Feeding growing herds for fertility

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How important is dairy herd fertility??

Cost of fertility problems

	Target	Actual
Calving interval (€3.08 per day)	365	390.2
Services per conception (€29.80 service)	1.82	2.37
Infertile culling % (€960.7 per cow)	6.0	13.8

Total cost of infertility problem for 100 cow dairy herd = **€16,894.60**

Ryan and O'Grady, (2004)

Good fertility is vital for herds trying to increase cow numbers!!

Nutrition for better dairy cow fertility

- Nutrition around calving
  - Rebreeding happens soon after calving
  - Nutrition has a huge influence on health around calving
- Nutrition in early lactation
  - Negative energy balance
    - Monitoring energy balance in your dairy herd?
  - Protein feeding

Nutrition and dairy cow health around calving

Difficult calving

Retained placenta

Metritis / Endometritis

Laminitis

Acidosis

Ketosis

Fatty liver

Milk fever

Displaced abomasum

Mastitis

Dairy Cow Health Around Calving

1. Body Condition Score Management

The most important thing you can do to ensure good dairy cow health around calving is to manage BCS properly!!

Target BCS for dairy cattle at different points of the lactation cycle

BCS at Drying off	2.75
BCS at calving	3.0 (90% of cows 2.75 – 3.25)
BCS at breeding	>2.5
BCS at 150 DIM	2.75
BCS at 200 DIM	2.75
BCS at 250 DIM	2.75

Where BCS at calving is 3.25, 30% of cows lose ≥ 0.5 units of BCS in early lactation
Where BCS at calving is 3.5, 47% of cows lose ≥ 0.5 units of BCS in early lactation
Buckley et al., (2003)

We often find over-conditioned dry cows and heifers on Irish dairy farms

Pre-calving

Long period of reduced feed intake pre-calving (Hayirli et al., 2002)

Increased chances of fatty liver, ketosis, difficult calving, retained placenta, displaced abomasum (Cameron, 1998, Kaneene, 1997)

Post-calving

30% lower feed intake in early-lactation (Garnsworthy et al,1982)

Reduced fertility: longer calving intervals (Mayne et al., 2002)

UCD Lyons Research Farm
Spring 07

Forage dry matter intake for BCS 3.25 and 4.04 at calving

Calving BCS	DRY	WK1	WK2	70days
3.25	6.06	12.07	13.17	13.90
4.04	6.07	10.56	11.50	13.21
P	0.98	0.06	0.04	0.27

UCD Lyons Research Farm
Spring 07

BCS and BW loss for BCS 3.25 and 4.04 at calving

Calving BCS	BCS loss	BW loss
3.25	0.64	43.30
4.04	1.12	55.52
P	0.001	0.065

If BCS loss is > 1 unit in early lactation conception rate may be as low as 17 to 38%

(Butler, 2000)

Moorepark data

BCS loss calving to 1st service	Pregnant at d 42 (%)
≤0.25	67
0.25 to 0.5	59
>0.5	47

(Buckley *et al*. 2001)

On-farm approach for BCS monitoring

1.
2.
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The most important thing you can do to ensure good dairy cow health around calving is to manage BCS properly!!

All farmers can BCS cows!!

Dairy discussion groups must focus on BCS??

Dairy cow health around calving

2. Negative energy balance pre-calving

- Cows loosing weight pre-calving

- Related to:

  Retained placenta

  Fatty liver and Ketosis (Bertics *et al*., 1992)

  Displaced abomasum (Le Blanc *et al*., 2005)

  Immunosuppression (Goff, 2003)

  Uterine infections : reduced fertility

Fatty liver (Up to 50% of cows in early-lactation)

Negative energy balance pre-calving

- Over-conditioning
- Group stress
- Poor silage quality
- Use of night feeding only
- Larger numbers of cows in dry cow pen

Dairy cow health around calving

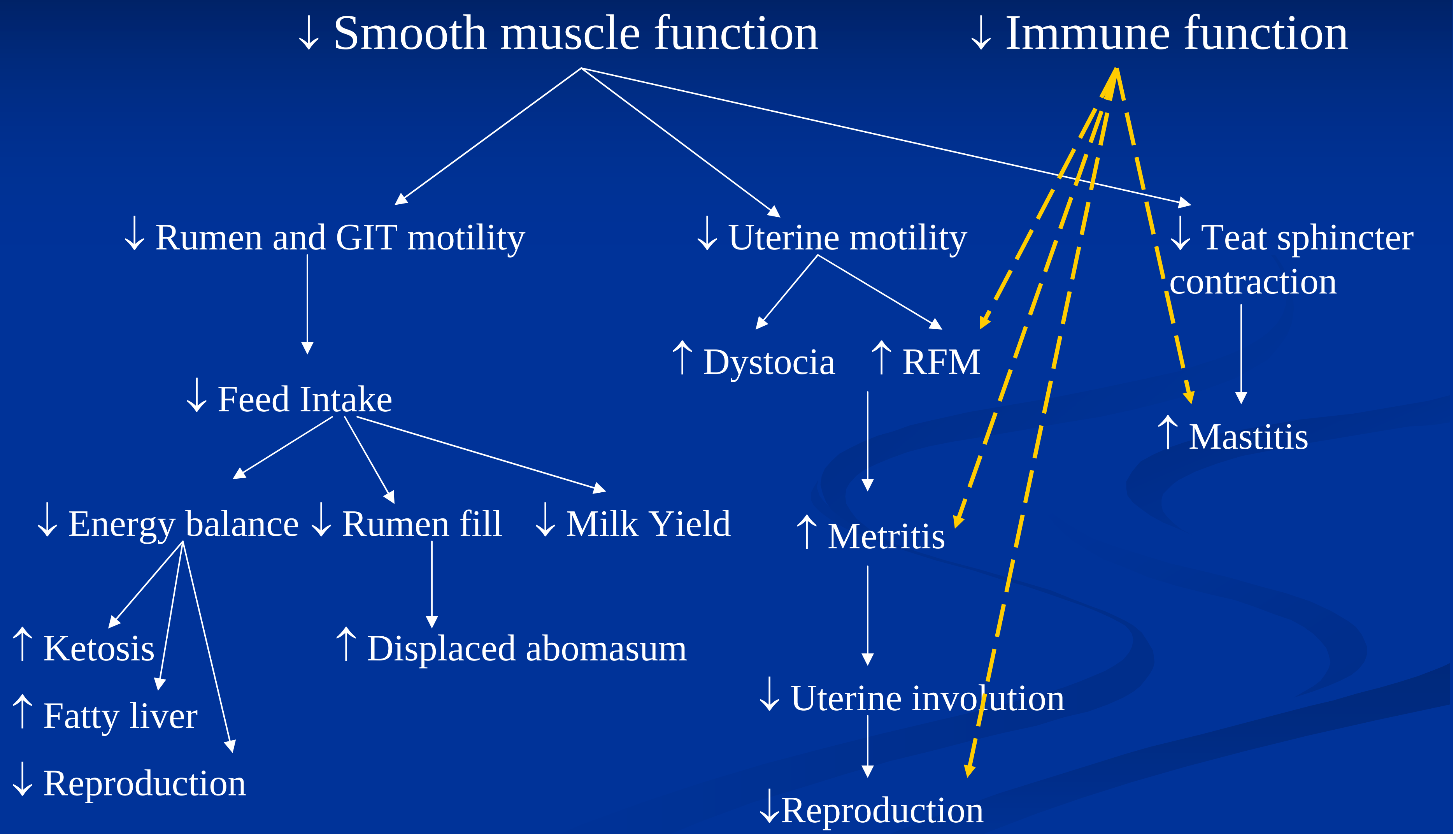
3. Milk Fever and subclinical hypocalcaemia

- 5-10% of cows get clinical milk fever (Houe et al., 2001)

- Expanding herds may retain older cows which means more milk fever

- 20 – 40% get Sub-clinical milk fever:
  - Retained placenta / Slow calvings
  - Low feed intakes after calving
  - Reduced immune system competence (Goff, 2003)
  - Reduced fertility: sub-clinical hypocalcaemia significantly delays first ovulation after calving (Jonsson *et al*., 1999)

Milk Fever Cascade



Adapted from Wilde (2005)

Subclinical hypocalcaemia in grazing New Zealand dairy cattle

	Day Relative to Calving					
	-14	0	1	2	3	4
% of cows clinical milk fever	1	4.8	1.9	1.2	<0.1	<0.1
% of cows subclinical milk fever	1	33	25	18	9.4	2.6

Plasma Ca < 1.4mmol/l clinical milk fever

Plasma Ca 1.4 - 2.0 mmol/l subclinical hypocalcaemia

n = 224

Roche (2003)

Practical control strategies for milk fever

- Identify milk fever control strategy used (often none)
- BCS management critical

- Ensure Mg supplement fed (15 - 20g per dry cow per day)
- Have blood Mg assessed in the close-up dry period

- Limit access to high K / high N pasture
- Only use forages with < 1.8% K (Irish silage on average 2.3% K)

- Carefully review the incidence of retained placenta, displaced abomasum, difficult calving, clinical milk fever
  - Review this data minus the heifers in the herd

Dairy cow health around calving

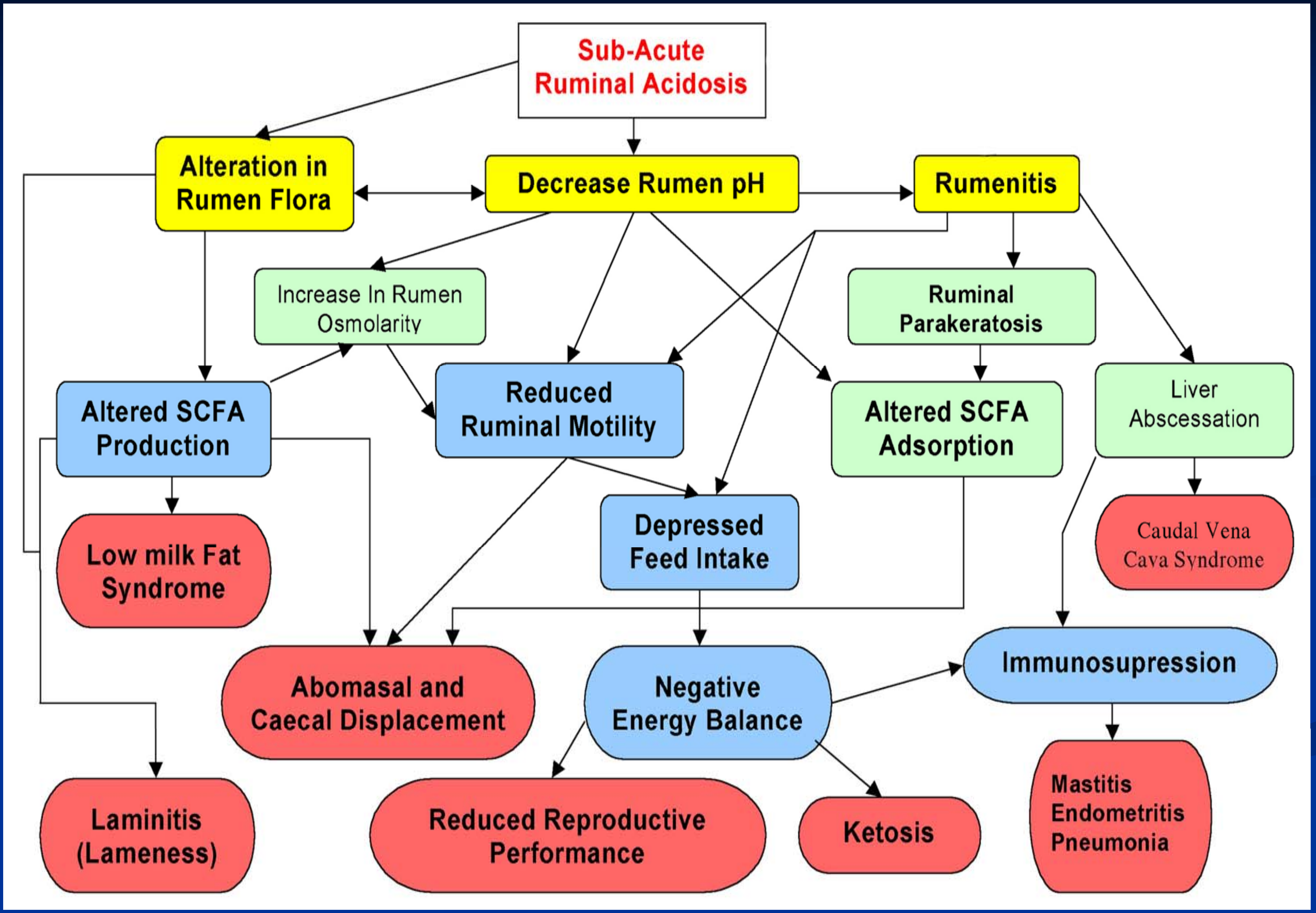
4. Maintaining a Healthy Rumen

Sub-acute ruminal acidosis reported in 20 to 40% of US dairy cows (Kleen et al., 2003)

Implications for:

- Lameness / Laminitis
- Negative energy balance
- Excess BCS loss in early lactation

There are reports that SARA may be a problem for pasture fed dairy cattle (Woodward et al., 2003) (Bramley et al., 2005)


Sub-Acute
Ruminal Acidosis
Alteration in
Rumen Flora
Decrease Rumen pH
Rumenitis
Increase In Rumen
Osmolarity
Ruminal
Parakeratosis
Altered SCFA
Production
Reduced
Ruminal Motility
Altered SCFA
Adsorption
Liver
Abscessation
Low milk Fat
Syndrome
Depressed
Feed Intake
Caudal Vena
Cava Syndrome
Abomasal and
Caecal Displacement
Negative
Energy Balance
Immunosupression
Laminitis
(Lameness)
Reduced Reproductive
Performance
Ketosis
Mastitis
Endometritis
Pneumonia

UCD dairy herd health SARA pilot study summer 2006 in Meath, Kildare and Wicklow (O'Grady et al., 2006)

- Rumen pH samples in 12 dairy herds
- Average yield 8114kg (sd 733kg)
- Average herd size 95 (sd 38 cows)
- Average concentrate fed 3.3kg/d (sd 1.5kg/d)
- Cows sampled were 80 to 150 DIM

- Results
- 3 out of 12 herds had a significant diagnosis of SARA
- 11% of cows had a rumen pH < 5.5 = SARA
- 53% of cows had a rumen pH < 5.8 = Too low for optimal feed digestion and intake

Monitoring rumen health

- % of resting cows ruminating should be > 80%
- Individual mid-lactation cows with milk fat% less than milk protein% by 0.2% (Hutjens, 2001)
- 10% of Herd with milk fat < 2.5% (Nordlund *et al*., 2004)

- Faecal consistency scoring
- Rumenocentesis: 12 cows 2 to 4 hours after concentrate meal if 3 have ruminal pH < 5.5 there is a SARA problem (Nordlund *et al*., 2004)

Rumenocentesis (Enemark *et al*., 2002)

Nutrition in Early Lactation

1. Negative Energy Balance

Energy Balance in Early Lactation: Wattiaux Babcock Institute

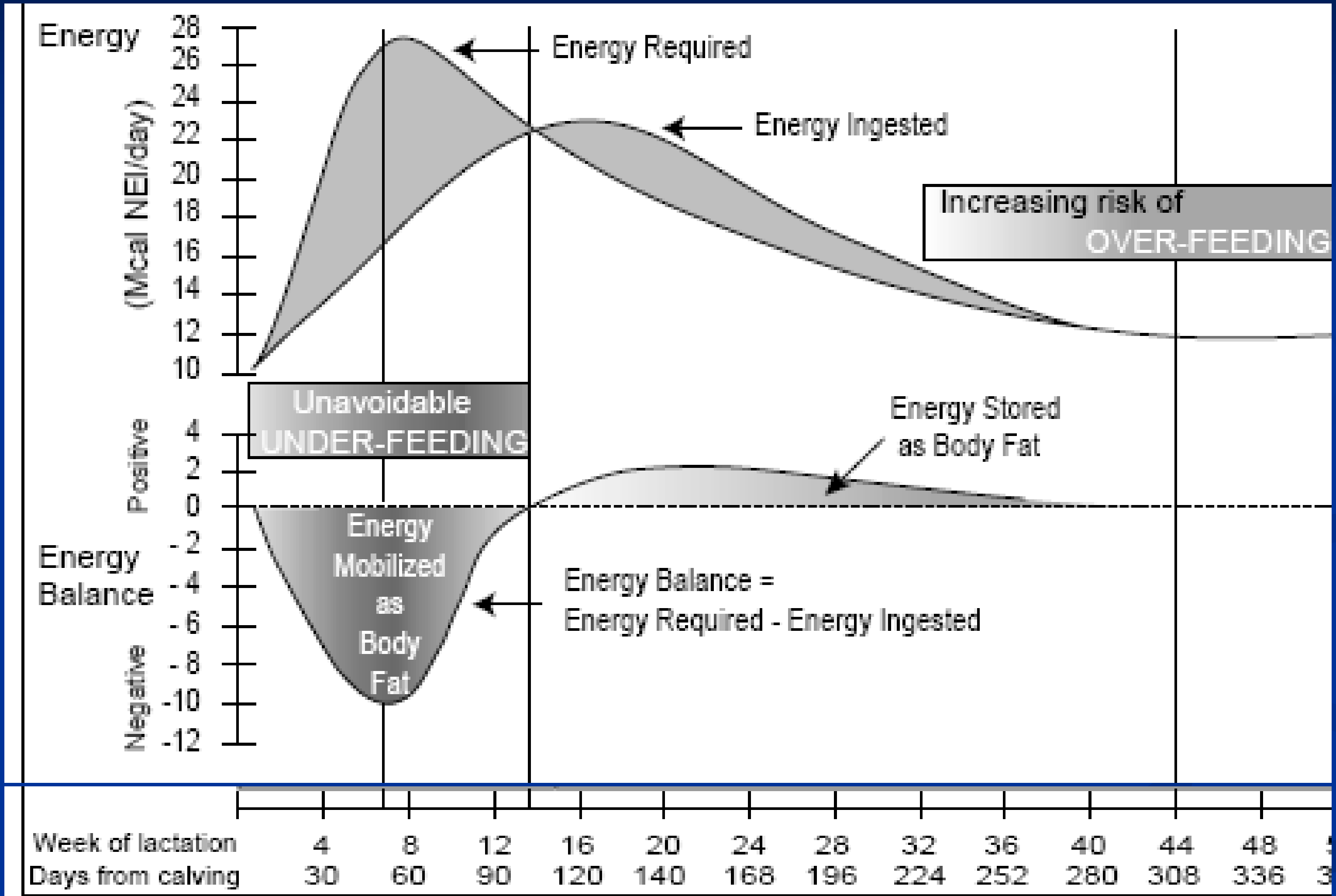


Figure 1: Energy balance of dairy cows in early lactation

0 Linden Dr., Madison, WI 53706 USA, phone: 608-265-4169, babcock@calshp.cals.wisc.edu

Early lactation nutrition and fertility

- Reasons for excessive negative energy balance
  - Over conditioned cows at calving
    - Reduces feed intake
  - Under-feeding relative to energy output
    - Management: feed trough space; grass allowance
    - Diet quality
    - Climatic / soil conditions
  - Ill health
    - Lameness, ruminal acidosis, metritis reduce feed intake

To Ensure Negative Energy Balance is Not Excessive In Early Lactation Maximising Feed Intake is Critical!

Herds with higher conception rates to first insemination had significantly higher mean intakes of DM and ME during the first 100 days of lactation

Mayne et al. 2002

Grazing cows NEB and fertility

- Group 1. Many dairy herds will have acceptable levels of energy balance with grazing only or mostly grazing diets
  - Cows have low energy output
  - Farmers / soil and climatic conditions on that farm make for high grass intakes
- Group 2. However many herds will experience excessive negative energy balance when the diet is grazing only or grazing with minimal levels of concentrate supplementation
  - Cows have high energy output
  - High intakes of grazed grass are not achieved for various reasons

Grazing cows NEB and fertility

- Many people believe that the fertility of grazing dairy cows will not be improved by feed supplementation in absolutely all circumstances
- However:
- It has been shown that higher levels of concentrate supplementation reduce BCS loss in early lactation (ie. improve energy balance) (Horan et al., 2005; McCarthy et al., 2007)
- It has been shown that <u>when grass supply is reduced</u> fertility is increased after concentrate supplementation

Grazing cows NEB and fertility (Kennedy, 2001)

Concentrate supplementation and fertility – Adequate Grass Supply

Concentrate kg/cow/day	0	3
Days to 1st oestrus	38	41
Cows served in 1st 3 weeks	92	89
Calving to conception days	91	93
Pregnancy rate 1st service	51	54
Pregnancy rate 2nd service	42	35
Pregnant %	85	88

Grazing cows NEB and fertility (Dillon, 1999)

Concentrate supplementation and fertility – Reduced Grass Supply

Concentrate kg/cow/day	0	3
Submission rate % 1st 3 weeks	91	95
Calving to service interval (days)	60	56
Calving to conception interval (days)	80	68
Pregnancy to 1st service %	41	64
Pregnancy to 2nd service %	68	86
Services / cow	2.10	1.50
Not in calf %	18	9

Does my herd have an acceptable level of energy balance in early lactation??

- What percentage of cows have BCS loss > 0.5 units in early lactation?
- What percentage of cows have BCS of < 2.5 at breeding?
- What percentage of cows have a Milk fat : protein ratio of more than 1.5? (Heuer *et al*., 1999)
- What percentage of cows have a milk protein of less than 3.05% (increases calving to conception interval)? (Heuer et al., 2002; Mayne et al., 2002)
- What percentage of cows have a decline in milk yield of more than 2.5% per week after peak milk yield (Chamberlain and Wilkinson, 2000)
- What percentage of early lactation cows have high levels of fatty acids (NEFA) or ketones (BHB) in blood (Whitaker, 1997; Oetzel, 2004)

Monitoring energy balance in early lactation cows

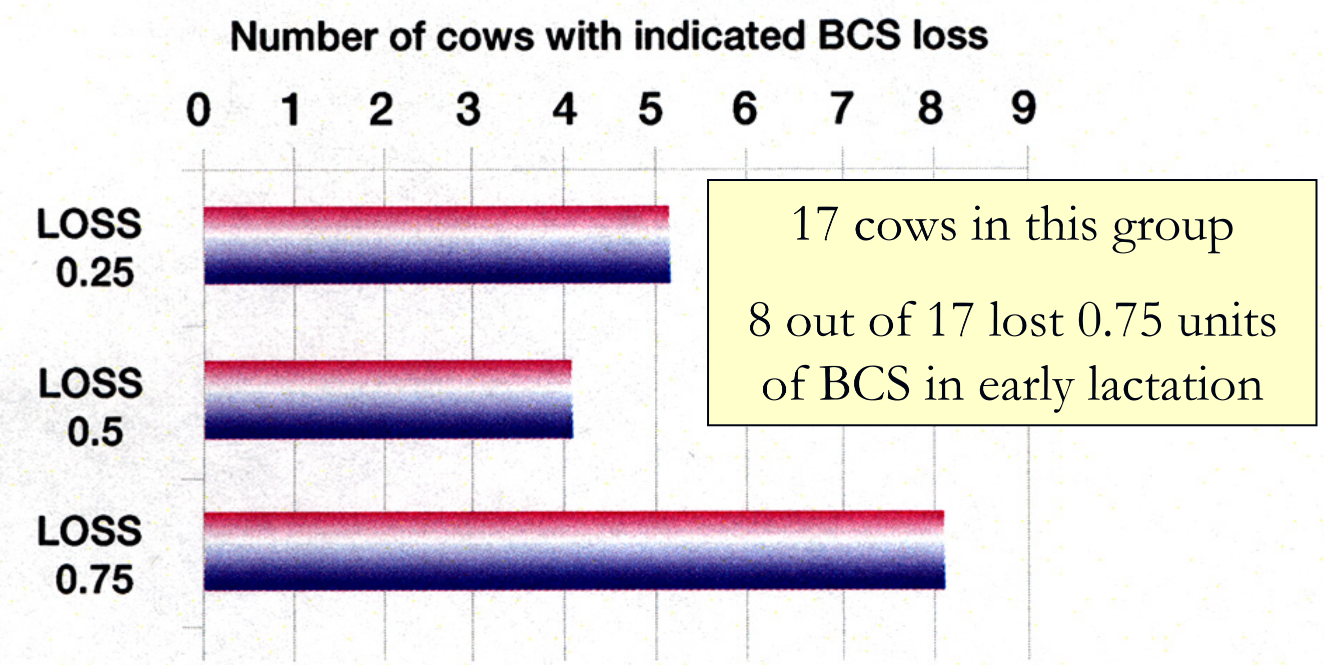
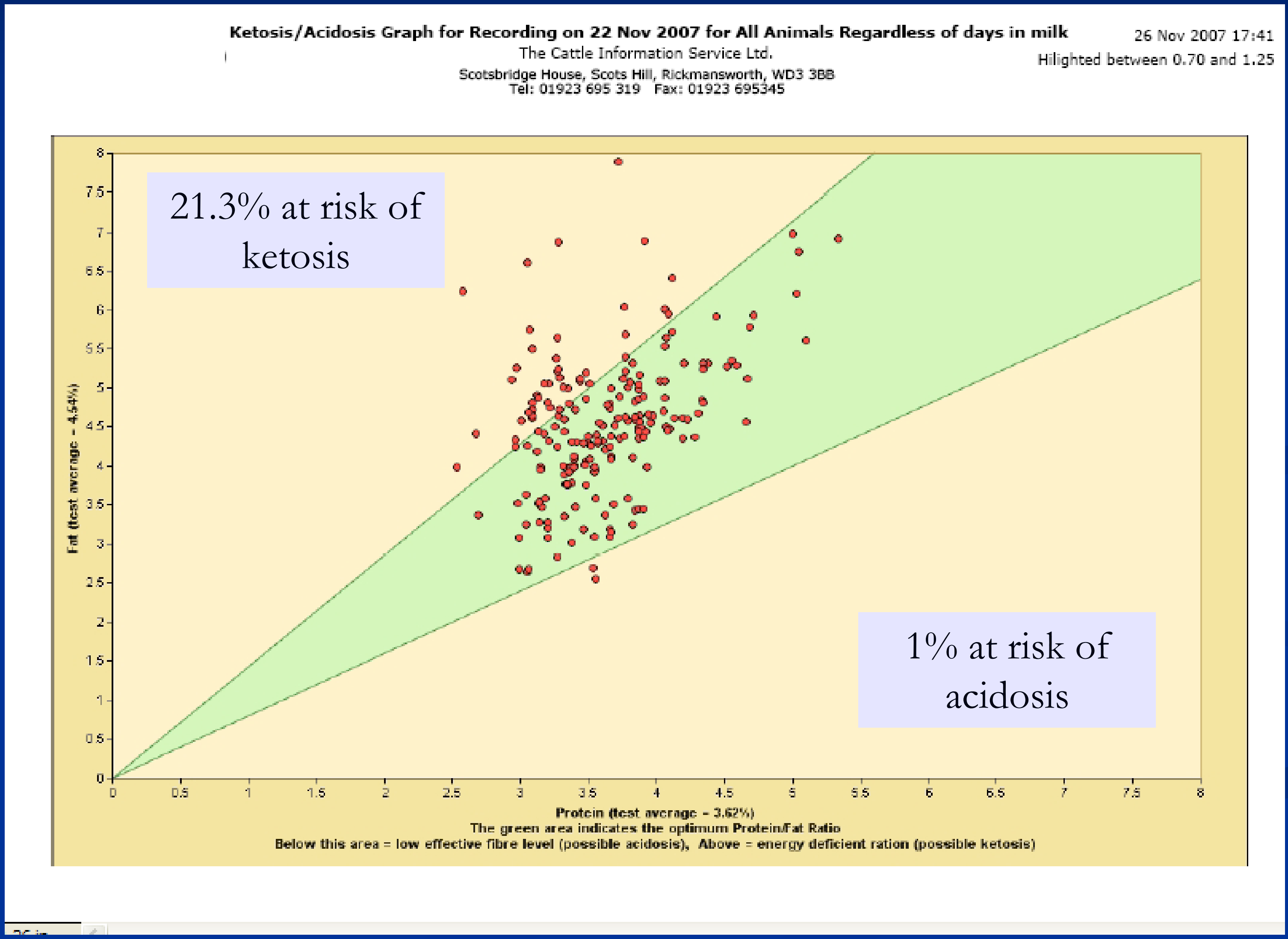


Figure 2: Body condition score loss in early lactation for cows of greater than third lactation indicating excessive negative energy balance (n=17). Many of the cows in this group had a BCS loss of 0.75 units in early lactation.

Monitoring energy balance in early lactation cows: milk recording data



Monitoring energy balance in early lactation cows: milk recording data

Line No	EarTag	Name	Lact No.	Date Calved	Ratio	Yield kg	Protein %	Fat %		
73	581493400436	UK581493400436	4	06 Nov 2007	0.41	17.30	2.58	6.24	Possible Ketosis	*****
158	561505601146	UK561505601146	1	10 Nov 2007	0.46	23.50	3.05	6.62	Possible Ketosis	****
259	561505500886	UK561505500886	2	15 Nov 2007	0.47	35.00	3.72	7.90	Possible Ketosis	****
182	561505500627	UK561505500627	3	22 Oct 2007	0.48	44.10	3.28	6.87	Possible Ketosis	****
307	561505101169	UK561505101169	1	16 Oct 2007	0.53	28.40	3.07	5.75	Possible Ketosis	***
108	581493100601	UK581493100601	4	07 Nov 2007	0.56	35.50	3.09	5.51	Possible Ketosis	**
335	581493100622	UK581493100622	4	19 Feb 2007	1.39	25.70	3.55	2.56	Possible Acidosis	**
7	581493600599	UK581493600599	5	19 Oct 2007	0.56	34.10	2.97	5.26	Possible Ketosis	**
43	561505400864	UK561505400864	2	23 Jan 2007	0.57	16.50	3.91	6.90	Possible Ketosis	**
323	561505101148	UK561505101148	1	27 Oct 2007	0.58	34.60	2.94	5.11	Possible Ketosis	**
109	581493100405	UK581493100405	4	24 Oct 2007	0.58	40.10	3.27	5.64	Possible Ketosis	**
257	561505101141	UK561505101141	1	23 Oct 2007	0.60	29.00	3.26	5.39	Possible Ketosis	*
5	581493700607	UK581493700607	4	20 Sep 2007	0.61	46.40	2.67	4.41	Possible Ketosis	*
86	561505500522	UK561505500522	3	04 Nov 2007	0.62	36.20	3.76	6.05	Possible Ketosis	*
58	561505700503	UK561505700503	3	18 Oct 2007	0.63	46.50	3.28	5.24	Possible Ketosis	*
314	561505501173		1	29 Oct 2007	0.63	29.50	3.27	5.22	Possible Ketosis	*
176	561505300373		4	30 Sep 2007	0.63	46.70	3.17	5.06	Possible Ketosis	*
138	561505100763		3	30 Sep 2007	0.63	30.60	2.53	3.99	Possible Ketosis	*
202	561505200547	UK561505200547	3	02 Nov 2007	0.63	34.70	3.21	5.06	Possible Ketosis	*
201	561505500774	UK561505500774	2	27 Sep 2007	0.64	55.40	3.12	4.91	Possible Ketosis	*
282	561505100889	UK561505100889	1	17 Oct 2006	1.31	23.10	3.53	2.69	Possible Acidosis	*
97	561505100959	UK561505100959	1	26 Oct 2006	0.64	32.90	3.29	5.14	Possible Ketosis	*
120	561505700853	UK561505700853	2	29 Mar 2007	0.64	26.40	4.11	6.41	Possible Ketosis	*
35	581493500101	UK581493500101	5	16 Oct 2007	0.64	54.00	3.13	4.88	Possible Ketosis	*
320	561505201135	UK561505201135	1	20 Oct 2007	0.64	25.60	3.09	4.81	Possible Ketosis	*
195	561505500655	UK561505500655	3	05 Oct 2007	0.65	34.10	3.06	4.69	Possible Ketosis	
44	561505401137	UK561505401137	1	11 Sep 2007	0.65	30.70	3.09	4.72	Possible Ketosis	
298	561505101162	UK561505101162	1	06 Oct 2007	0.66	29.90	3.01	4.58	Possible Ketosis	
216	561505200701	UK561505200701	3	05 Oct 2007	0.66	41.90	3.31	5.02	Possible Ketosis	
231	561505100707	UK561505100707	3	12 Nov 2007	0.66	42.90	3.77	5.70	Possible Ketosis	
233	561505301185	UK561505301185	1	05 Nov 2007	0.66	25.20	3.20	4.82	Possible Ketosis	
186	561505600635	UK561505600635	3	01 Oct 2007	0.66	49.00	3.09	4.65	Possible Ketosis	
294	561505401158	UK561505401158	1	09 Oct 2007	0.67	33.10	3.09	4.62	Possible Ketosis	
92	581493700439	UK581493700439	4	08 Oct 2007	0.67	46.80	3.48	5.20	Possible Ketosis	
322	561505101176	UK561505101176	1	19 Oct 2007	0.67	29.60	3.35	5.00	Possible Ketosis	
100	561505200729	UK561505200729	3	08 Oct 2007	0.67	39.40	3.44	5.13	Possible Ketosis	

Monitoring energy balance in early lactation cows: blood metabolite data

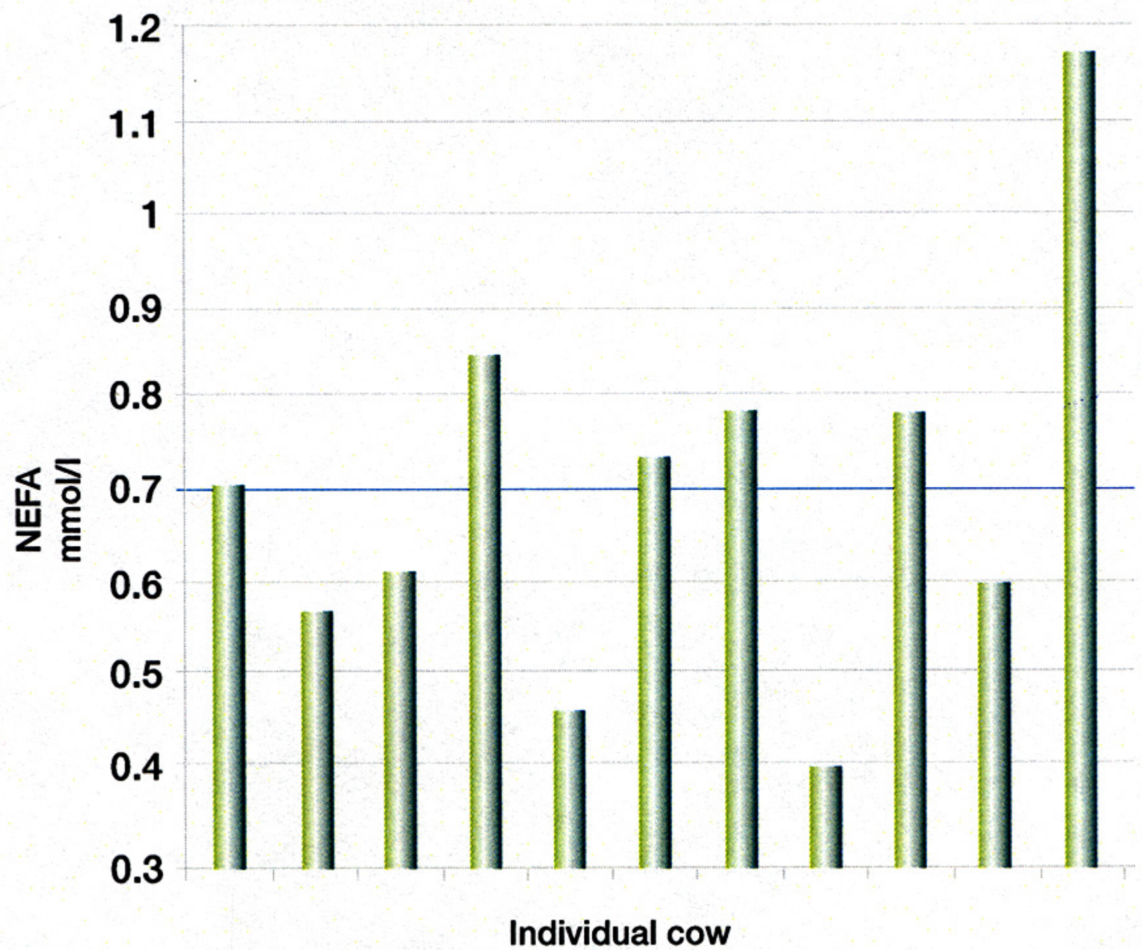


Figure 1: Non-esterified fatty acid concentrations in plasma of early lactation cows indicative of negative energy balance (acceptable threshold below blue line). In this case no over-conditioning existed in the dry period.

Possible implications of herd expansion on negative energy balance

- Higher stocking rates on grazing area reduce grass intakes
- Use of lower quality second-cut grass silage reduces feed intake for indoor fed cows
- Possible use of lower levels of maize silage on a per cow basis in early lactation reduces feed intake for indoor fed cows
- Increased number of animals subjected to group stress eg heifers

Possible implications of herd expansion on negative energy balance

- Increased number of cows in front of the same feed trough space
- Less time for monitoring and treating sick or lame cows
- Increased time away from the feed trough or grass as milking takes longer
- Heifers often are too fat at calving

Nutrition in Early Lactation

2. Protein feeding and fertility for Irish dairy cows

Protein feeding and fertility for Irish dairy cows

- Irish dairy cows often fed excessive levels of protein, particularly rumen degradable protein
- What effect does excessive protein feeding have on fertility??

RDP and grazing dairy cows

Example: Dairy cow: 30 kg milk 3.2% protein; 4.0% Fat

Diet: 1st rotation grass and 4 kg unmolassed beet pulp

Diet details " (1/1) of database "

Proportion of supply

Feedstuffs	distrib.	AS FED	DMI	UF	PDIN	PDIE	FU	Pabs	Ca	Cost
Roots, Tubers, Beet pulp unmolassed	fixed	4.00	3.52	4.02	226	388		2.1	26.8	
fresh forages, Grasses, 1rst grazing	ad libitum	96.4	16.1	16.11	2287	1433	15.30	38.7	111.1	
Theoretical ingredient	non used									

Excess of RDP is 692g (2513 – 1821)

Diet summary

	DMI	UFc	PDIN	PDIE	FU	Pabs	Ca	Cost
Supplies	19.630	19.57	2513	1821	15.30	40.8	137.9	
Requirements		18.20	1801	1801	17.47	44.5	141.9	
Balance		1.37	711	20		-3.7	-4.0	
% requirements		108	139	101		92	97	

UF correction 0.56

35.3

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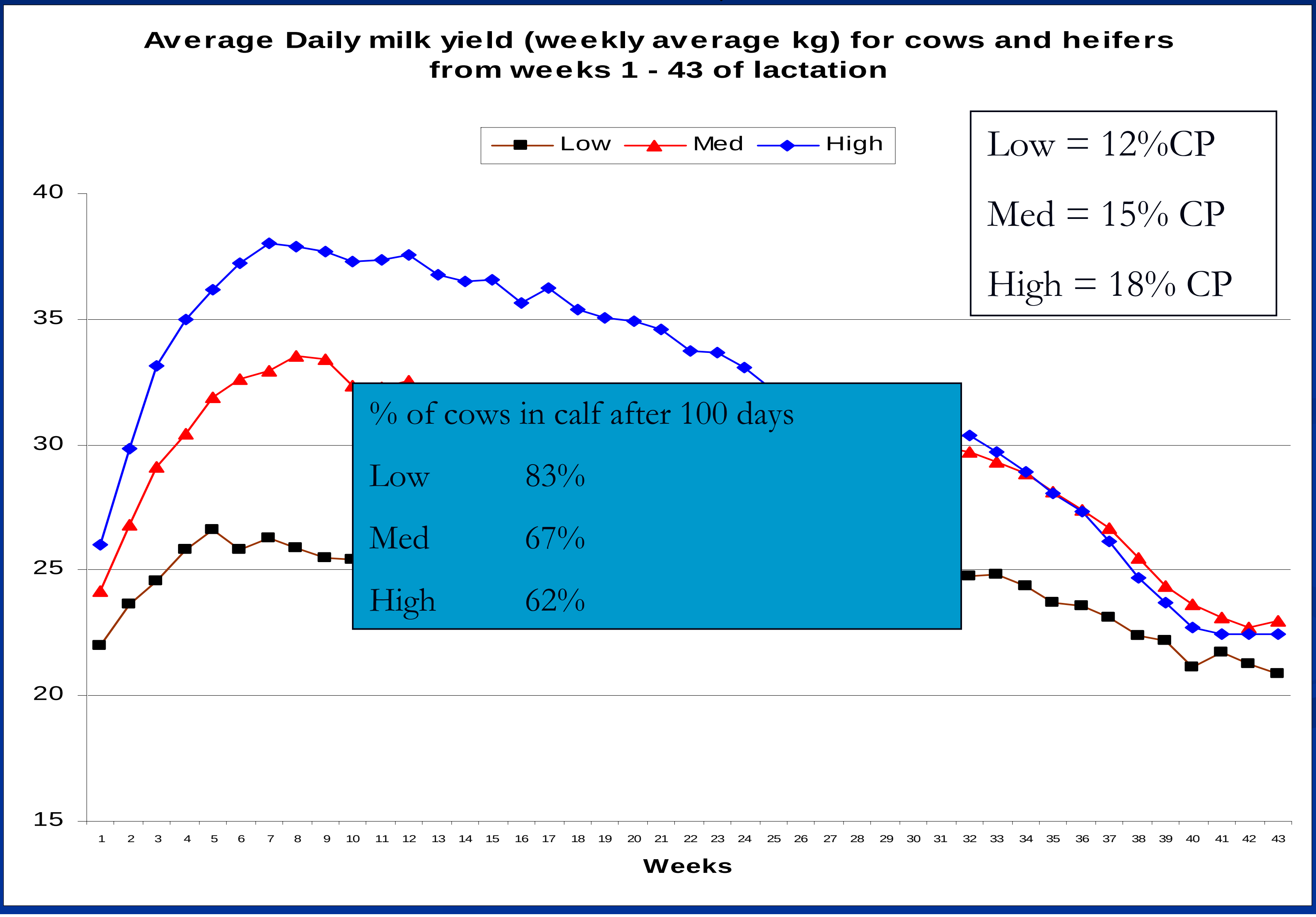
Protein feeding and fertility

High levels of Rumen Degradable Protein (RDP):

- Delays the first ovulation or oestrus
- Reduce conception rate after first insemination
- Increase number of days open
- Lower overall conception rate
- Makes energy balance more negative
- It is possible that intermediate metabolites of RDP (ammonia and urea) have direct negative effects on fertility in dairy cattle experiencing negative energy balance (Tamminga, 2006)

Diet crude protein% and fertility (Data kindly made available by: Young et al., 2007; AFBI Hillsborough, NI)



Protein feeding and fertility

- Feeding excess protein
  - Reduces fertility
  - It is almost impossible to avoid feeding excess RDP to grazing cows in Ireland in early lactation
  - However, grazing diets should be supplemented with low protein compounds for cows in early lactation

Summary and Conclusions

- Optimal nutritional status around calving is vital for good dairy herd fertility
  - Proper BCS management
  - Avoiding negative energy balance pre-calving
  - Avoiding milk fever or subclinical hypocalcaemia
  - Maintaining rumen health

Summary and Conclusions

- Energy balance is the most important factor of early lactation nutrition for fertility
  - Energy balance should be monitored for all dairy herds
  - Milk recording data
  - BCS data
  - Blood metabolite data

Thank you for your attention!