Euroopa Maaelu Arengu Põllumajandusfond: Euroopa investeeringud maapiirkondadesse

CENTURION
KNOWING-HOW IN FEED AND FOOD

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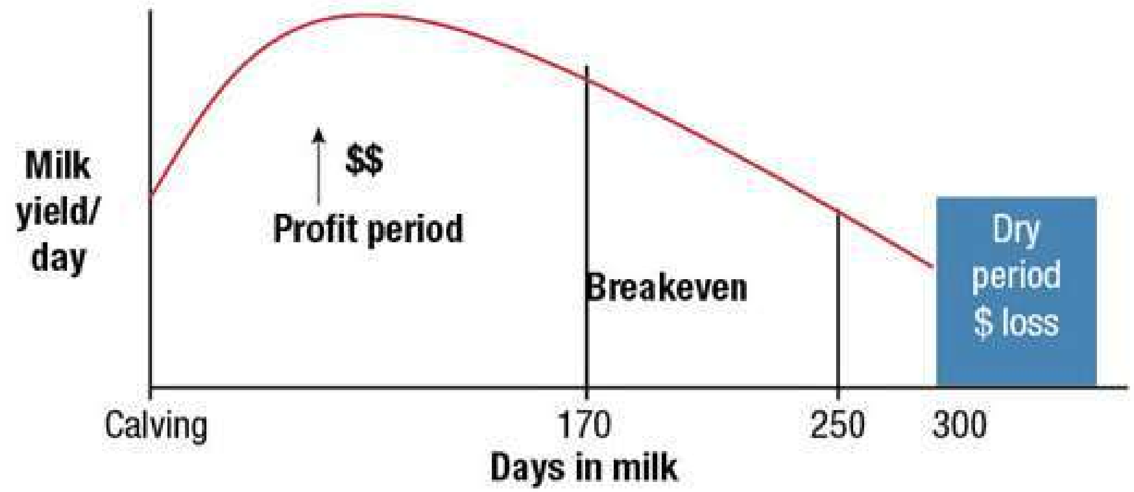
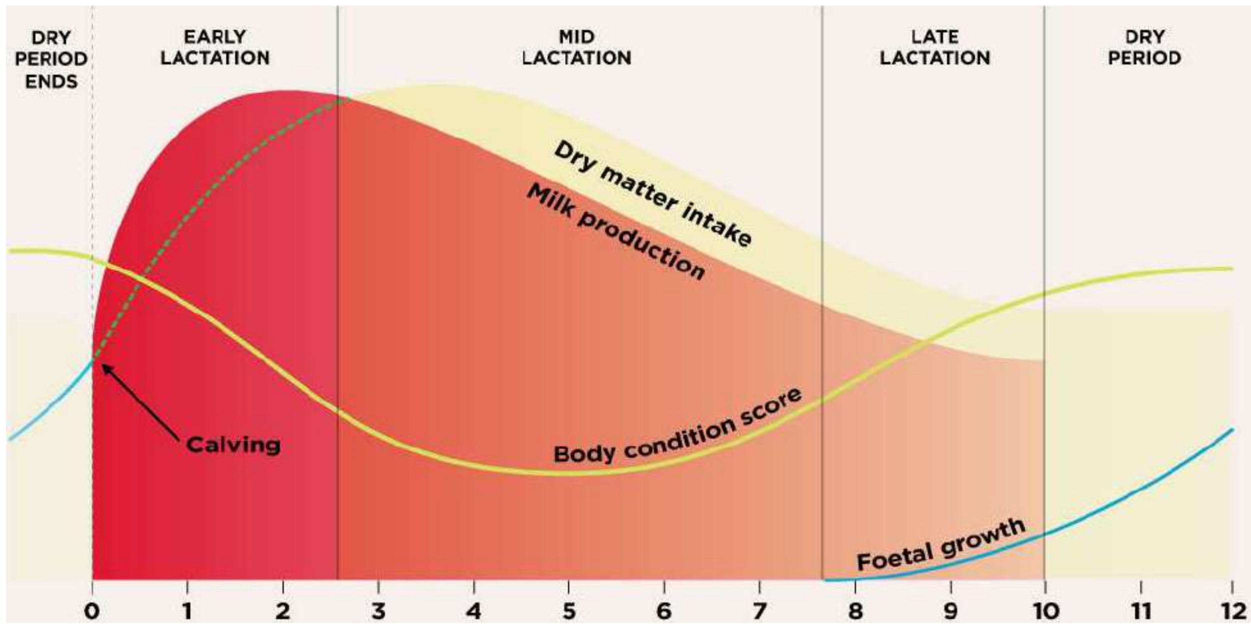
28.04.2021

Milk Cycle Economics



Milk Production Cycle



parameters

Health issue	target
Milk fever	1%
Clinical ketosis	<1%
Abomasal displacements	<1%
Clinical mastitis	<5 cases/100 cows/first 30 DIM
lameness	<2% with Score >2
hypomagnesia	0%
Retained placenta (>24 hours)	<4%
Vaginal discharge after 14 days	<3%
Calvings assistance	<2%
Clinical acidosis	0%

Table 2: Pregnancy rate (PR) likelihood ratios for dairy cows (n=170) categorized by milk urea nitrogen (MUN) concentration on the day of artificial insemination (AI)

MUN (mg/dl)	Cows n	PR (%)	Likelihood ratio [a]
< 16	94	81	1.02
16 – 18.9	40	72	0.64
19 – 21.9	24	67	0.48
22 – 24.9	8	50	0.24
≥ 25	4	50	0.24

[a]Percentage of cows pregnant divided by the percentage of cows not pregnant

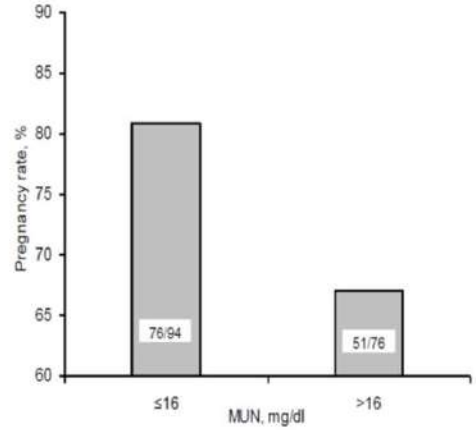


Fig. 2: The relationship of milk urea nitrogen (MUN) to pregnancy rate at artificial insemination (AI) in lactating cows (n=170). Pregnancy rate was significantly reduced ($p<0.05$) in cows with MUN ≥ 16 mg/dl. The number of pregnant cows is indicated within each category.

parameters

Tabel 2: Verschillende close-up en far-off strategieën vergeleken. Naar Dann et al., 2006

Methode	Far-off[1]		150 % NRC, ad libitum		100% NRC, ad libitum met stro		80% NRC, Gelimiteerd	
	Close-up[2]		Ad libitum	Gelimiteerd	Ad libitum	Gelimiteerd	Ad libitum	Gelimiteerd
Droogstand	VEM/Kg Ds	FO	964	964	788	788	964	964
		CU	976	976	976	976	976	976
	VEM/dag	FO	13881[4]	13881[4]	8195[6]	8195[6]	6362[5]	6362[5]
		CU[7]	12102	6636	13273	7124	10833	7222
	Energie Balans	CU[7]	135%	72%	147%	80%	126%	83%
	BCS verandering	FO	+0.38	+0.38	+0.14	+0.14	+0.02	+0.02
		CU[7]	-0.07	-0.12	+0.05	-0.21	-0.12	-0.09
	NEFA (µEq/L)	-7d	288	527	270	417	253	402
Postpartum	DS opname (Kg/dag)	1-10 DIM	14.2	14.0	16.0	15.8	15.4	16.2
	Energie balans (%)	1-10 DIM	78	82	86	91	90	96
	TAG lever (%)	1-10 DIM	2.78	2.4	3.48	1.47	1.42	1.31
	BHBA (mg/dl)	1-10 DIM	8.73	9.37	8.61	7.65	6.85	6.37
	Melkvet (%)	56 DIM	3.9	3.64	3.74	3.44	3.54	3.63
	Kg melk/dag	1-10 DIM	26.5	25.6	30.0	29.4	26.7	26.1
	Kg melk/dag	1-56 DIM	37.1	36.7	39.7	39.2	37.1	36.8
	Gezondheidsproblemen[3]	1-56 DIM	26	25	12	17	18	19

Rantsoen om te voorzien in 150%, 100% of 80% van NRC 2001 behoeften te verzien in Nel tijdens de far-off periode. Het 150% rantsoen werd ad libitum toegediend, voor de 100% groep werd er tarwe stro bijgevoegd en voor de 80% werd er gelimiteerd in droge stofopname, tot 6.6 Kg DS per dag.

[2]In de close-up periode werd er hetzelfde rantsoen gevoederd maar gelimiteerd (7.2 kg DS per dag) of ad libitum en dit telkens in de verschillende far-off groepen zodat deze gesplitst werden.

[3]Som van het voorkomen van lebmaagverplaatsing, klauwproblemen, subklinische ketose, klinische ketose, mastitis, metritis, hypocalcemie en retentio secundinarum.

[4]In werkelijkheid komt dit overeen met 160% van NRC 2001 behoeften (711 kg lichaamsgewicht)

[5]In werkelijkheid komt dit overeen met 66% van NRC 2001 behoeften (681 kg lichaamsgewicht)

[6]In werkelijkheid komt dit overeen met 104% van NRC 2001 behoeften (702 kg lichaamsgewicht

[7]van dag -24 tot dag -7

Transition index

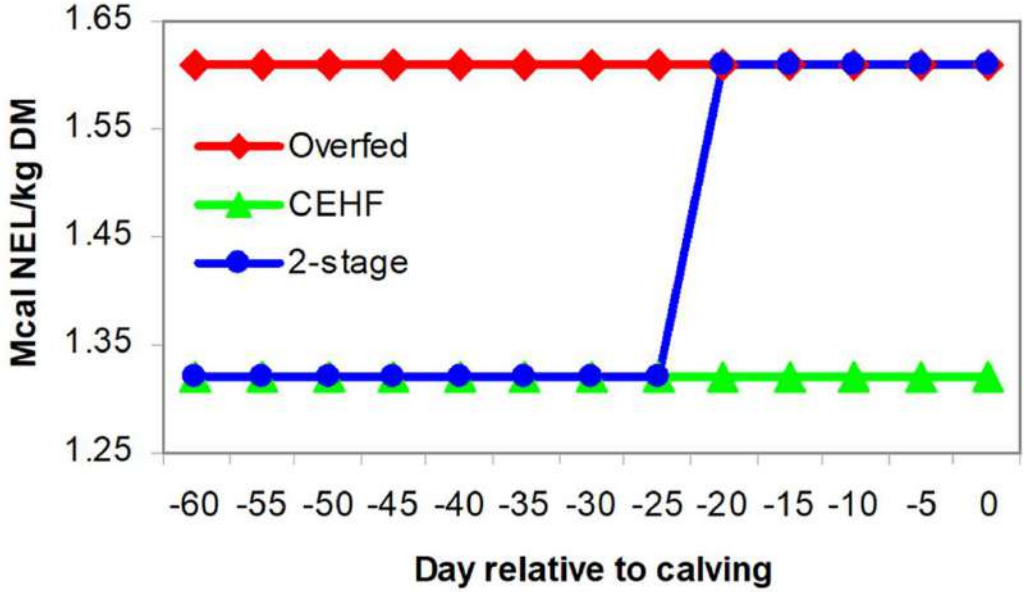
Transition periode		
-35	0	+ 28

Succes factors

- Optimized dry cow rations
- Optimized fresh group rations
- Management techniques

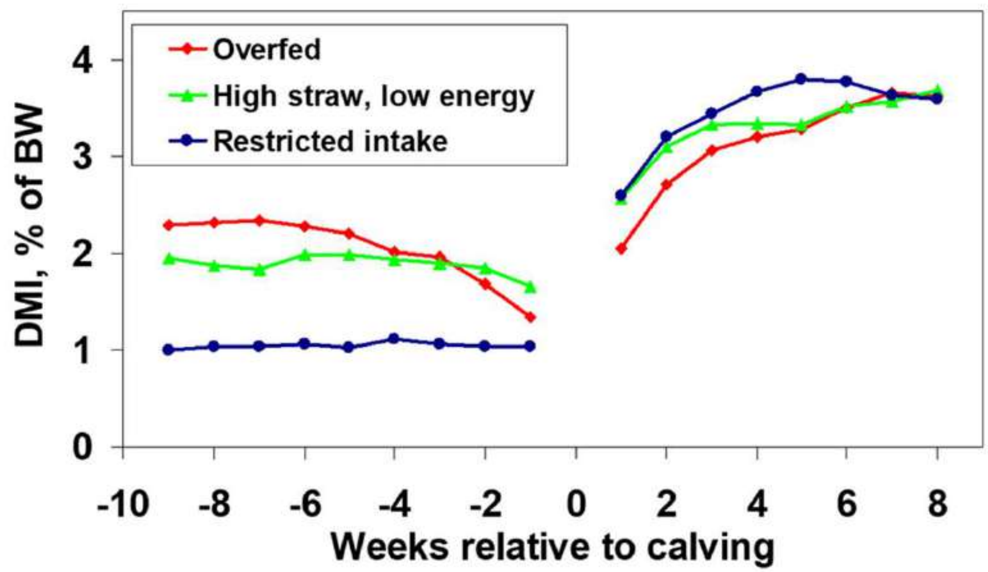
grouping

Single fed or 2 group feeding



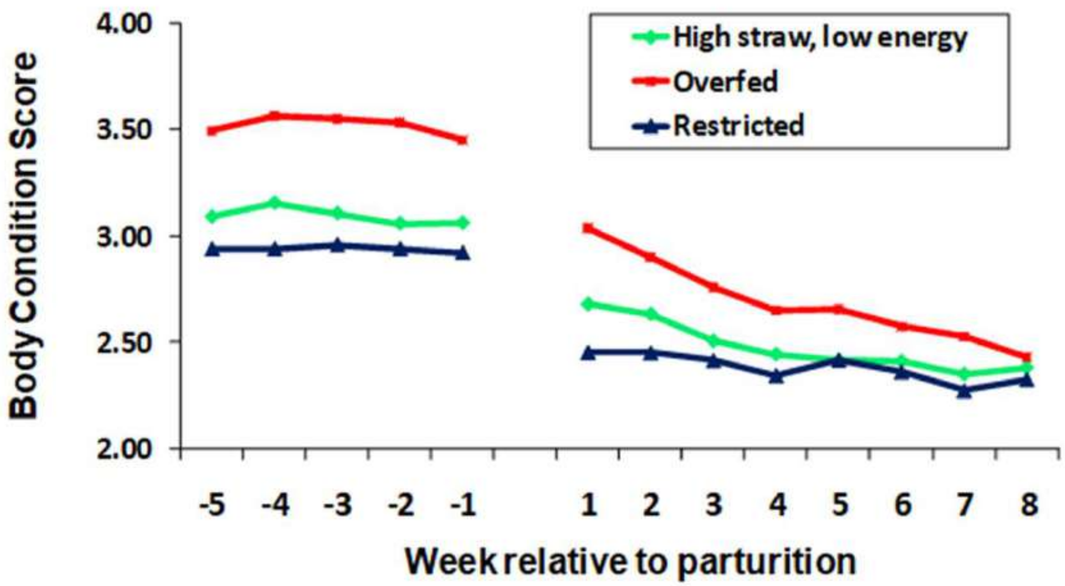
grouping

Weekly dry matter intake for cows fed different amounts of energy during the dry period



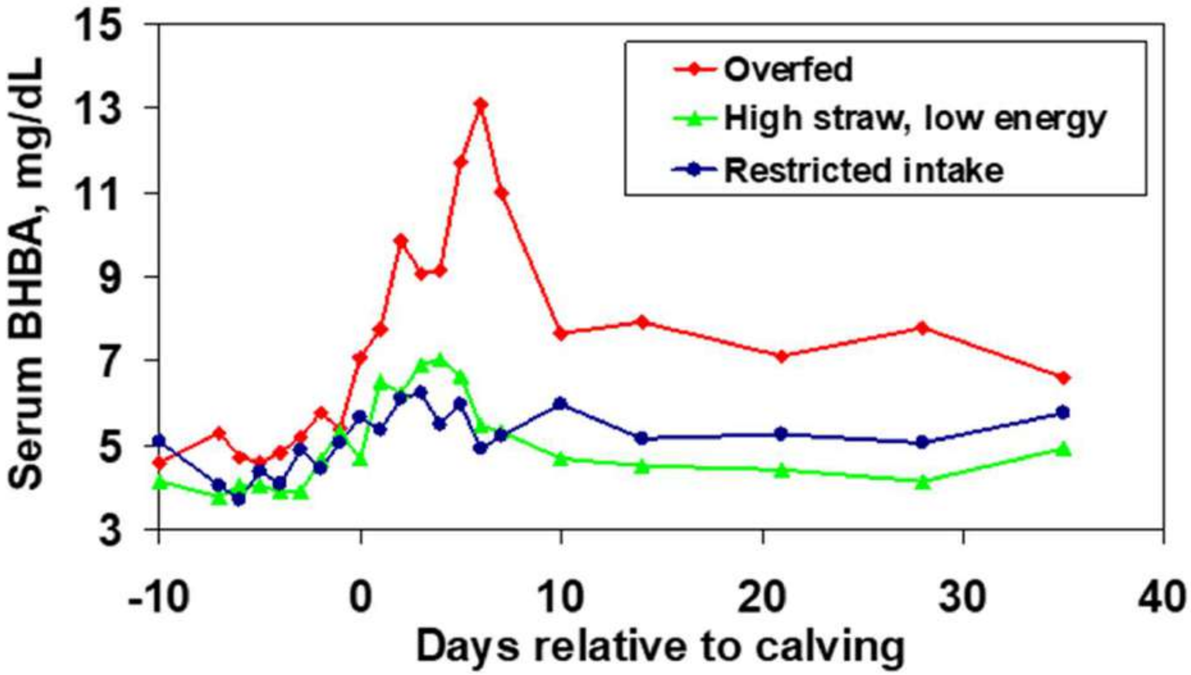
Janovick and Drackley, 2010

grouping



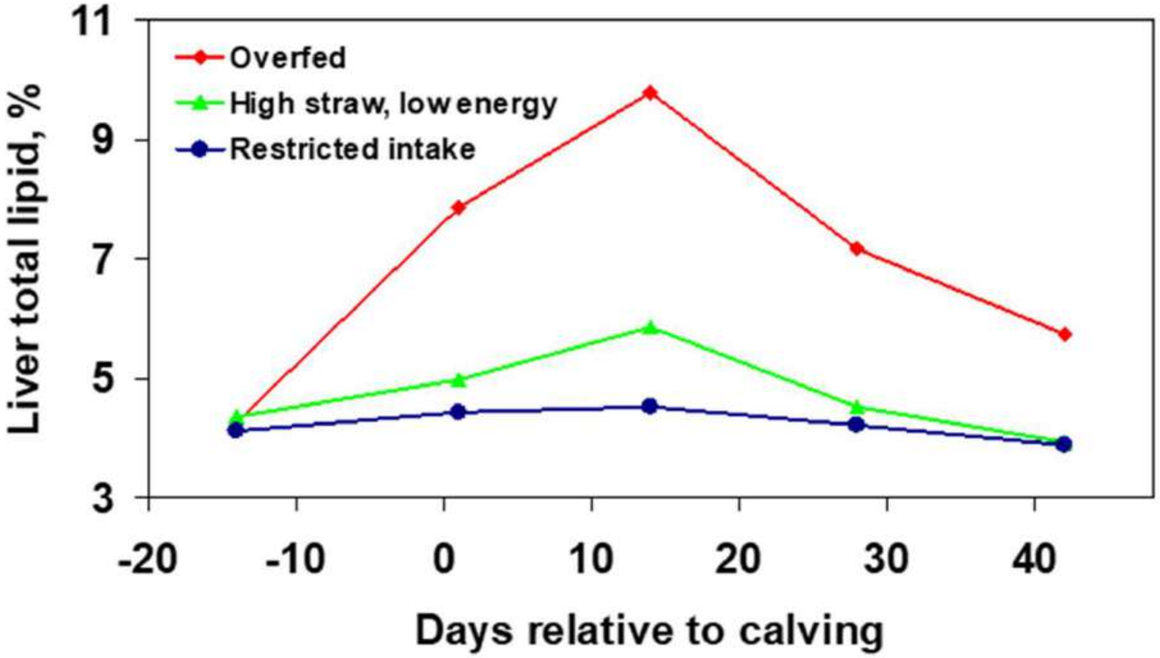
Body Condition Score
4.00
3.50
3.00
2.50
2.00
High straw, low energy
Overfed
Restricted
-5
-4
-3
-2
-1
1
2
3
4
5
6
7
8
Week relative to parturition

grouping



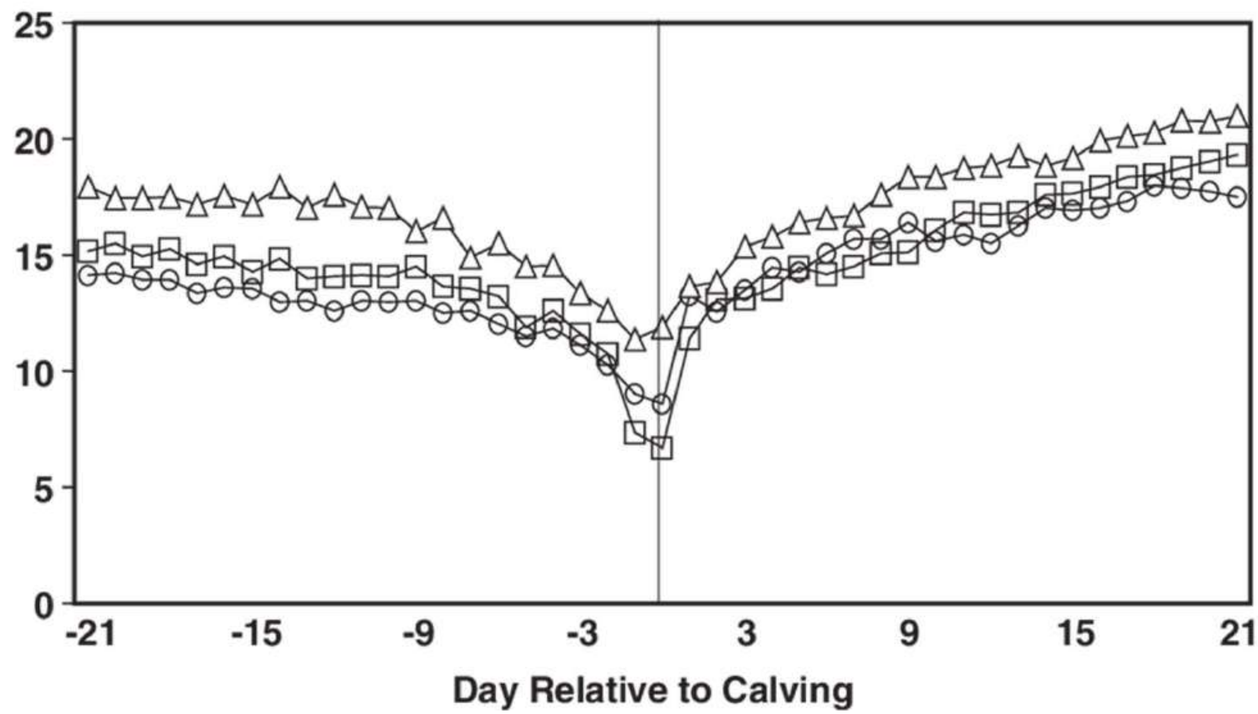
Overfed
High straw, low energy
Restricted intake
Serum BHBA, mg/dL
15
13
11
9
7
5
3
-10
0
10
20
30
40
Days relative to calving

grouping

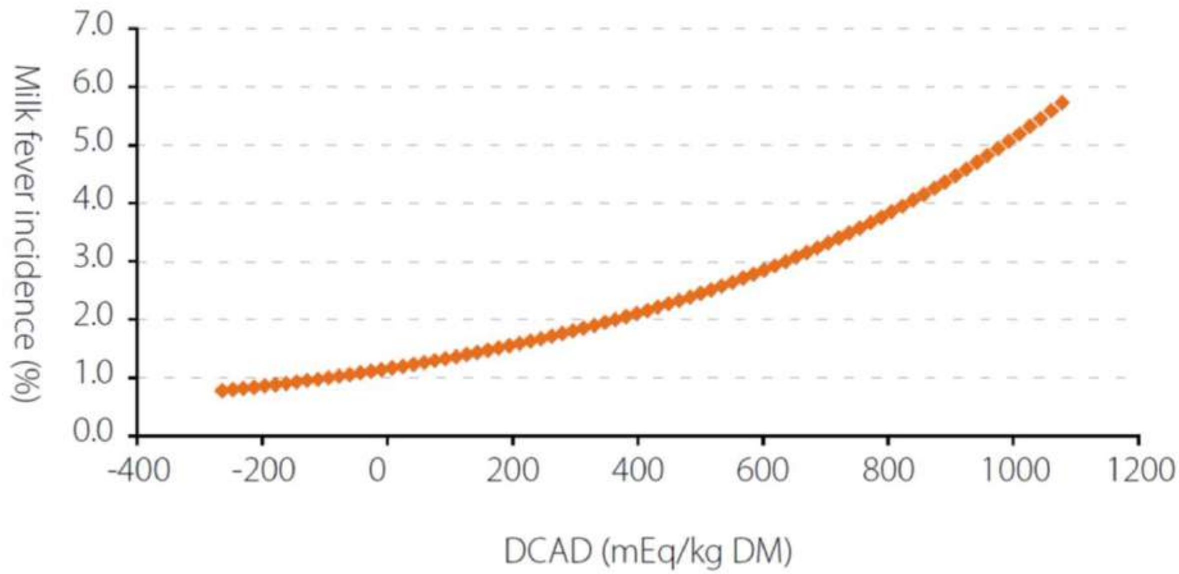


Overfed
High straw, low energy
Restricted intake
Liver total lipid, %
11
9
7
5
3
-20
-10
0
10
20
30
40
Days relative to calving

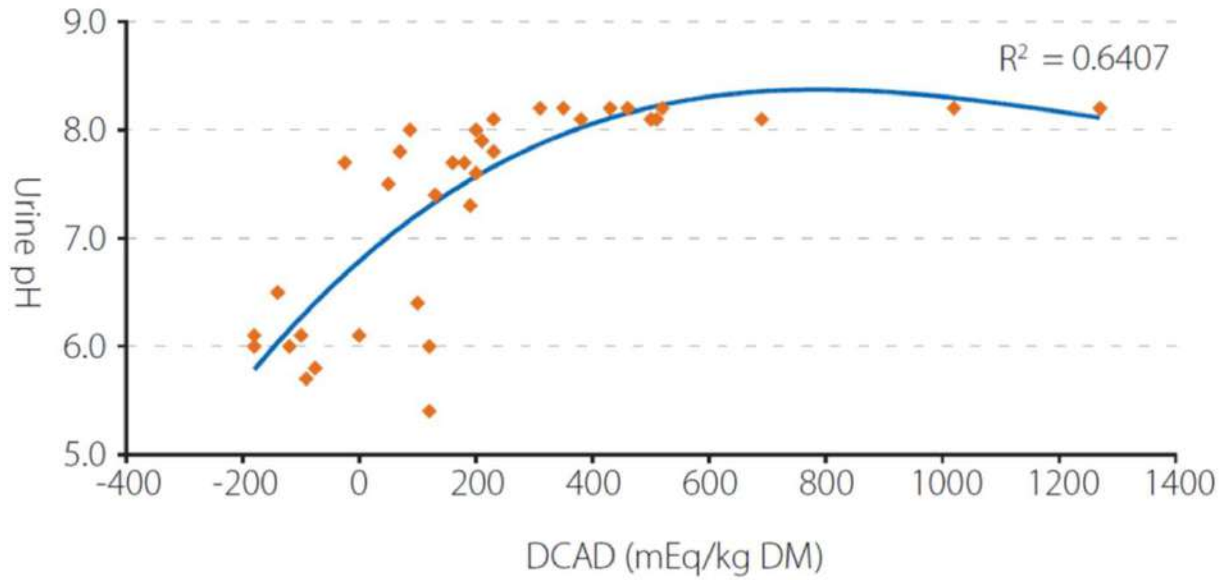
Dry matter intake



Milk fever

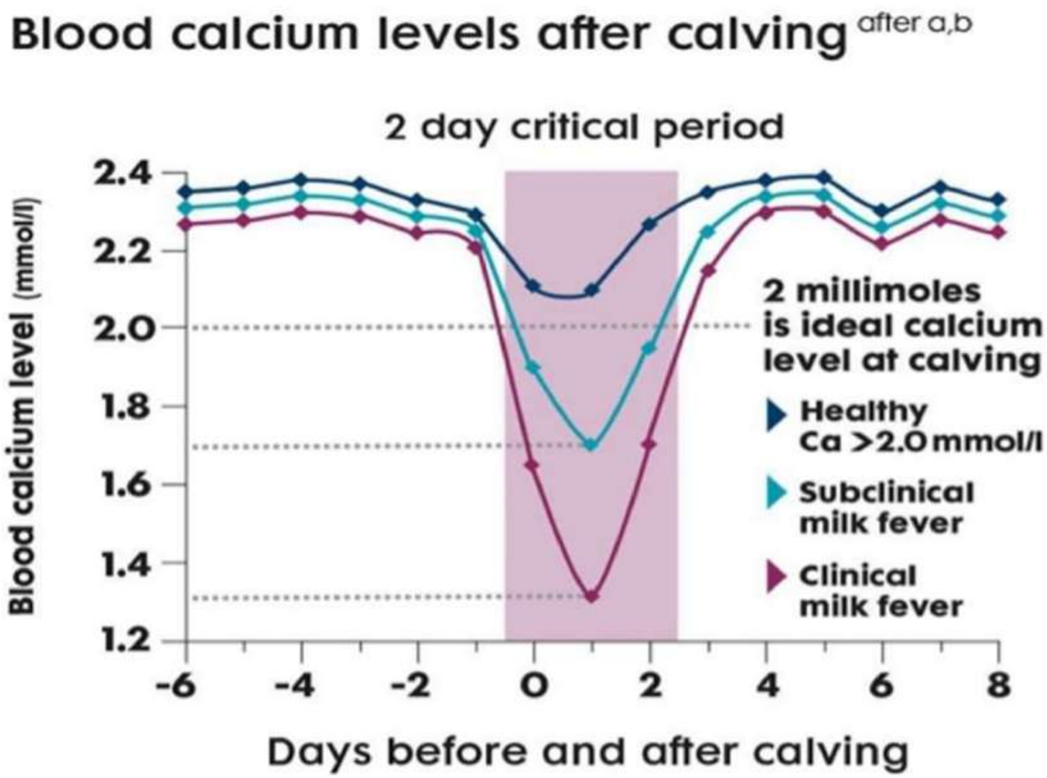

Milk fever incidence (%)
7.0
6.0
5.0
4.0
3.0
2.0
1.0
0.0
-400
-200
0
200
400
600
800
1000
1200
DCAD (mEq/kg DM)

milkfever



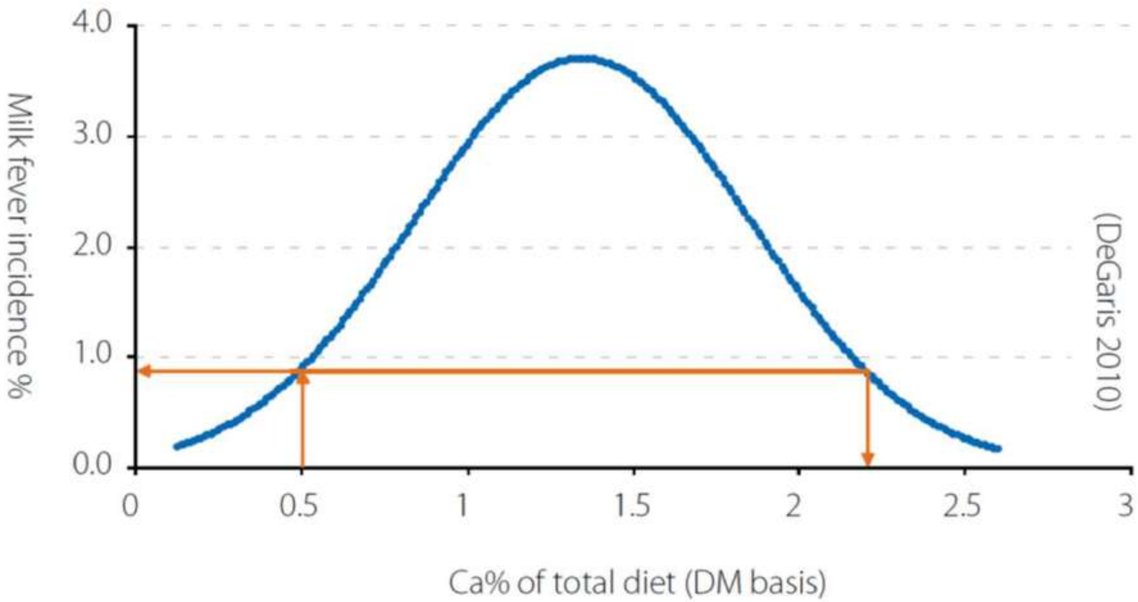
9.0
8.0
7.0
6.0
5.0
Urine pH
R² = 0.6407
-400
-200
0
200
400
600
800
1000
1200
1400
DCAD (mEq/kg DM)

Milk fever



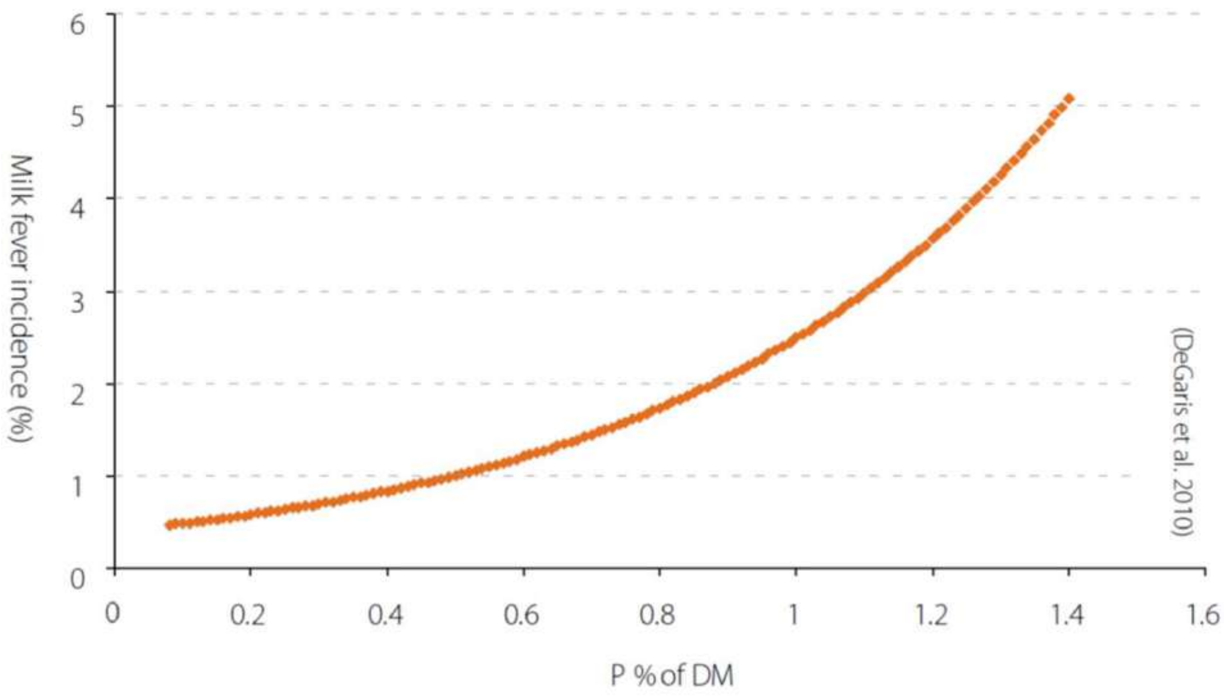
Blood calcium levels after calving after a,b
2 day critical period
Blood calcium level (mmol/l)
2.4
2.2
2.0
1.8
1.6
1.4
1.2
-6
-4
-2
0
2
4
6
8
Days before and after calving
2 millimoles is ideal calcium level at calving
Healthy Ca >2.0 mmol/l
Subclinical milk fever
Clinical milk fever

Milk fever



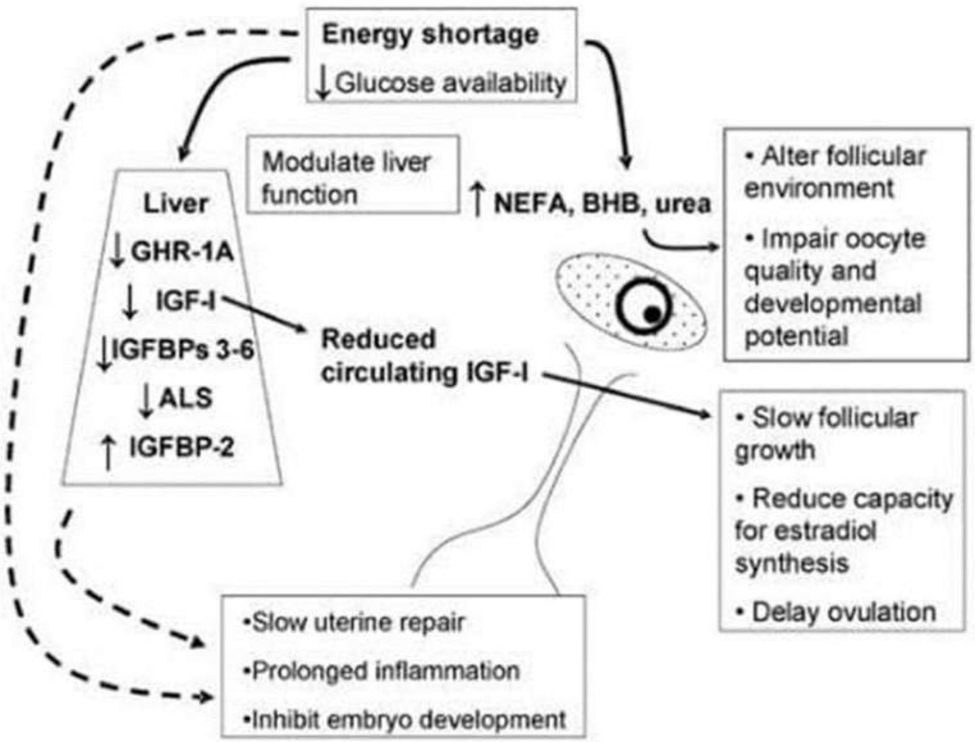
Milk fever incidence %
4.0
3.0
2.0
1.0
0.0
0
0.5
1
1.5
2
2.5
3
Ca% of total diet (DM basis)
(DeGaris 2010)

milkfever



Milk fever incidence (%)
0
1
2
3
4
5
6
0
0.2
0.4
0.6
0.8
1
1.2
1.4
1.6
P % of DM
(DeGaris et al. 2010)

Reproduction



Solutions so far…

- High dose of starch
- MPG
- Fats
- Monensin

Starch..

- High dose compromises ruminal health
- Efficiency of used starch on intestinal level decreases
- Might compromise intestinal health (tight junctions and erosions)

High-grain feeding alters caecal bacterial microbiota composition

and fermentation and results in caecal mucosal injury in goats

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MPG

- Neurotoxic at high doses (>500g)
- Influence on rumen fermentation (question remains if this is wished)
- Low effect on reproduction parameters

Fats…

- Mobilization of endogenous adipose tissue and its demand on hepatic gluconeogenesis may limit the cow from using additional fatty acids supplied in the diet.
- Leptin, an adipose tissue hormone, discovered in 1995, acts to inhibit caloric intake and increase metabolic rate of animals with increased fat stores. Leptin increases the animal's sensitivity to the gastric hormone cholecystokinin thereby reducing reticulo-rumen digesta passage and enhancing the negative impact of dietary fiber on intake due to greater reticulo-ruminal fill and distension.

Monesin…

- Should we use this, taking consumer awareness in consideration..
- Strong anti-protozoic effects

Reproduction

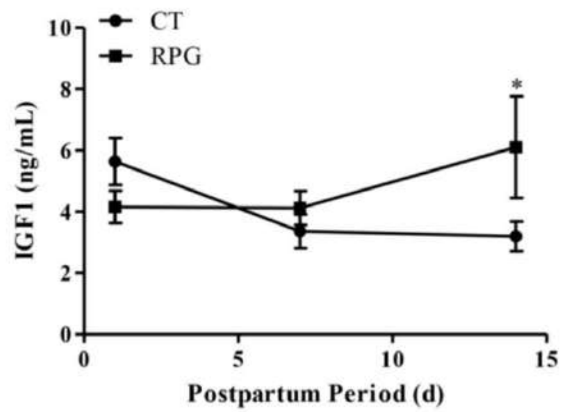

Figure 1. Plasma concentrations of IGF1 in post-natal cows in the RPG and the CT group during the experimental period. Data are presented as the means ± SD. Compared to control diet: * $p < 0.05$.

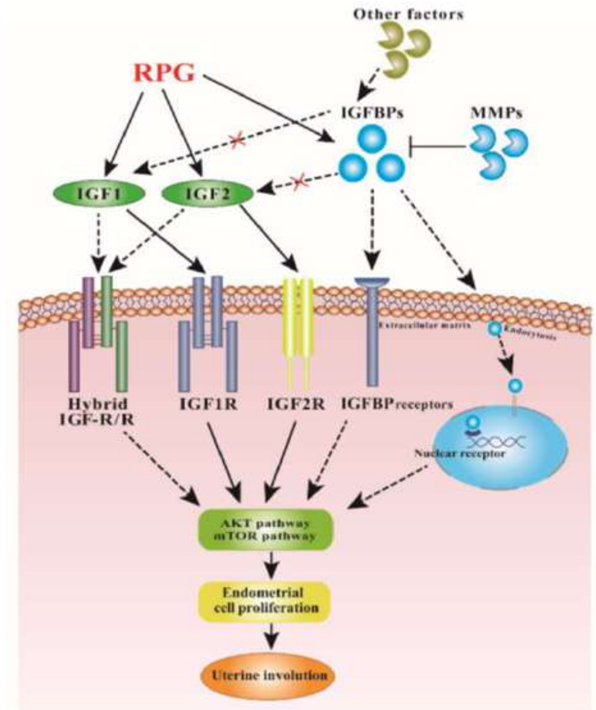

Figure 6. Proposed mechanism for RPG in regulating the uterine involution in post-natal dairy cows. The effect of RPG addition was mediated by both IGFs and mTOR/AKT signaling pathways. RPG addition might promote IGF1 and IGF2 binding to their respective receptors and enhance IGF-independent actions of IGFBPs, thereby activating the mTOR/AKT signaling pathway and accelerating the endometrial proliferation and repair. Each ligand displayed a specific binding affinity for the receptors: continuous arrows indicate high affinity, while dotted arrows and a red "X" indicates low affinity. The black dashed arrows are currently unknown.

Production

Effects of supplementing RPG on animal performance in early lactation dairy cows.

Items	Treatments[1]				SEM[2]	*P*-value		
	CON	LRPG	MRPG	HRPG		Treatment	Time	Treatment × Time
DMI (kg/d)	23.78	25.85	22.42	25.23	1.06	0.11	0.01	0.75
Liveweight (kg)	571	601	550	574	32.61	0.21	0.10	0.13
Yield (kg/d)								
Milk	42.84	45.99	41.07	44.46	1.98	0.35	< 0.001	0.06
Fat	1.82	1.94	1.67	1.72	0.11	0.31	0.02	0.001
Protein	1.29	1.30	1.23	1.22	0.05	0.67	< 0.001	0.29
Lactose	2.96	3.14	2.55	3.02	0.17	0.10	< 0.001	0.36
ECM[3]	47.42	50.10	44.43	46.07	2.29	0.37	< 0.001	0.003
4% FCM[4]	44.41	47.52	41.43	43.50	2.30	0.32	< 0.001	0.001
Milk composition (g/kg)								
Fat	42.6	42.3	40.8	39.1	0.16	0.42	< 0.001	0.004
Protein	30.4[a]	28.3[b]	30.3[a]	27.1[c]	0.05	< 0.001	< 0.001	0.001
Lactose	69.2	67.9	61.8	67.8	0.28	0.27	< 0.001	0.57
SCC[5] (10^3/mL)	138.00	76.90	200.95	73.80	82.14	0.66	0.01	0.06

[a,b,c] Means with a row with different superscripts differ.

[1] Treatments: CON = control group, a basal diet; LRPG = low RPG, a basal diet plus 200 g/d RPG; MRPG = medium RPG, a basal diet plus 350 g/d RPG; HRPG = high RPG, a basal diet plus 500 g/d RPG.

[2] SEM = Standard error of the mean.

[3] ECM = 0.327 × milk (kg/d) + 12.95 × fat (kg/d) + 7.65 × protein (kg/d).

[4] 4% FCM = 0.4 × milk (kg/d) + 15 × fat (kg/d).

[5] SCC = somatic cell count.

Production

Effects of supplementing RPG on serum biochemical indices in early lactation dairy cows.

Items[1]	Treatments[2]				SEM[3]	*P*-value		
	CON	LRPG	MRPG	HRPG		Treatment	Time	Treatment × Time
GLU, mmol/L	3.51[b]	3.52[b]	3.90[a]	3.56[b]	0.09	0.002	< 0.001	0.001
BHBA, mmol/L	0.49[a]	0.48[a]	0.39[b]	0.47[a]	0.02	0.01	< 0.001	< 0.001
NEFA, μmol/L	50.70[a]	48.75[a]	39.92[b]	48.35[a]	2.63	0.01	< 0.001	< 0.001
AST, U/L	88.20[ab]	84.62[b]	70.50[c]	95.28[a]	3.57	0.002	< 0.001	0.05
INS, mIU/L	23.66[bc]	22.38[c]	27.04[a]	25.83[ab]	0.81	0.001	< 0.001	0.004

[a,b,c] Means with a row with different superscripts differ.

[1] GLU = glucose; BHBA = β-hydroxybutyric acid; NEFA = non-esterified fatty acid; AST = aspartate aminotransferase; INS = insulin.

[2] Treatments: CON = control group, a basal diet; LRPG = low RPG, a basal diet plus 200 g/d RPG; MRPG = medium RPG, a basal diet plus 350 g/d RPG; HRPG = high RPG, a basal diet plus 500 g/d RPG.

[3] SEM = Standard error of the mean.

Production

- 4 randomly chosen dairy farms in Holland (total approx. 570 cows)
- Glunergy fed in TMR with group feeding or Dosing equipment
- 200 g Glunergy/cow/day
- Days in Milk tested 8-80
- Measurements: BSK (1 point increase = 220 l milk yield on year)

  Milk, Fat, Protein

  BHBA, animal weight, BCS

Production

	start N = 101	14 days N = 105
Average Milk	45.7	47.6
% fat	4.03%	4.01%
% protein	3.43%	3.42%
% lactose	4,60%	4.60%
FCPM	46.1	47.7
BSK	53.2	54.5
Days in Milk	41	46
Average weight	701	707
BCS	2.42	2.62
Ketose (MPR/BHB)	8	4

CENTURION

KNOWING-HOW IN FEED AND FOOD

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