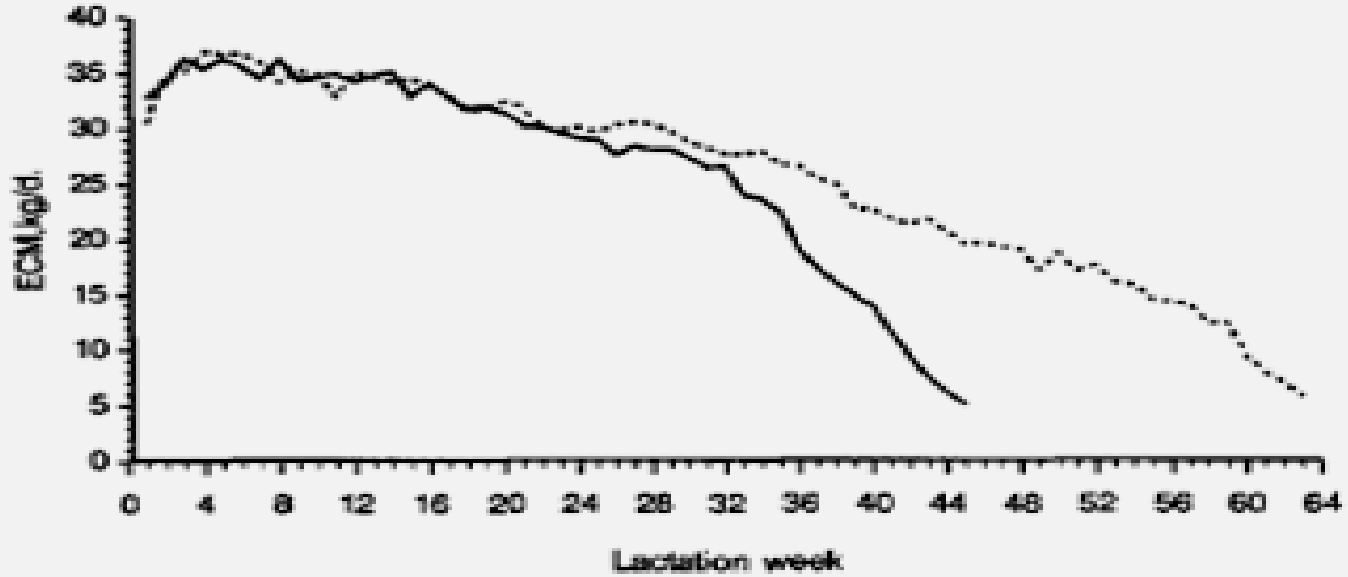
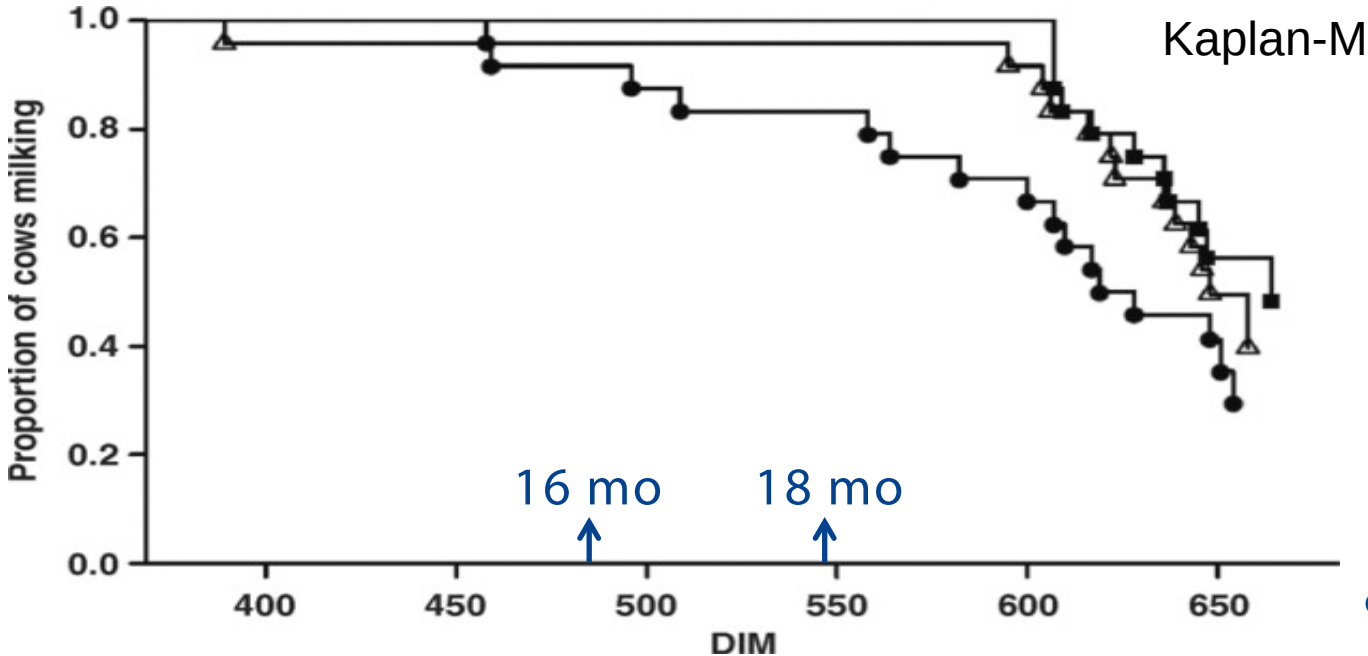


Fig. 1. Average daily yield of energy corrected milk (ECM) during the first experimental lactation in herd 2 (40% primiparous, 60% multiparous) for cows managed for 12- (————) or 18- (- - -) month calving intervals.

Bertilsson et al., 1997

Proportion of cows still milking during a 670-d lactation



Kaplan-Meier survival curves

Diet:

Grainger et al. 2009, J. Dairy Sci.

AARHUS
UNIVERSITY

Cheese-making properties

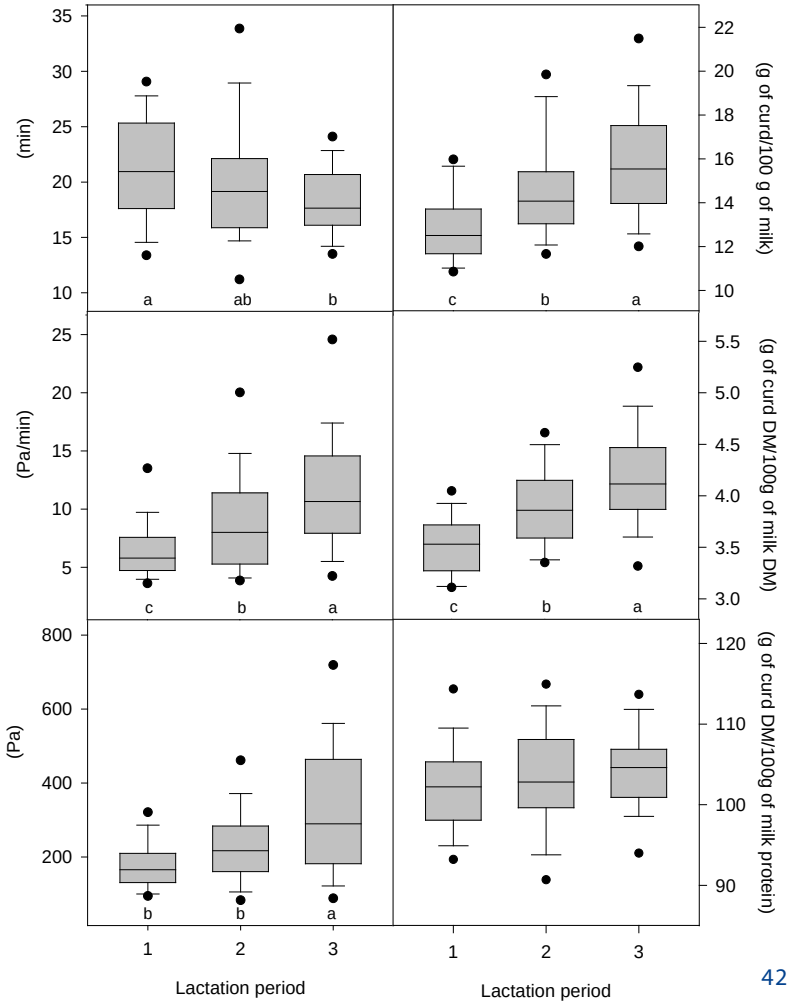
CFR and G'max ↑ from P1 to P3

\+ Wet and dry curd yield ↑ with P1 to P3

RCT ↓ in late lactation

= 100 g of milk protein = same curd yield

No changes in curd moisture

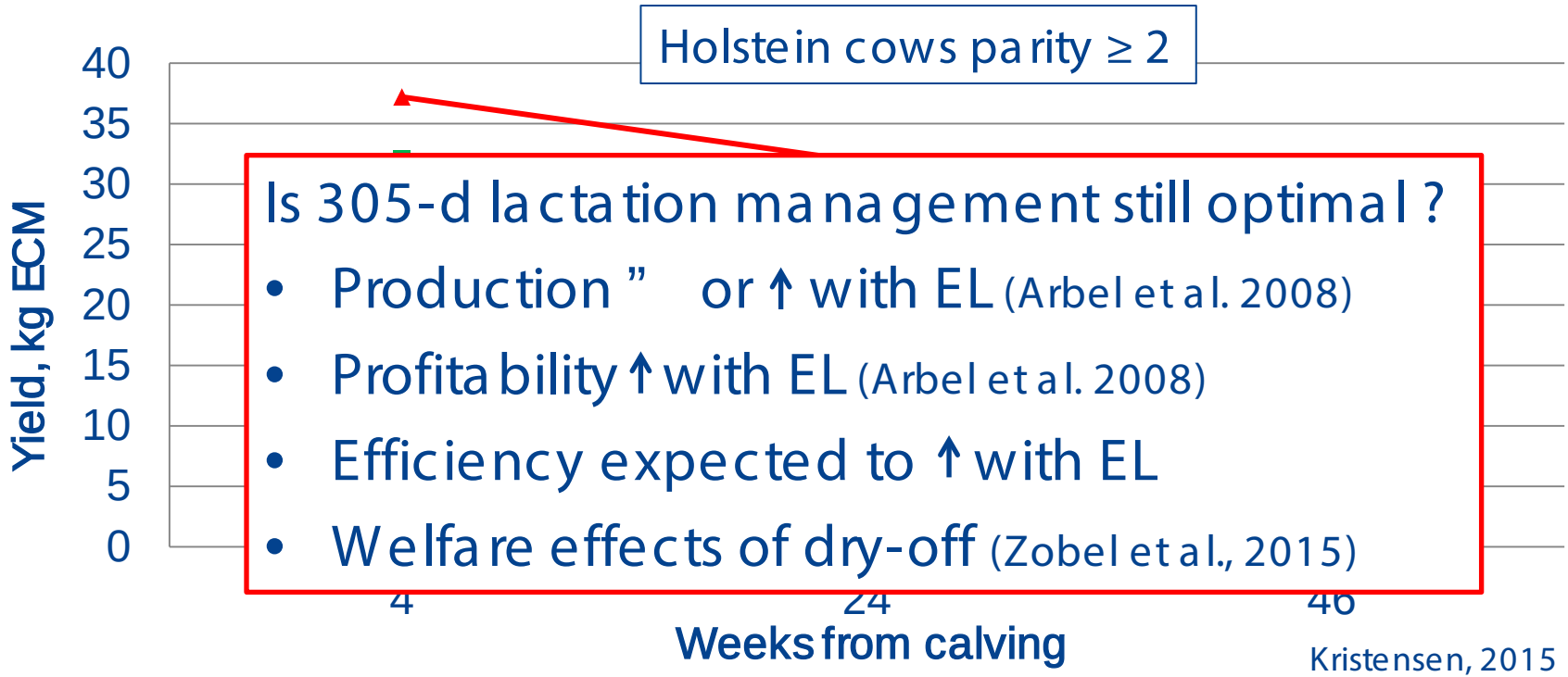


Maciel et al. 2016

IS 305-D LACTATION MANAGEMENT STILL OPTIMAL ?

- Production = or ↑ with EL (Arbel et al. 2008)
- Profitability ↑ with EL (Arbel et al. 2008)
- Efficiency expected to ↑ with EL
- Welfare effects of dry-off at high yields (Zobel et al., 2015)

YIELD HAS INCREASED – PERSISTENCY?



Is 305-d lactation management still optimal ?

- Production ” or ↑ with EL (Arbel et al. 2008)
- Profitability ↑ with EL (Arbel et al. 2008)
- Efficiency expected to ↑ with EL
- Welfare effects of dry-off (Zobel et al., 2015)

Kristensen, 2015

Production data	Physiological data	Reproduction data
Daily DMI, MY, LW BCS every 2 weeks Milk fat, protein, lactose & cells every week + ECM and EB (input – output) calculations	Weekly plasma NEFA, BHBA, glucose, urea, uric acid, insulin, IGF-1 from week 1 to 36 Progesterone in milk	Hourly activity Estrus behavior Pregnancy rates and number of AI per pregnancy