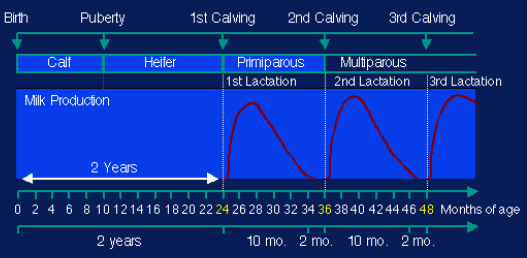
Dry period and parturition

Lactation cycles



Dry period

last 45-60 of pregnancy

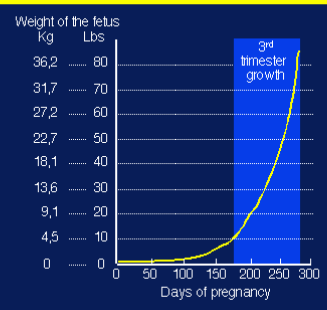
How:

- **Interruption of milk production with a significant decrease in the energy supply**
- **Diet rich in fiber (forages) with little consentrates and silages**

Why:

- **Provide a resting period for the udder in order to rebuild, and reconstituite mammary tissue for the next lactation;**
- **Provide cow with a period with limited nutritional and productive stress;**
- **Increase nutrients availability to the fetus in the last period of pregnancy when there is a sharp increase in requirements;**

Growth of a fetus during pregnancy



Relationship between length of dry period and milk production in the following lactation

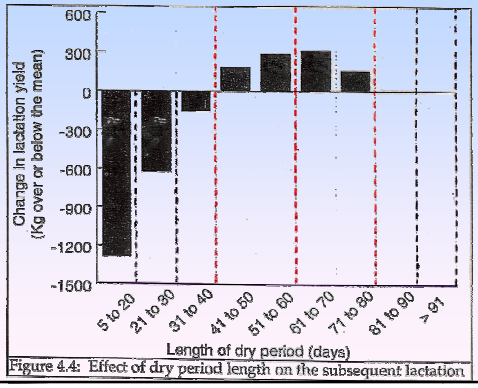


Figure 4.4: Effect of dry period length on the subsequent lactation

Critical time Dry period - 1

First two weeks

The difficulties in shutting off milk production creates greater mastitis risk

Use of localized antibiotics

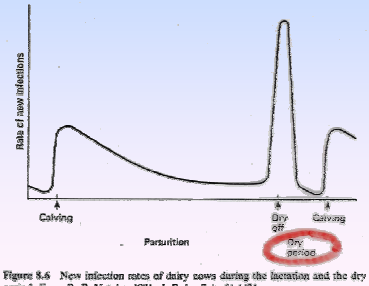
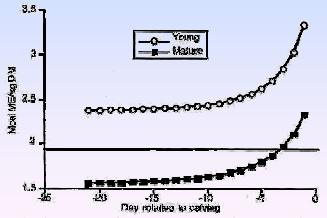


Figure 8.6 New infection rates of dairy cows during the lactation and the dry period. From R. P. Natzke. 1981. *J. Dairy Sci.*, 64:1431.

Last three wks before parturition: critical time for the dry period

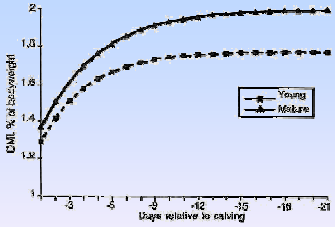
- Sharp increase in requirements
  - ✓Fetal growth
  - ✓Growth of gladular mammary tissue



2. Estimated energy density required in diets of transition cows to meet requirements for maintenance and gestation. Note: values can be converted to NE_l by multiplying by 0.6

Last three wks before parturition: critical time for the dry period

- Decrease in DM intake
  - fetal volume
  - hormonal status



Changes in intake in Holstein cows during the final weeks of the dry period (Grummer, 1998)

	Days to parturition		Days to parturition		
	- 21	- 1	- 21	- 1	Δ%
	----kg/d----		----% PV----		
All (n.=299)	13.2	9.0	1.91	1.34	-30.1
Primiparous (n.=141)	10.6	7.7	1.77	1.29	-27.2
Multiparous (n.=158)	14.6	10.0	1.99	1.37	-31.3

Last three wks before parturition: critical time for the dry period

Reduced intake
↓
Energy deficit
↓
Mobilization of body reserves
↓
Incomplete oxidation of NEFA ← No glucose
↓
Ketosis

Metabolic disorders in high producing dairy cows

Occurance of disorders around the calving

Disorder	Avegrage (%)	Range (%)
Milk fever	7.2	0 su 44.1
Dispaced abomasum	3.3	0 su 14
Ketosis	3.7	0 su 20
Retain placenta	9.0	0 su 22.6
Metritis	12.8	0 su 66

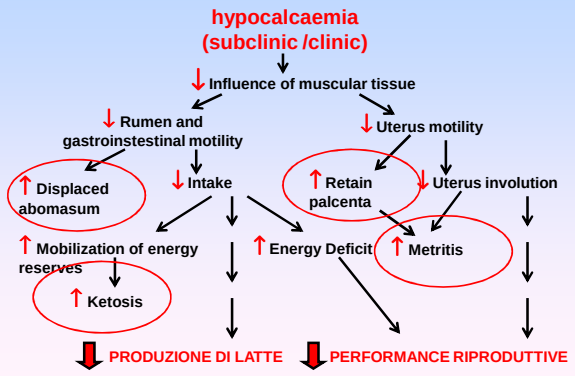
Adapted da Jordan e Fourdraine, 1993

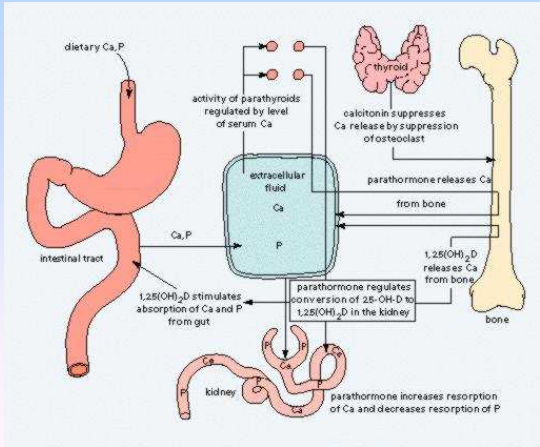
Hypocalcaemia – milk fever – (collasso puerperale)

Blood (mg/100ml)	Ca	P	Mg
Normal – Lactation	8.4-10.2	4.6-7.4	1.9-2.6
Normal – after calving	6.8-8.6	3.2-5.5	2.5-3.5
Clinic Hypocalcaemia	3.5-5.7	0.6-2.6	2.5-4.1

(PSU DAS 96-27)

Effect of hypocalcaemia in the postpartum





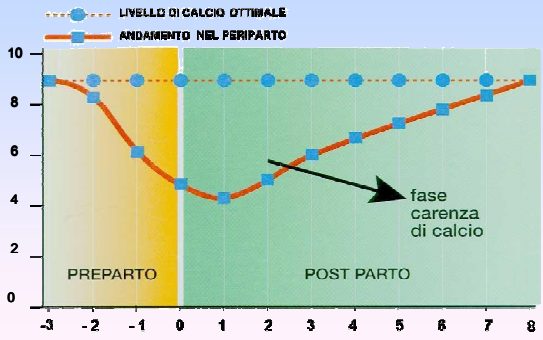
Ca Balance

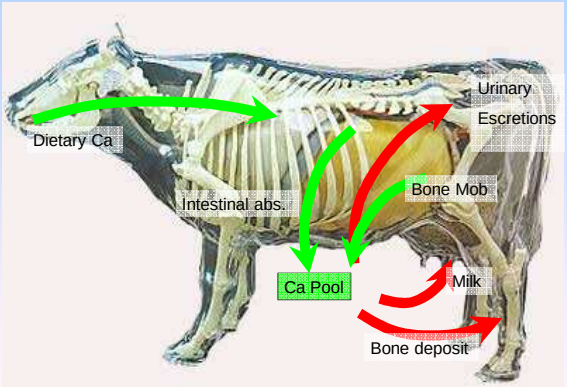
Source of Ca	
Bone mobilization (Paratormone)	Intestinal absorption [1,25 $(OH)_2D$]

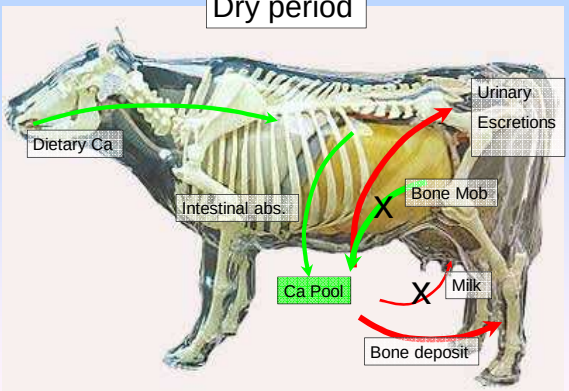
Ca pool

Feces	Urine	Fetus	Milk
5-8 g/d	2-10 g/d	2-7 g/d	20-80 g/d
Dry period 9-16 g/d			
Lactation 29-90 g/d			

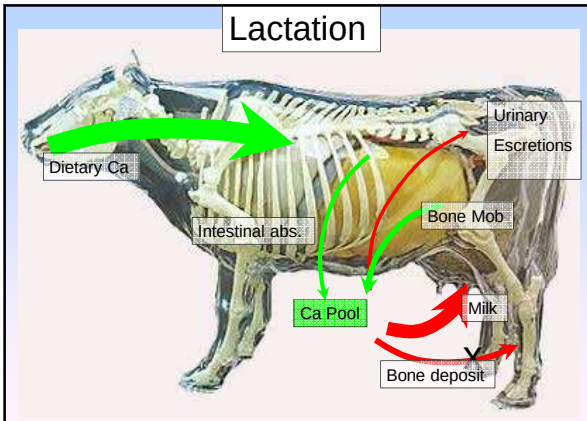
Blood calcium in the pre e post partum (mg/100 ml)







Lactation



Dietary anion cation difference (DCAD)

Formula to calculate (DCAD):

DCAD = mEq(Na + K) – (Cl + S)/ 100 g ss

Last 3 wks od dry period goal:

DCAD = -5 ÷ -10 mEq /100 g s.s.

↓ Blood pH

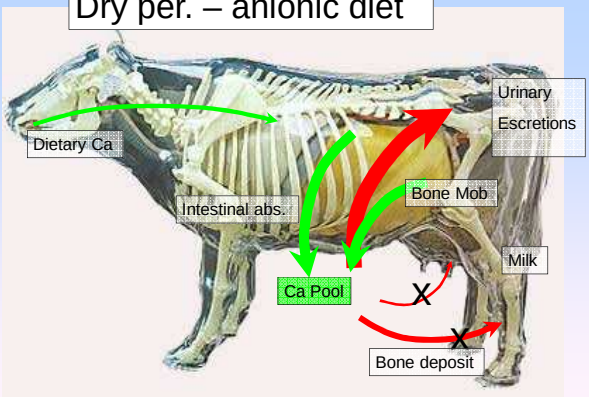
•Metabolic acidosis mobilizes cations

•Mobilization of bone Ca

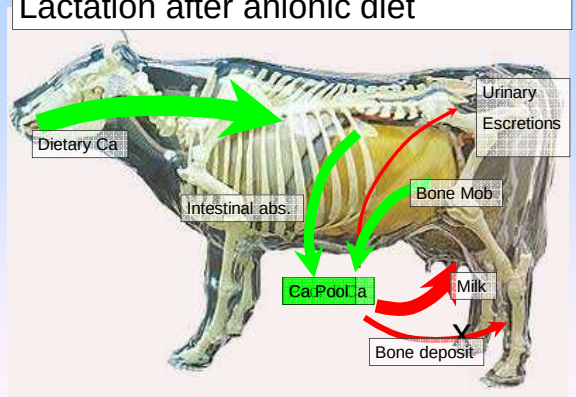
• ↑ absorption of Ca from the intestin

↓ milk fever and and subclinical Hypocalcaemia

Dry per. – anionic diet



Lactation after anionic diet

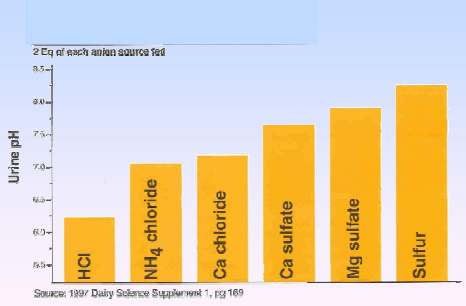


Goal

Reduce DCAD value to get closer to 0 or slightly negative to increase Ca mobilization from bone and intestinal absorption of dietary Ca

Potassium is the enemy

Blood pH with different anionic salts



Practical implication

- **Anionic salts are not palatable**
- **When using anionic salt evaluate:**
  - **S<0.4-0.5%ss**
  - **Mg<0.5%ss**
  - **NPN<2.5%ss**
  - **RDP<70%pg**
- **Verify their effectiveness (Urinary pH urine) after 7-10 d**

Evaluate anionic salts

	Dry per.		Lactation
DCAD	Urines pH	acid-base status	Blood Ca
>0 mEq/100gSS	7-8	alcalosi	ipocalcaemia
<0 mEq/100gSS	5.5-6.5	Slight metabolic acidosis	Normal Ca
<0 mEq/100gSS	<5.5	metabolic acidosis!!!	

Further actions

- Use of boli rich in readly absorbable Ca
- Injections before and after parturition of Vit. D

Ketosis

Ketosis incidence in high producing dairy cows

(da Burhans, Cornell Univ. 1999)

Study	Cows	Ketosis
	n.	(%)
Bigras-Poulin, 1990	2204	3.3
Jourdan, 1993	14823	3.7
Dyk, 1995	2260	12.0
Grohn, 1995	8070	4.6
Scott, 1995	443	8.5
Kelton, 1996	NR[1]	3.0
Realistic goal		3 - 5

[1] Non riportato

Tabella 2: Variazione di alcuni parametri ematici e del contenuto di glicogeno e lipidi del fegato in vacche da latte che presentano chetosi (modificato da Schmidt e coll., 1988)

		Normale	Chetosi
Sangue		mg/100 ml	
	Glucosio	52	28
	Corpi chetonici	3	41
Plasma		mg/100 ml	
	NEFA	3	33
	Trigliceridi	14	8
	Colesterolo libero	29	15
Fegato		% del peso	
	Glicogeno	3	< 0,8
	Lipidi	3	> 10

BODY CONDITION SCORE (BCS)

Feeding management should maintain specific values of BCS at the different lactation phases

	BCS	
Calving	3.0 - 3.5	↘
At milk peak	2.25 - 2.75	↘
~ 90 - 100 d DIM	2.0 - 2.5	↗
100 a 200 d DIM	2.75 - 3.25	↗
from 200 d DIM to dry period	3.0 – 3.5	↔
Dry period	3.0 – 3.5	

DIM = days in milk; Goal to loose 1 unit or less of BCS in the first 100d of lactation

Pre-calving phase

Cows too fat: BCS > 3.5

- ✓Difficult delivery at parturition
- ✓Retained placenta (metritis)
- ✓Higher risk of metabolic deseases (ketosis)
- ✓Milk yield reduction

Nutritional deficit and ovarian activity

Excesses losses of BCS during the first phase of lactation prolong the *post-partum* anestrum phase reducing the reproductive efficiency

BCS losses between wk 1-5 of lactation

	< 1.0	> 1.0
Calving - 1° ovulation, d	30	42
Calving – 1° heat, d	42	62
Calving – 1° inseminazion, d	67	79
Conceptions / 1° service, %	55	17

(Butler e Smith, 1989)

Ketosis - max risk -2 -- +10 wk Calving

Consequenses and economical cost

(da Guard, Cornell Univ. 1999)

- Dead cows, % 0.5
- Culled anaimals, % 5.0
- conception delay, d 10
- Milk losses, kg 230
- Economic cost, $ 151

Cure – precursors of glucose

Therapy – i.v. glucose or destrose solutions

Goal

Reduce nutritional deficits from the very beginning of lactation

↑ Milk ↘

EFFICIENZA

↓ INTER Calving ↗

STRATEGY

↓

Stimulate maximum feed intake before and after calving

Strategies to increase feed intake at the beginning of lactation

- correct formulation (don't feed excess of NDF and use highly digestible NDF sources
- correct distribution of TMR
- Mantain great animal confort

Effect of feed intake on milk production and reprodoctive paratmeters

(Lucy e coll., 1992)

Cows: 70

Period: 1- 10 wks in lactation

	Intake kg s.s./d	
	17.9	19.8
Milk production, kg/d	31.6	35.2
BW changes, kg/d	-2.2	-1.5
Calving-1° ovulation, d	>65	23
Calving-1° heat, d	66	49
Calving-1° insemination, d	71	64
Conception/1°service, %	0	27
Service/conception, n	2.7	1.4
Calving-conception, d	90	67

Productive consequences in the first 20 DIM

	Intake DM kg/d	Milk Production kg/d	BW losses kg
Healthy cows	17.8	33.5	34
Problem cows:			
Displaced abomasum and/or ketosis	12.4	25	54
Retained placenta and/or metritis	13.9	25.3	39

Wallace et al., 1996

What to do

Increase in energy concentration of the diet

Increase in the good sources of fiber

What should be doing?

Change dry cows diet

↑ Corn grain ⇒ + energy

↑ Soy bean meal ⇒ + proteins

What to do

Increased NFC concentration yield more C3 and neoglucogenesis and rumen papillae development

What the farmer normally do?

Dry cow TMR + Lactation TMR

DCAD???

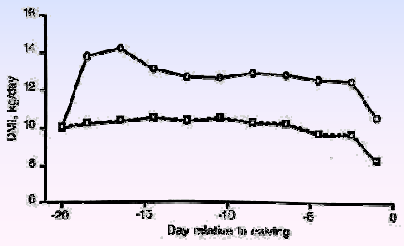
pre-Calving diet: an example NRC 2001

Feeds	Days to Calving		
	- 40	- 30	- 5
Corn silage	--	4.3	4.0
Grass silage	8.1	7.4	3.7
Straw	5.8	1.6	--
Corn	--	--	1.7
Soybean meal	--	--	0.3
Min-vit	0.5	0.4	0.3
Chemical composition			
total DM, kg	14.4	13.7	10.0
NDF	62.2	53.9	46.5
NFC	19.6	27.2	34.7
CP	9.9	10.8	12.4

pre-Calving DM intake (Minor e coll., 1996)

	Diet – 19 d to Calving	
	Normal	High NFC
Intake DM, kg/d	9.8^{B}	12.4^{A}
Glucose d-7, mg/d	61.9^{b}	65.7^{a}
NEFA d-7, ueq/L	325^{A}	143^{B}

A, B: $P<0.01$; a, b: $P<0.05$



post-Calving Responce (36 settimane)

	Diet – 19 d to Calving	
	Normale	High NFC
Intake DM kg/d	21.7	22.0
Milk, kg/d	34.4^{b}	36.4^{a}
Fat, %	3.57	3.32
Protein, %	2.92^{B}	3.06^{A}

A, B: $P<0.01$; a, b: $P<0.05$

Other actions

- provide propylene glycol (200-300g/d) and Ca propionate in the drinking water.
- Nowadays glycerin has a favorable price (biodiesel)
- They provide C3 without causing acidosis problem

Glycol and milk producion

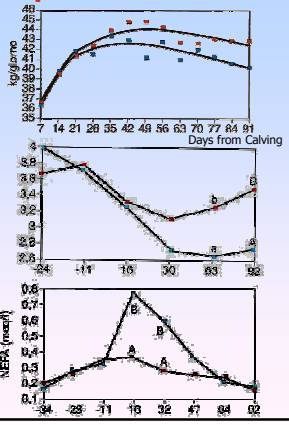
TESI:

- CONTROL
- TReated 200 g/d from -15 to 90 g

Milk

BCS

NEFA



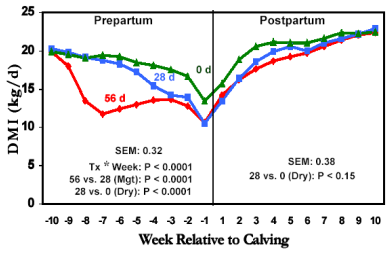
Metabolic disorder

Most of the problems we've discussed appear right after calving when there are rapid changes in metabolism and feeding

Why don't we avoid the changes…..eliminating the dry period????

Reduction of the dry period

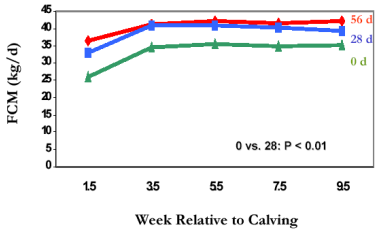
Figure 1. Dry matter intake of cows fed and managed for 56 (♦), 28 (■), or 0 (▲) day dry periods. Tx = treatment effect. Tx*wk = treatment by week interaction. If Tx is significant, then contrasts were 56 vs. 28 or 28 vs. 0 days dry.



(Grummer e Rastani, 2003)

Reduction of the dry period

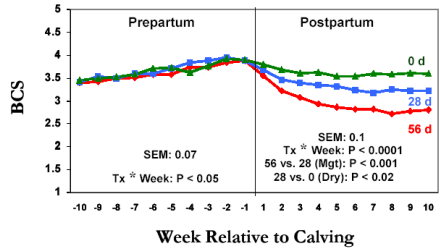
Figure 2. 4% Fat-corrected milk production of cows fed and managed for 56 (♦), 28 (■), or 0 (▲) day dry period.



(Grummer e Rastani, 2003)

Reduction of the dry period

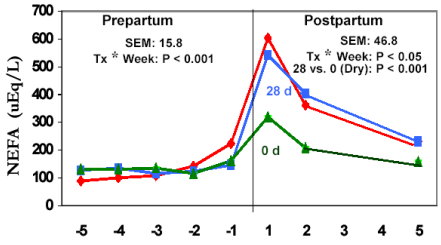
Figure 3. Body condition scores of cows fed and managed for 56 (♦), 28 (■), or 0 (▲) day dry periods.



(Grummer e Rastani, 2003)

Reduction of the dry period

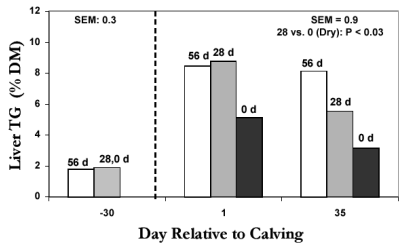
Figure 4. Plasma NEFA concentrations in cows fed and managed for 56 (♦), 28 (■), or 0 (▲) day dry periods.



(Grummer e Rastani, 2003)

Reduction of the dry period

Figure 6. Liver triglyceride (TG) at 30 days prepartum and 1 and 35 days postpartum when cows are managed for 56, 28 or 0 day dry periods.



(Grummer e Rastani, 2003)

Reduction of the dry period

Table 3. Ovarian dynamics and reproductive performance of cows fed and managed for 56, 28, and 0 d dry periods.

	56 d	*28 d*	*0 d*
Follicle size at first ultrasound, mm	6.3[a]	8.2[ab]	9.5[b]
Days to first 10 mm follicle	10.5[a]	8.9[b]	8.0[b]
Days to first ovulatory follicle	29[a]	22[ab]	14[b]
Days to first AI	75[a]	68[b]	69[b]
First service conception rate, %	20[a]	30[ab]	55[b]
Services per conception	3.1[a]	2.5[ab]	1.7[b]
Days open	145[a]	124[ab]	94[b]

[a,b] differ at $P < 0.05$

(Grummer e Rastani, 2003)

Reduction of the dry period

	Dry period d			
	60	30	0	0+bst
	Avg. Prod in the first 120 DIM			
Primiparous kg/d	43.0	40.0	32.1	34.5
Pluriparous kg/d	47.3	45.5	41.9	45.4

Removal of the dry period

Must consider:

- No antibiotic treatments at dry off;
- Quality of milk close to calving;
- Quality of colostrum;
- Where to place cows close to calving;