# Herd health challenges in high yielding dairy cow systems

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# The “big three” diseases

Fertility

Lameness

Mastitis

Energy balance and body condition

Ruminal acidosis and abomasal displacement

Immunity

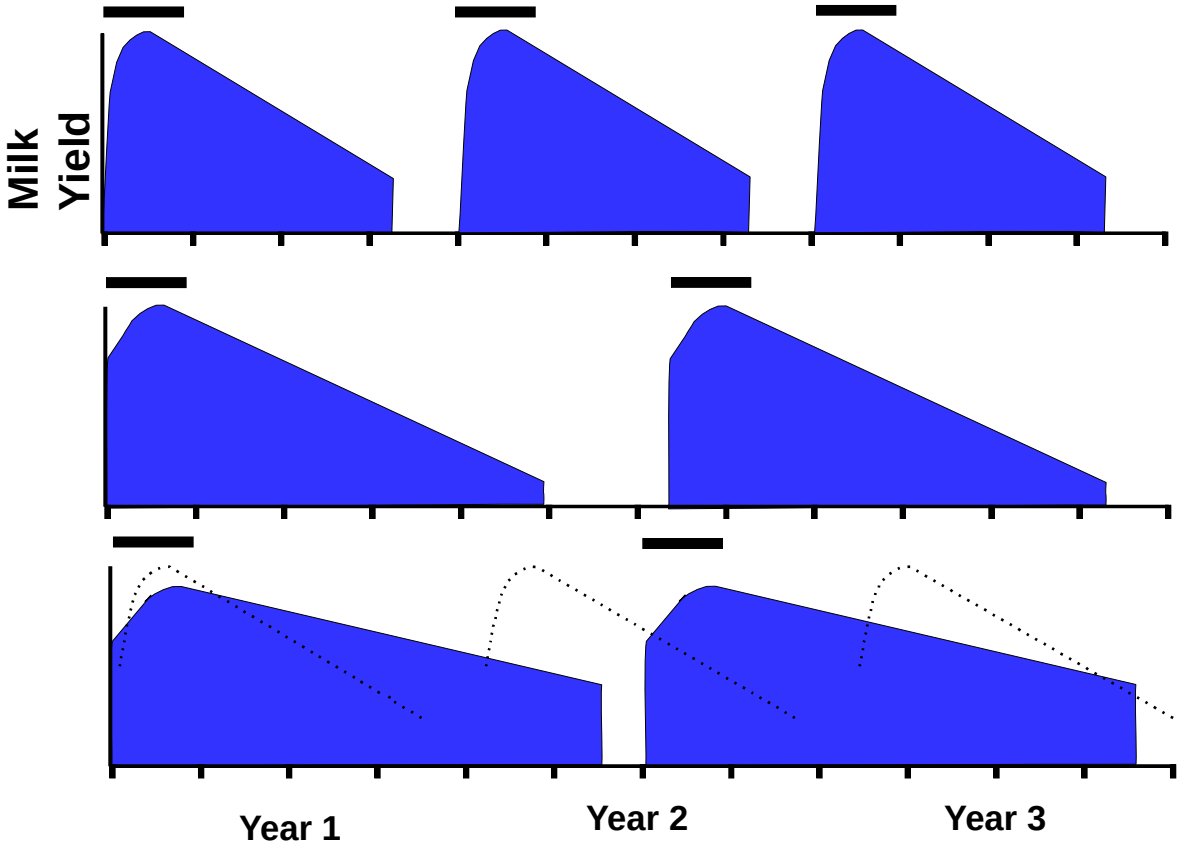
**The right cow for the right environment / management**

# Yield and Fertility

| Herd Lactation Yield (litres) | Mean Calving Index (days) |
|---|---|
| <6,000 | |
| 6-8,000 | |
| 8-10,000 | |
| 10,000+ | |

National Milk Records Holsteins UK n=200 per group randomly selected for year to 31/8/13.

# How is fertility related to yield?




Conventional lactation:
3 risk periods

Extended lactation:
2 risk periods
Less milk /cow /year

Persistent lactation:
3 x day milking
Lower peak?
Genetics?

# Energy Demand

Run a marathon

1.5-2 x maintenance for one day

Tour De France

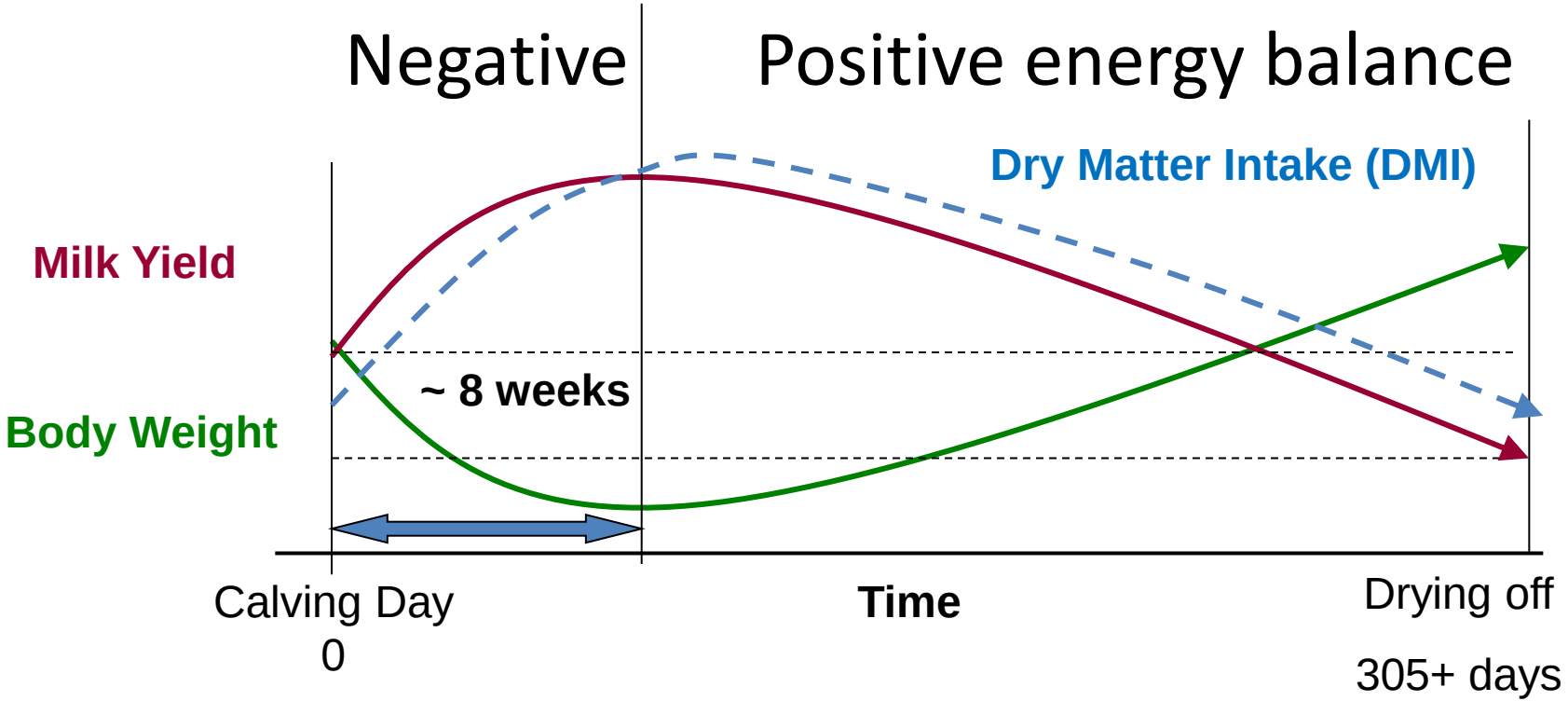
3-4 x maintenance for 3 weeks

Cow giving 50 litres

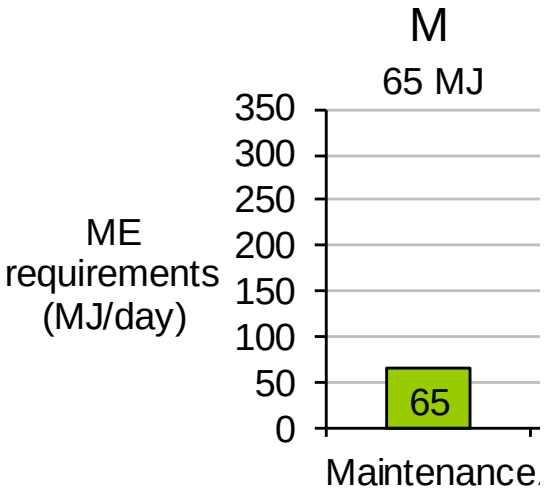
4-5 x maintenance for 4 months

(and conceive a new calf)

# Lactation Energy Requirements



# Energy Requirements



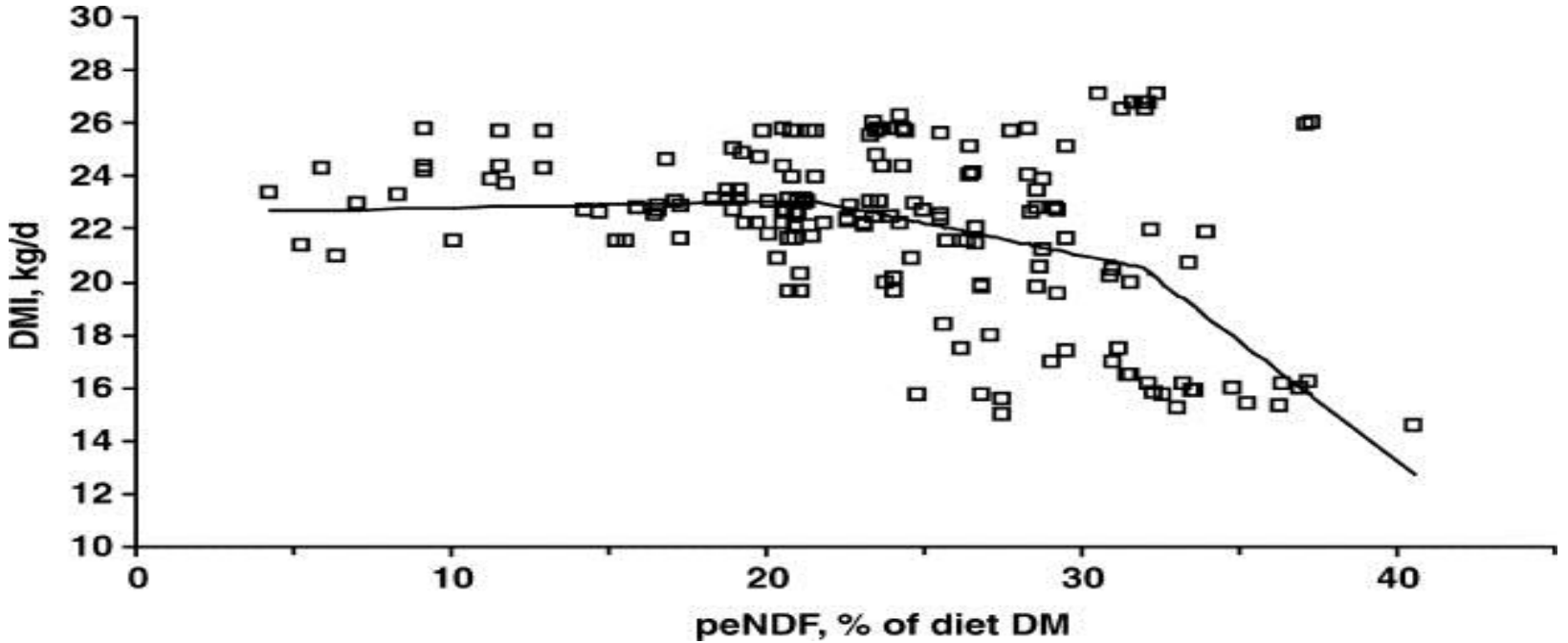
# Energy density M/D

- Energy per unit of diet (Metabolisable Energy / kg Dry Matter (DM))

- For high yielding Holstein (315MJ/24kg) ≈ 13 MJ / kg DM
  - Dry Matter Intake is limiting factor

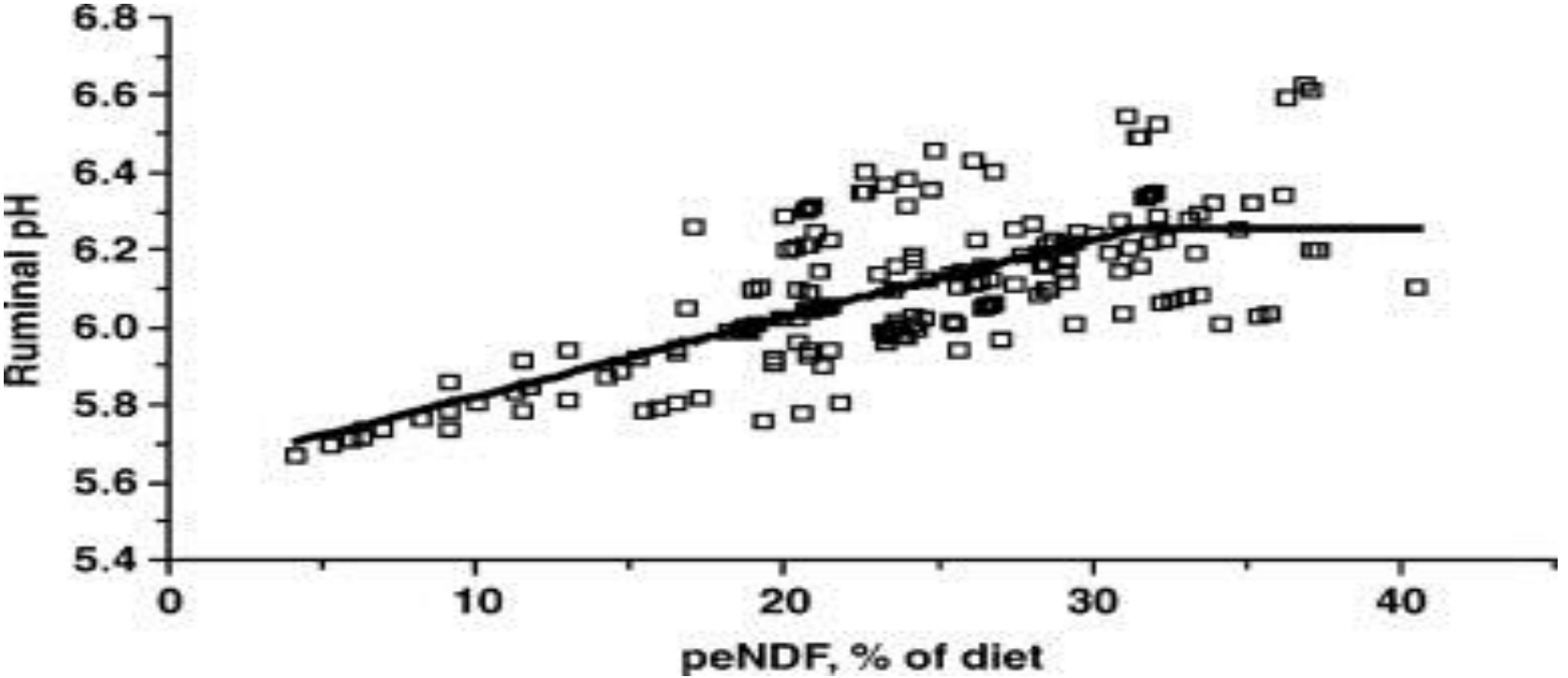
- For dry cow (95MJ / 10kg) ≈ <10 MJ/kg DM
  - DM Intake needs to be maintained as high as possible
  - 12-14 Kg / day?

# Dietary Fibre and Dry matter intake




Modelling the Adequacy of Dietary Fiber in Dairy Cows Based on the Responses of Ruminal pH and Milk Fat Production to Composition of the Diet. Q. Zebeli, J. Dijkstra, M. Tafaj, H. Steingass, B.N. Ametaj, W. Drochner
Journal of Dairy Science 2008 91, 2046-2066DOI: (10.3168/jds.2007-0572)

# Dietary Fibre and Ruminal pH

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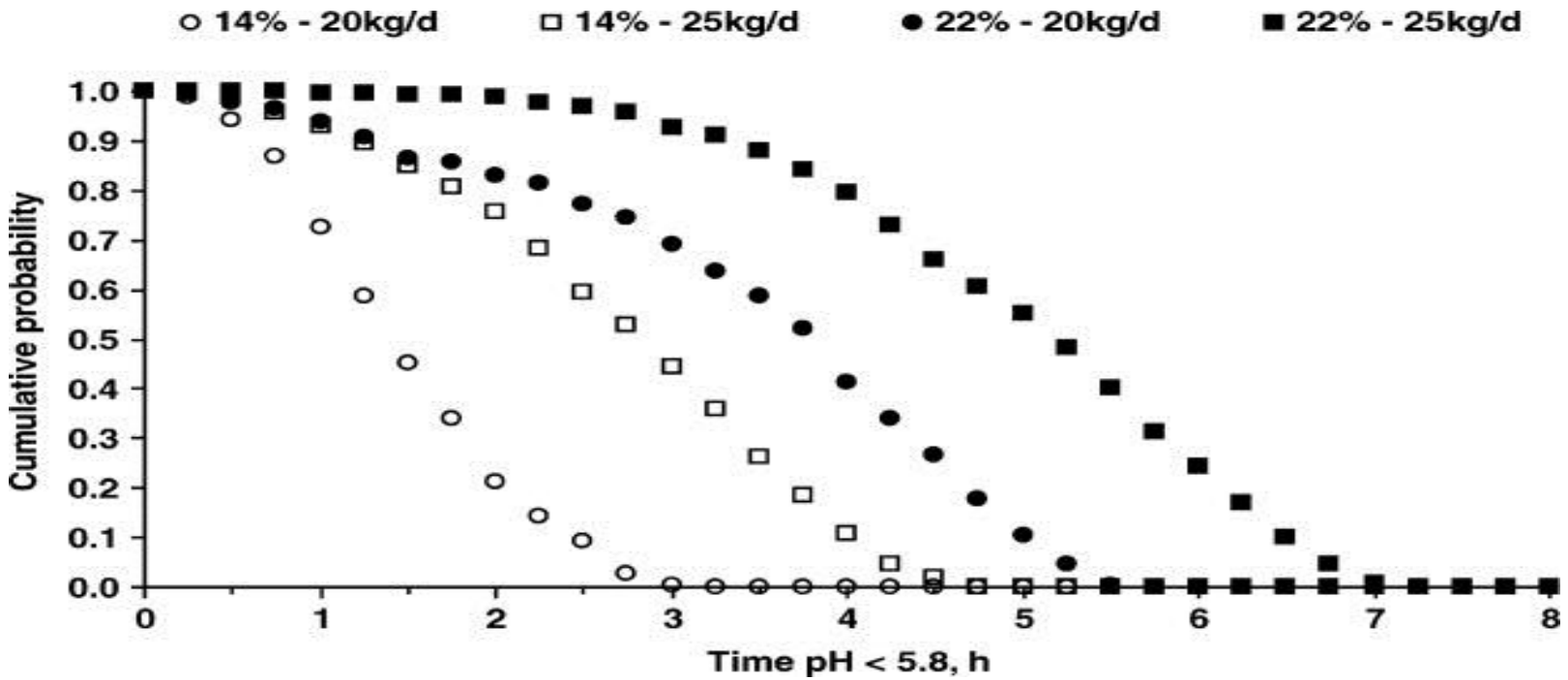
# Dietary starch, DMI and Ruminal pH

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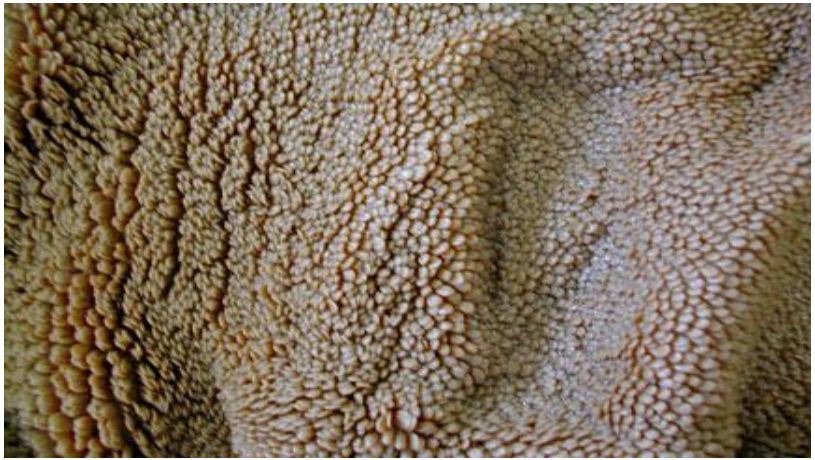
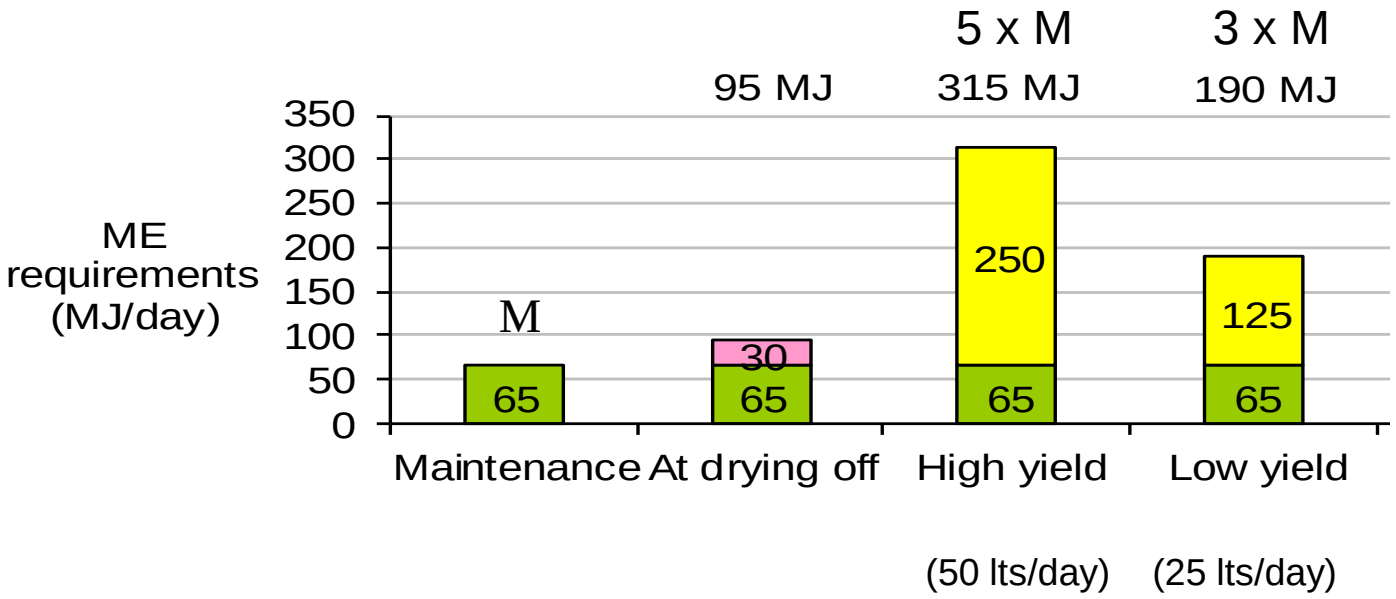
# After calving …..

- **Energy requirements + 300%**
- **Glucose requirements + 270%**
- **Amino acid requirements + 200%**



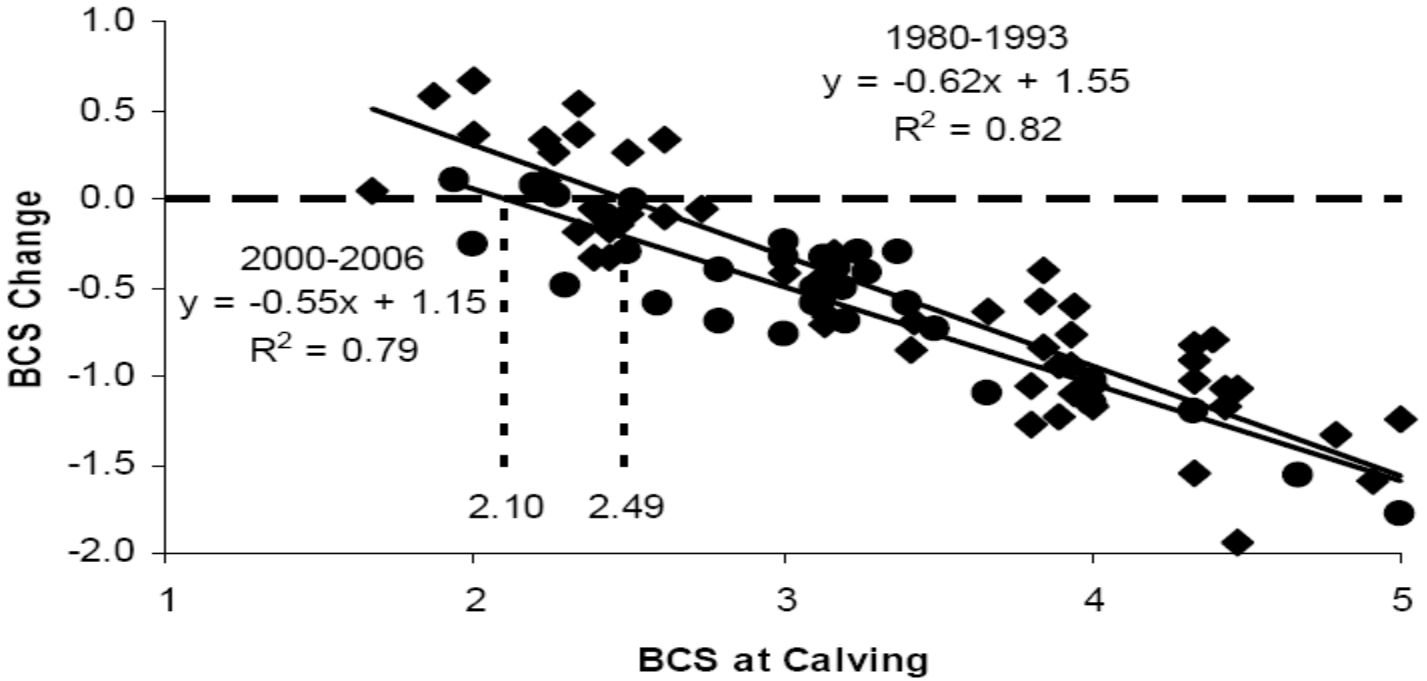
Courtesy of Wyn Morris ForFarmers

# Energy Requirements




25 MJ = 0.75 Kg body weigh gain/day

# Fat cows lose more body condition after calving




Garnsworthy

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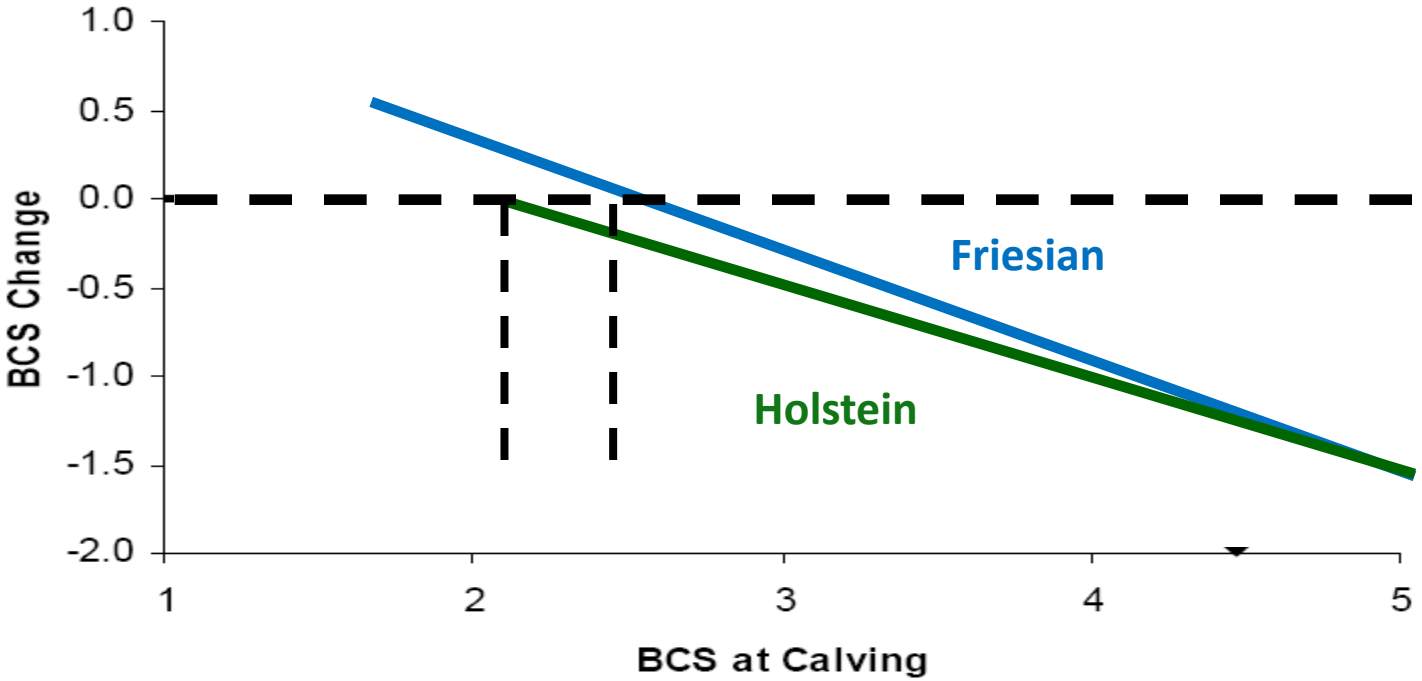
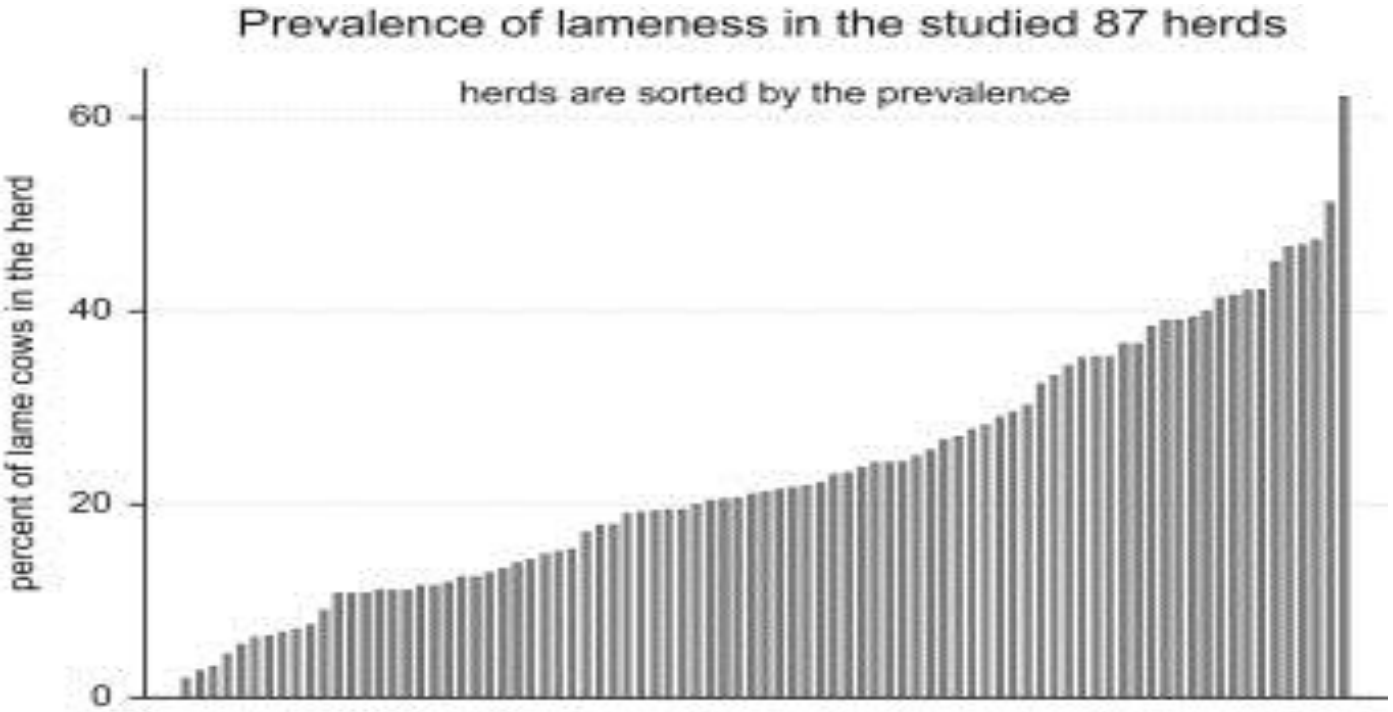



Garnsworthy

# Association between BCS and Lameness

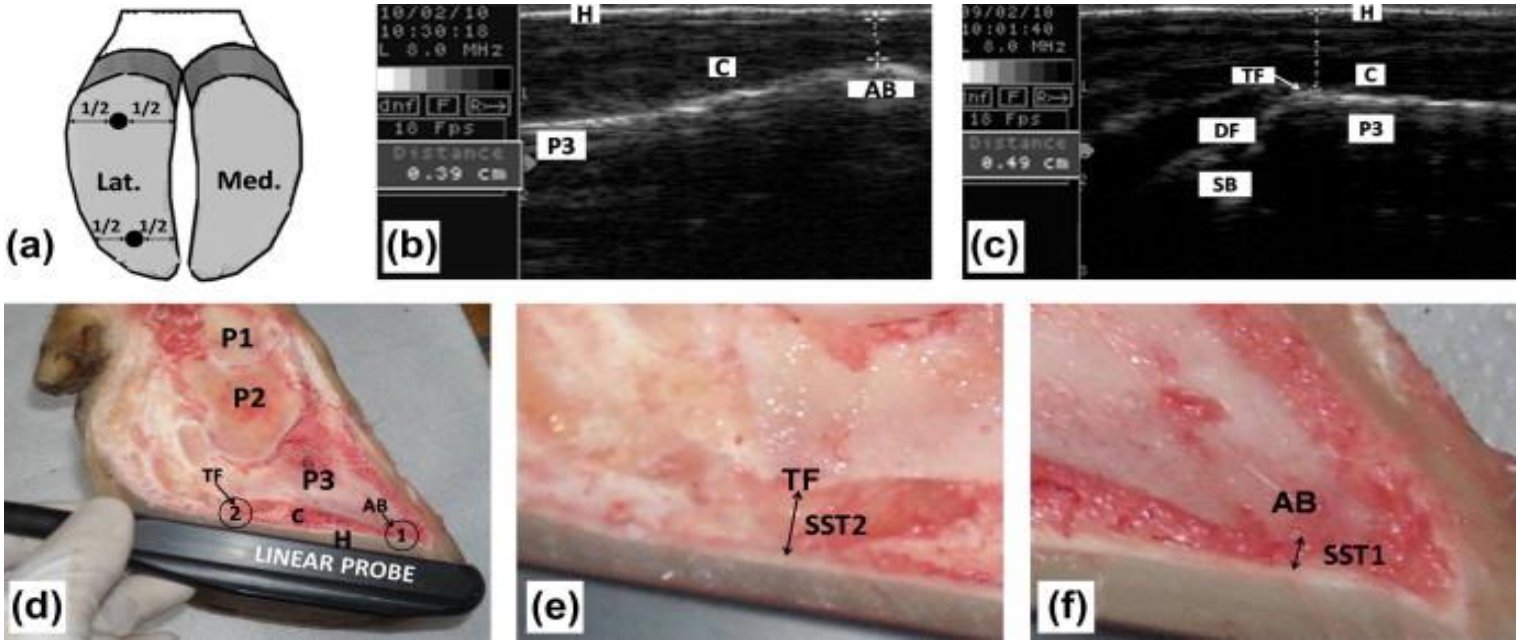
- Which comes first?
- Lim et al Preventive Veterinary Medicine 118 (2015) 370
- BCS at calving <2.25 or BCS loss of 1 score or more after calving
  - More likely to become lame
  - Less likely to stop being lame
- Increase in BCS after calving
  - More likely to stop being lame

# How common is lameness?



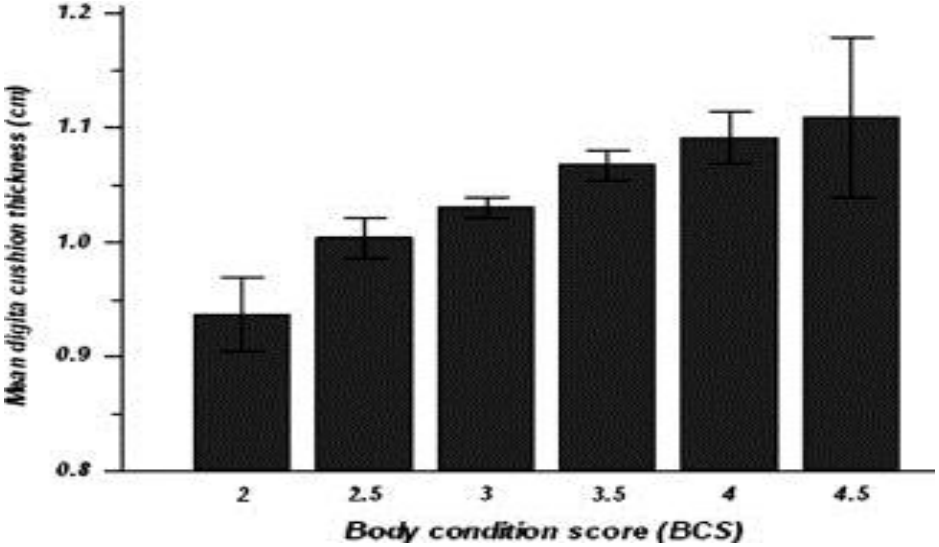

**Prevalence and risk factors for lameness in insulated free stall barns in Finland**
Sarjokari et al Livestock Science, Volume 156, Issues 1–3, 2013, 44 - 52

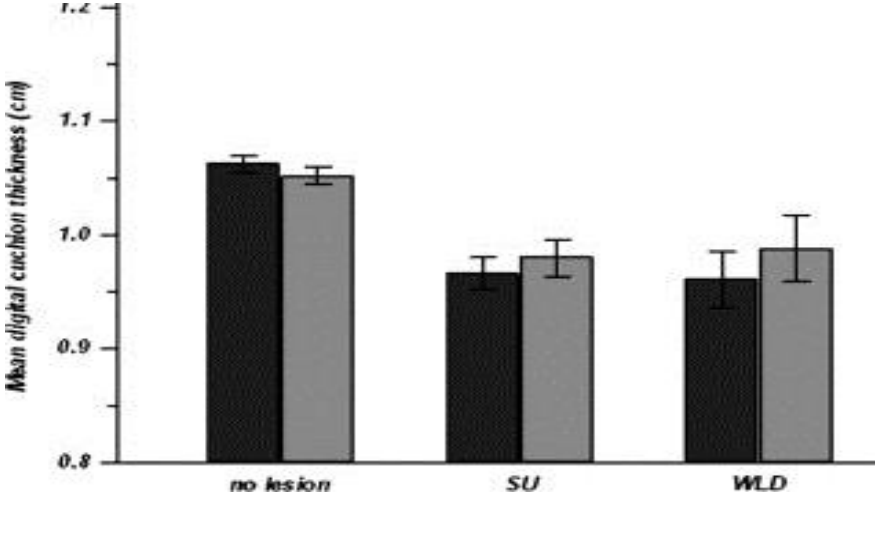
# BCS and Lameness – digital cushion fat pad




Toholj et al. The Veterinary Journal, Volume 199, (2014) 290 - 294

# BCS, digital cushion thickness and lameness




Digital cushion thickness by body condition score (BCS)

Bicalho & Oikonomou (2013) Livestock Science 56 96

Digital cushion thickness at dry-off for cows that were:
No lesion = No claw horn lesions at dry-off or next lactation
SU = Solar Ulcer at dry-off or next lactation
WLD - White Line Lesions at dry-off or next lactation

# Will technology solve the fertility problem?

| Detection method | % of possible heats identified |
|---|---|
| Farm staff (alone) | **56** |
| Heattime™ | **59** |

**~40% heats not being detected by any one system**

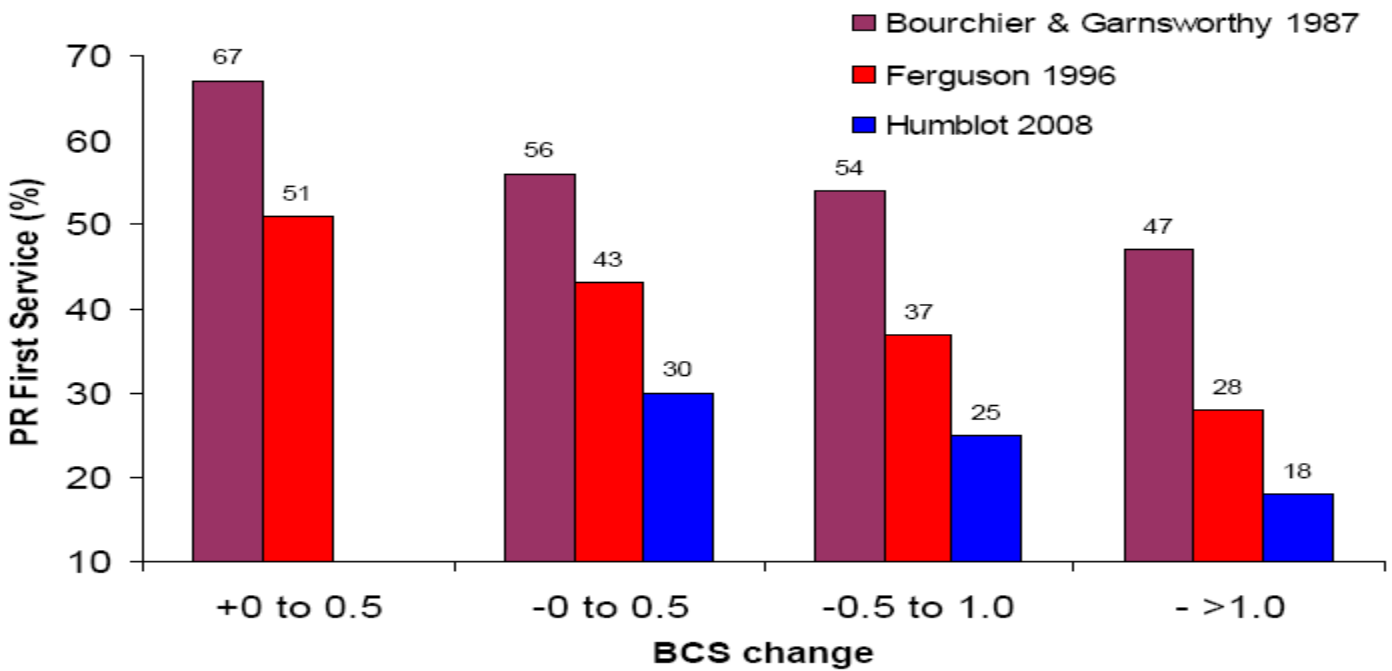
**Low Body Condition**

**High Yield (over 55kg/day)**

**Lameness**

Holman A, Thompson J, Routly JE, Cameron J, Jones DN, Grove-White D, Smith RF, Dobson H.
Comparison of oestrus detection methods in dairy cattle.
Veterinary Record. 2011 169 (2):47. doi: 10.1136/vr.d2344.

# BCS change and 1st service Pregnancy rate

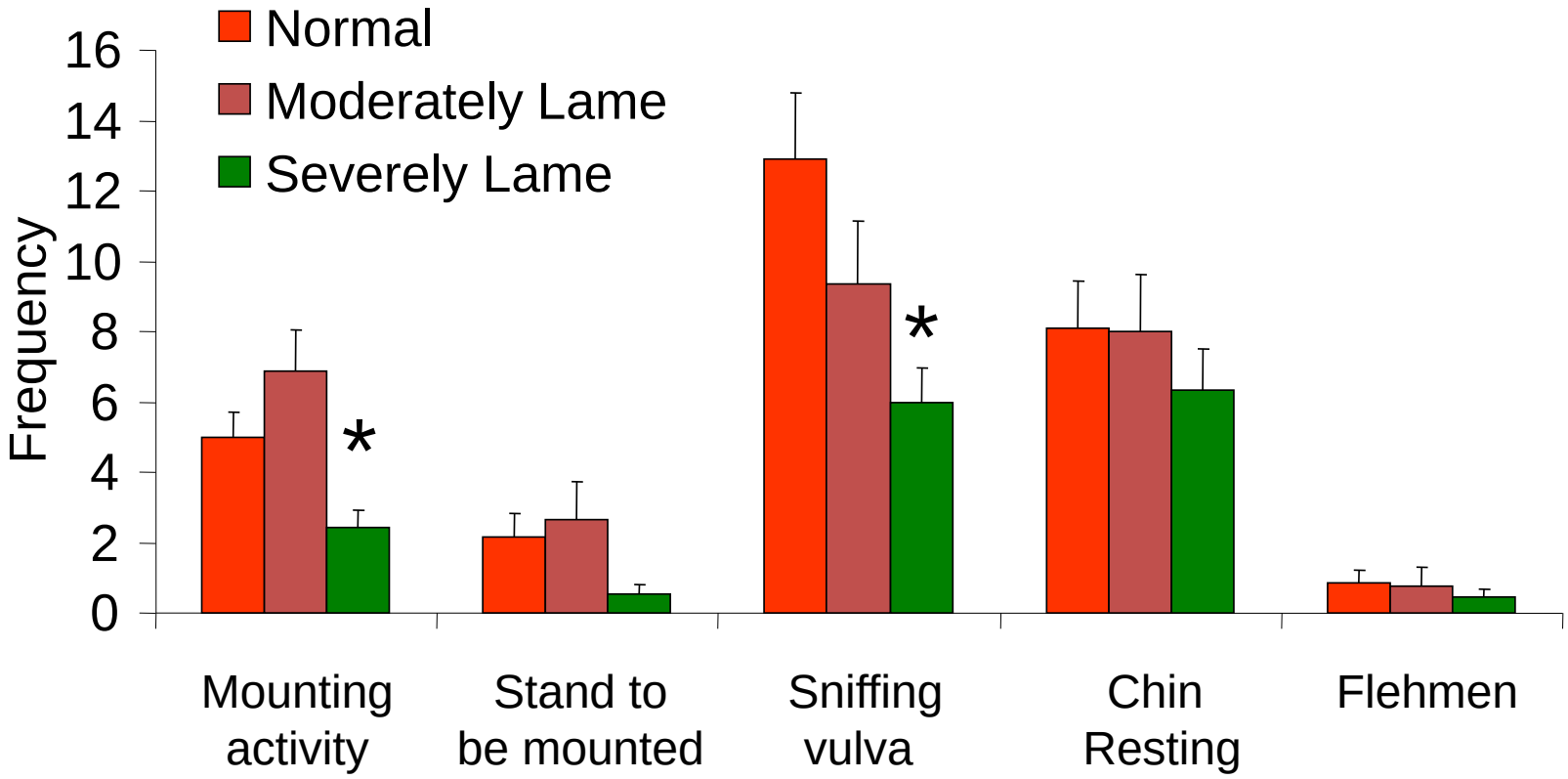


# Lame cows have first CL and first oestrus later

| | ‘Normal’ | Lameness |
|---|---|---|
| First post partum luteal activity (days) | 33 | 50 |
| First post partum oestrus (days) | 60 | 84 |

Petersson et al (2006) Animal Reproduction Science 91 201

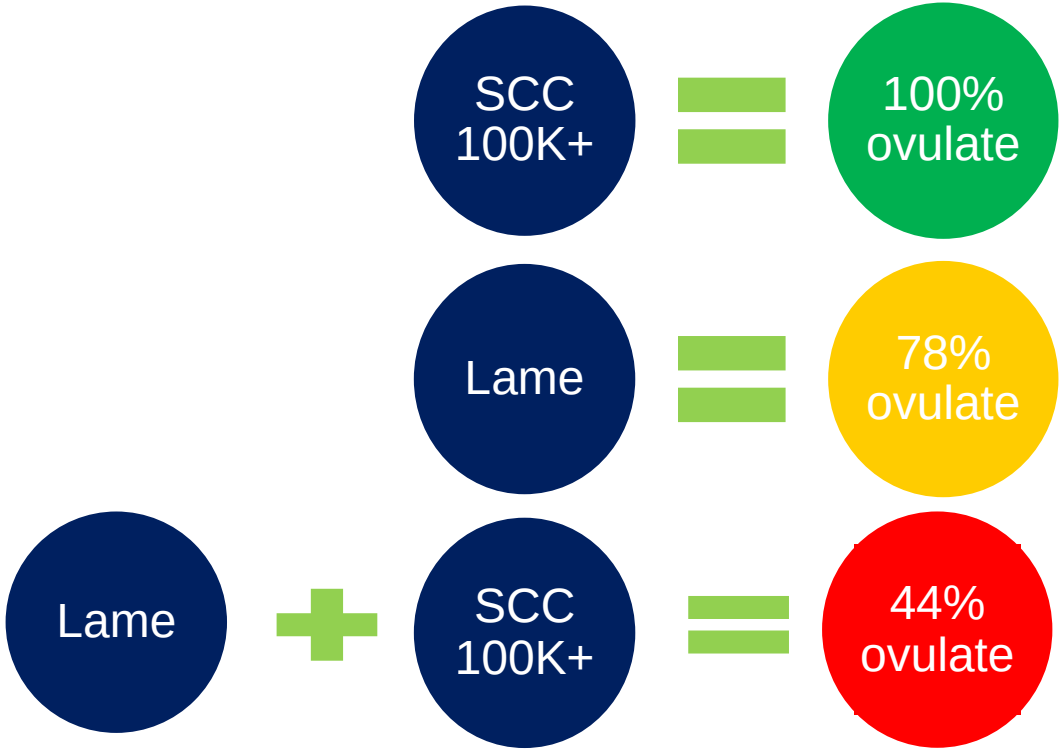
# Specific sexual behaviours are affected




*= P< 0.05

Walker et al. (2008) Hormones and Behavior 53 493

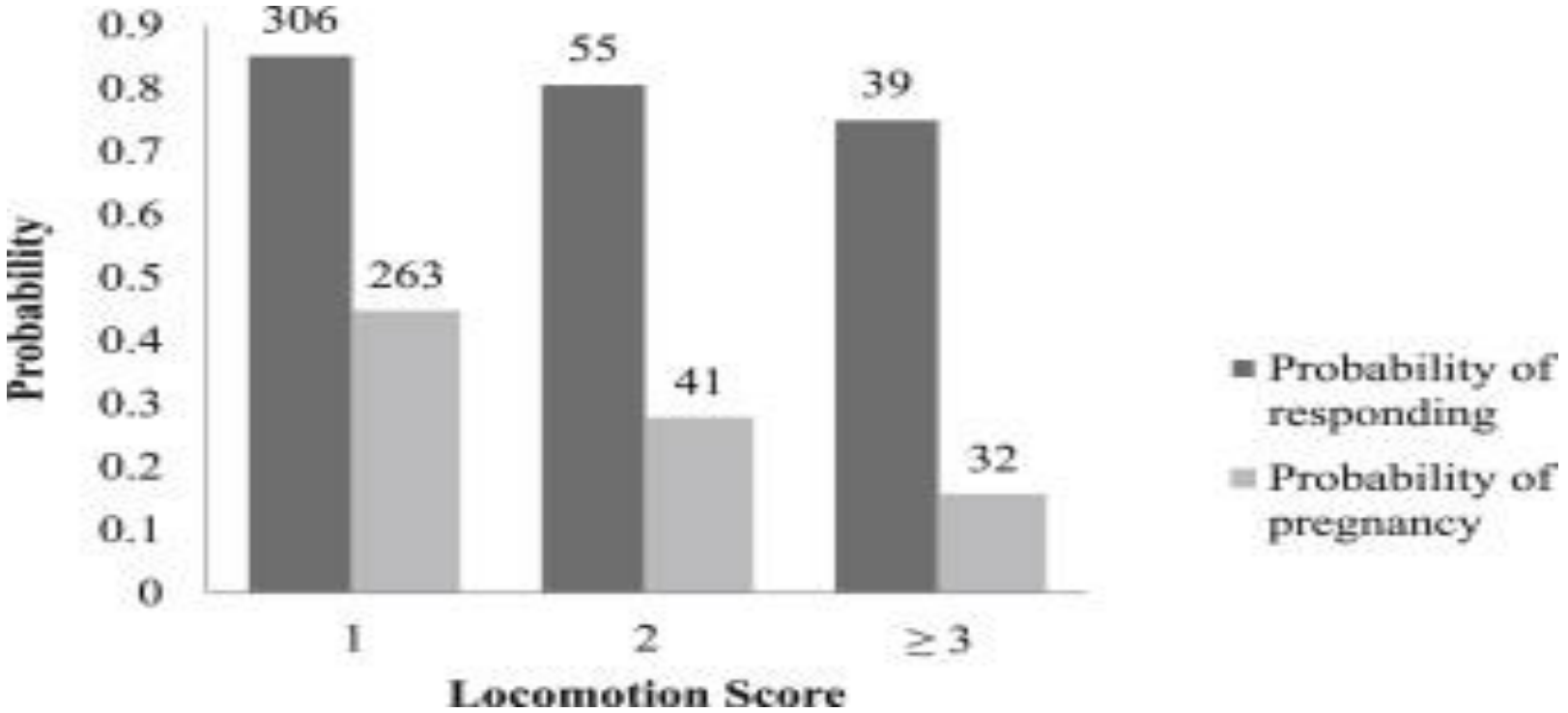
# Diseases interact with fertility




Morris, Smith and Dobson

**Do we need to worry about the physiology? We have pharmaceuticals!**

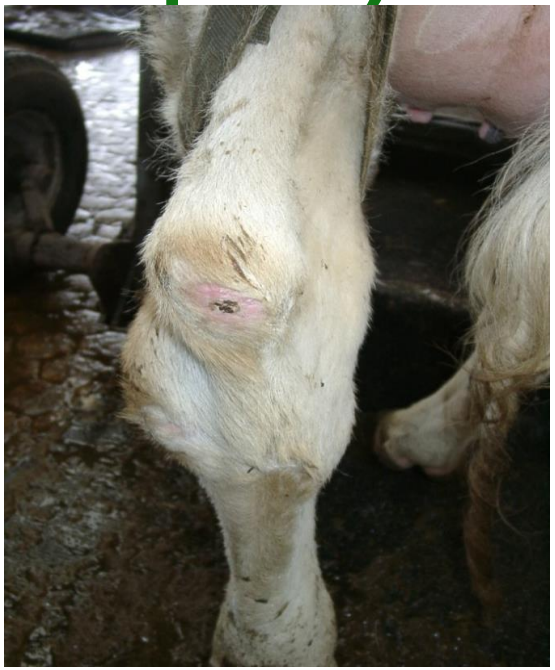
**Lame cows respond poorly to progesterone synchronisation regimes**




McNally et al, Theriogenology (2014) 82 1263

# Don’t breed the cow out of the building?

# Farmers report hock lesions to milk purchaser (and obtain a better price)



# Reducing antibiotic use in animals

- Arla gården standards
- Improve immune response
  - Reduce “stress”
  - Nutrition
  - Genetics
    - Somatic Cell Count
    - Immune response


- Identify and remove risk factors for disease
  - Environment

# Thoughts for the future

- Understanding animal response to chronic stimuli
- Treatment vs prevention of disease
- Early detection
  - of lameness
  - of body condition loss
- What phenotypes can be accurately measured?
- Fertility as a “catch all” welfare monitor
  - (see Garcia et al. de Vries et al, Nyman et al, 2011)

# Cattle welfare is under scrutiny

- Food security will drive the development of farming systems
  - Cost and availability of food are key issues, but
  - A proportion of consumers are influenced by perceptions of animal welfare in different systems.
- We need to manage animal genotype and environment interactions to meet consumer expectations.