

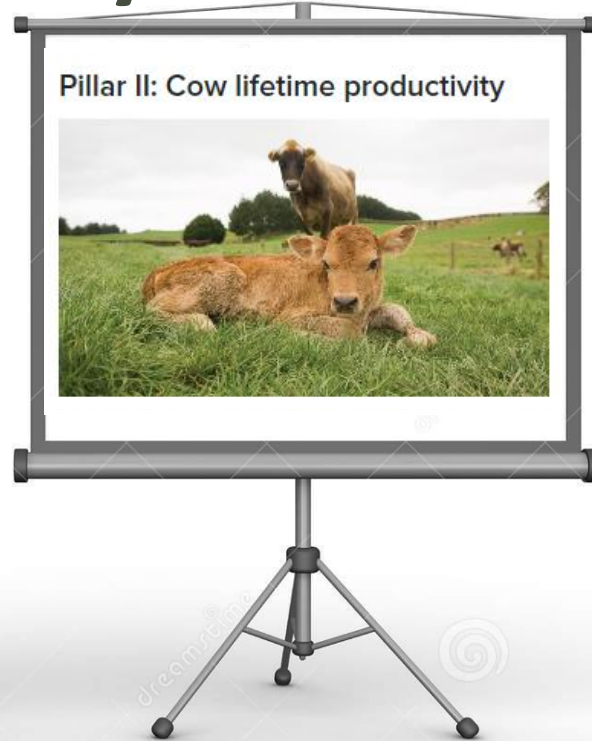
“Pillars” Programme

Recent reproduction results

Dr. Jane Kay, DairyNZ



New science for better fertility and lifetime productivity



Better fertility?



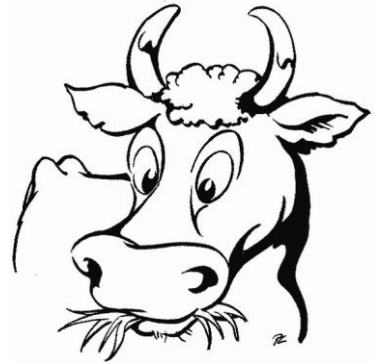
Increase 6-week in-calf rate

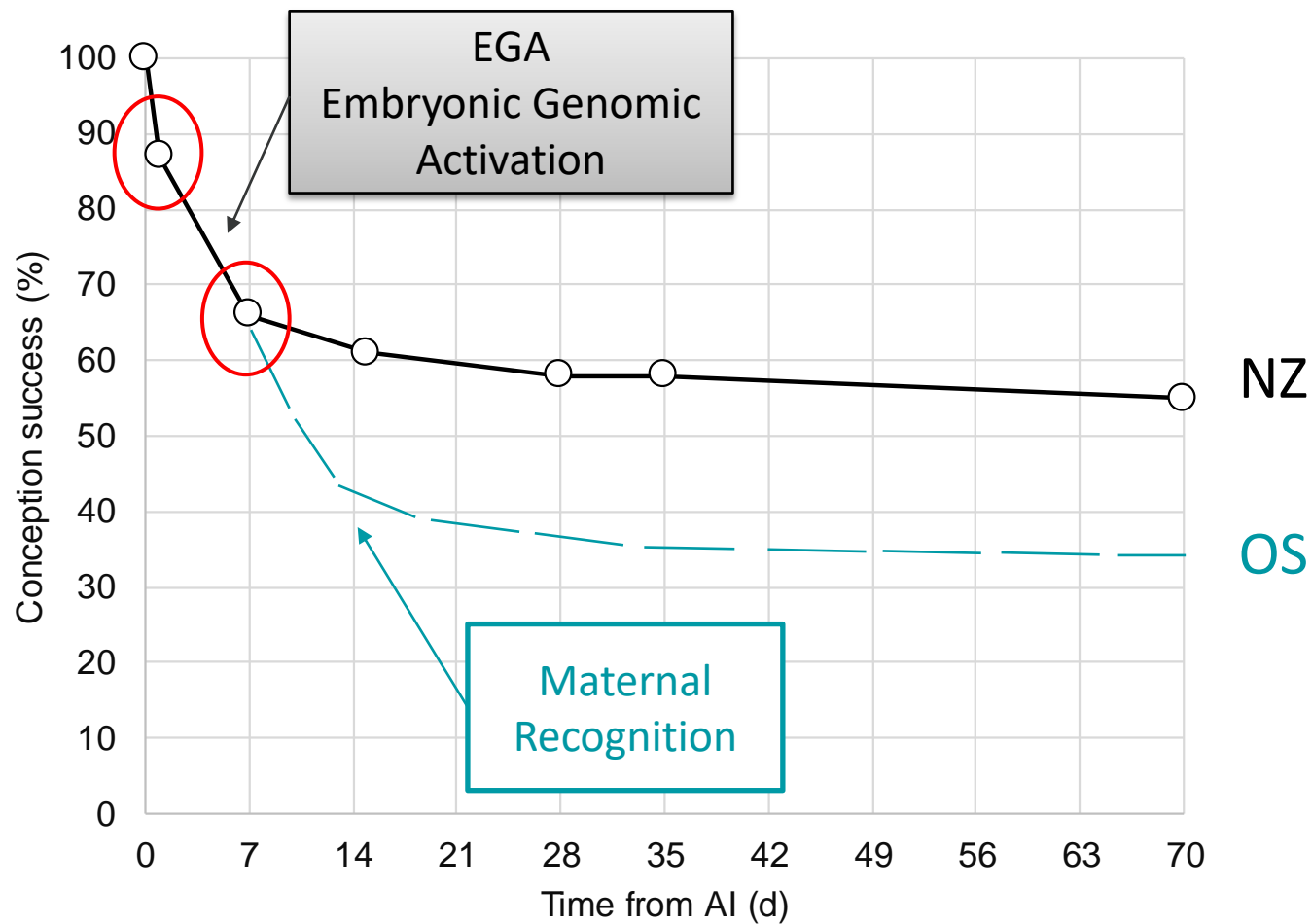


Increase conception rate (currently 52%)

When does conception loss occur?

- International research (OS cows) - early embryonic loss within first 2-3 weeks
- Large scale field trial (AgResearch)
 - 2 years
 - 4 farms
 - 1,872 cows





What does this mean

- Greatest conception loss occurs in first week after pregnancy (d4)
- Totally reliant on stored nutrients and RNA (follicular fluid)
- Extensive *in vitro* studies to identify rate-limiting nutrients during this process
- On-farm supplementation with limiting nutrient?



Extra information

- No effect of milk yield/composition, BCS, age, farm, breed on conception rate
- Probability of conception increases by:
 - 13% with an extra week postpartum before AB
 - 43% with an extra 3-wks postpartum before AB
 - 18% with each oestrus cycle before AB



Can nutrition affect cycling?



Starch – “Gainsworthy diet”

Starch



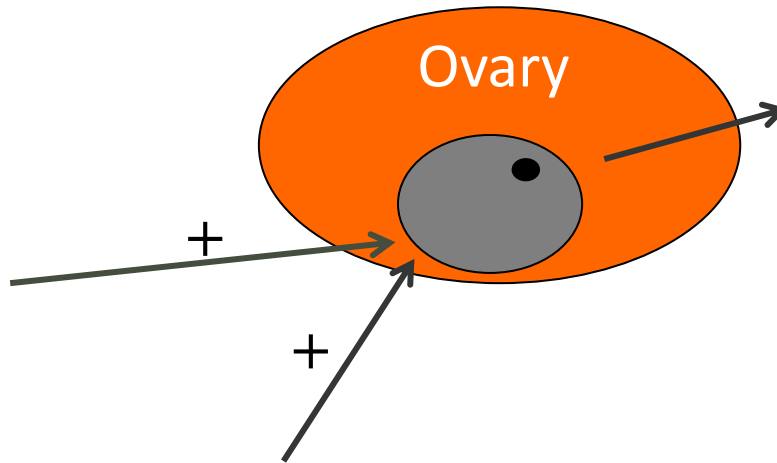
Glucose



Insulin



Insulin-like Growth Factor 1(IGF-1)



In theory, cow....

- Cycles faster
- Stronger heats
- More fertile

Results

Overall result (%)	+ high fibre feed	+ high starch feed
3-wk submission rate	90	88
Conception rate	58	53
6-wk in-calf rate	84	79
Empty rate	4	6

What does this mean

- Farm specific results (6-wk in-calf rate)
 - Improved marginally
 - Remained unchanged
 - Substantially reduced
- No benefit to production or reproduction of supplementing with starch-based supplement



Better fertility?



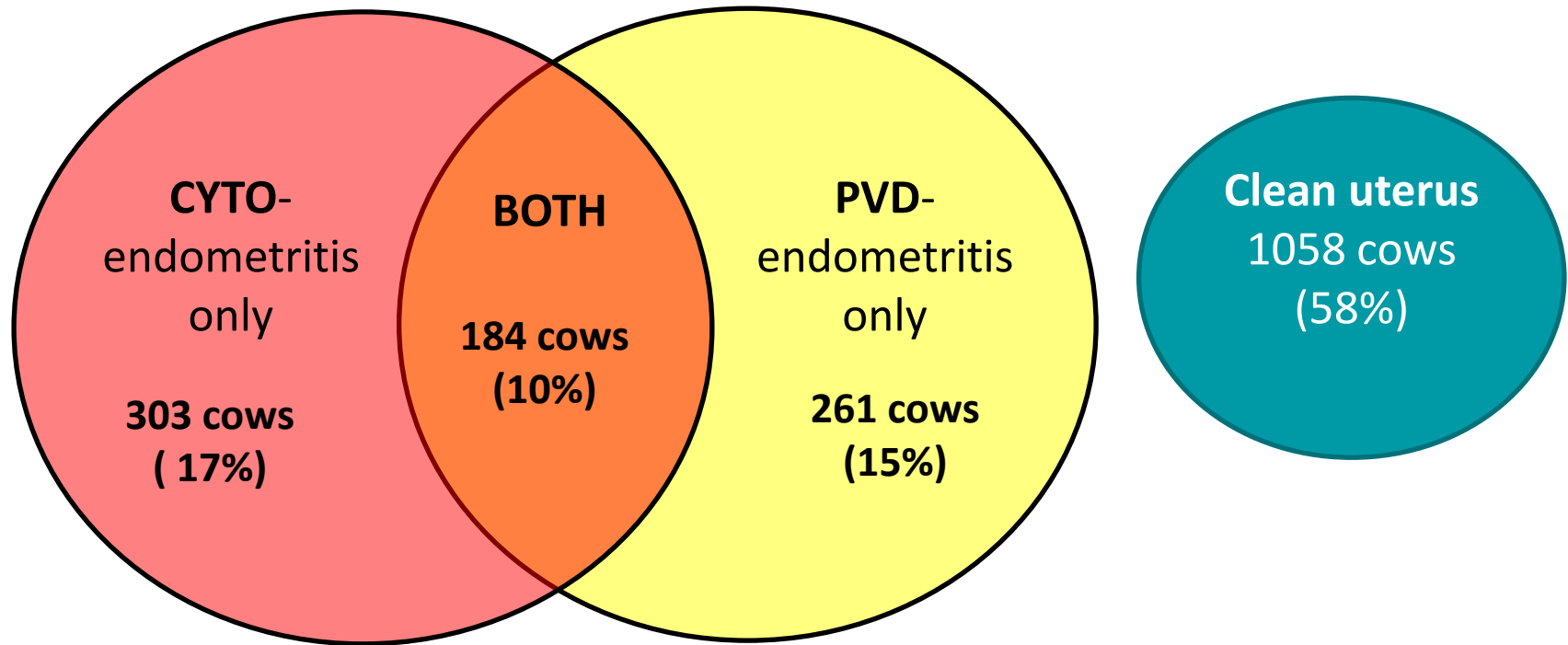
Increase 6-week in-calf rate



Improve cow health and immune function

Endometritis

- 1,806 cows
- 100 herds
- 4-weeks premating



What does this mean

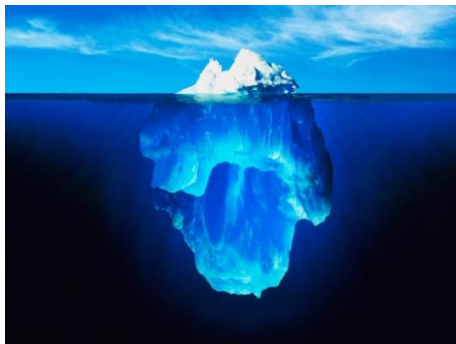


- Significant degree of repro failure is due to failure of uterus to recover before mating
- Prevalence of endometritis is linked with transition period health/calving difficulty
- Focus on improving transition period management to improve immune response

Transition cow health

Low blood calcium

- Milk fever



2% downer cow (< 1.4 mM Ca)

5% clinical (< 1.4 mM Ca)

35% subclinical (< 2.0 mM Ca)

- Reduced immune function
 - increased risk of other disorders/diseases

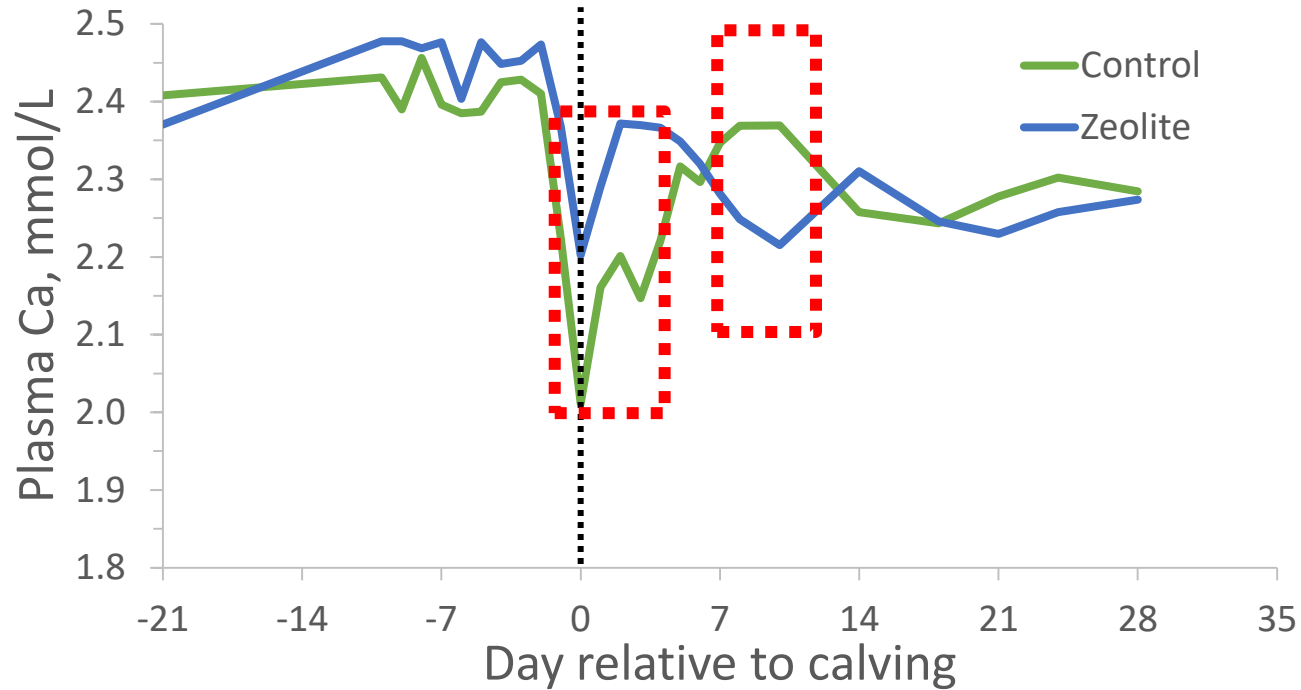


Zeolite

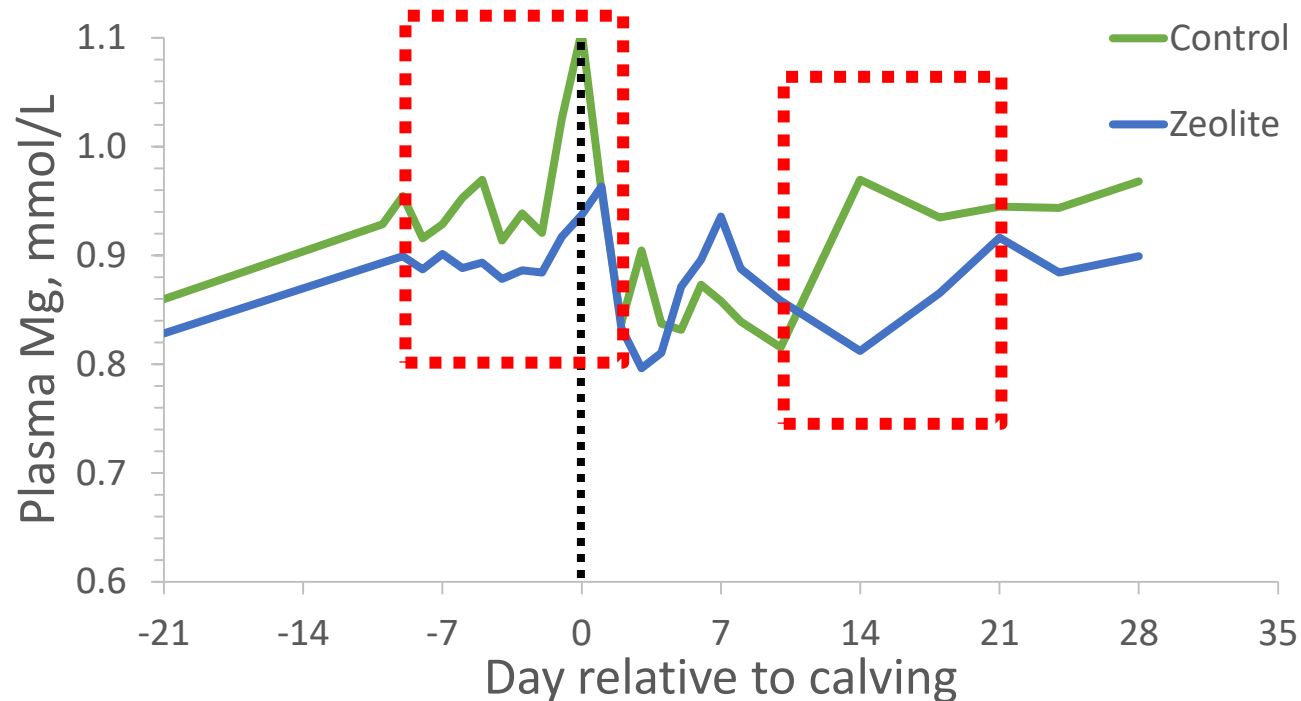


- Natural mineral formed from volcanic ash
- Magnet - negative charge that binds positive minerals (e.g. calcium and ammonium)
- Sponge - honeycomb framework with pores

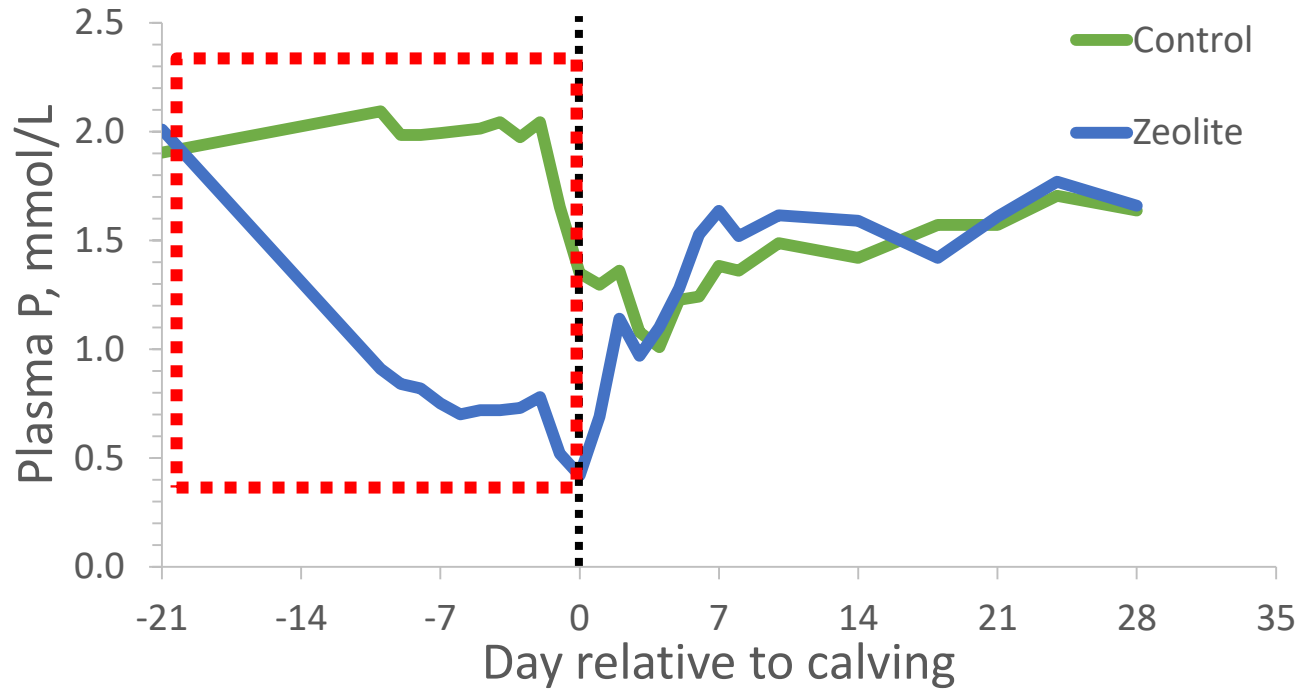
Plasma Calcium



Plasma Magnesium



Plasma Phosphorus



What does this mean



- Not suited to our system
- Higher blood calcium, but lower magnesium and phosphorus
- Risk in cows with borderline mineral levels?
- No impact on milk fever incidence
- No impact on milk production
- Immune and inflammatory measures?
- Cost \$30/cow

Imrestor™

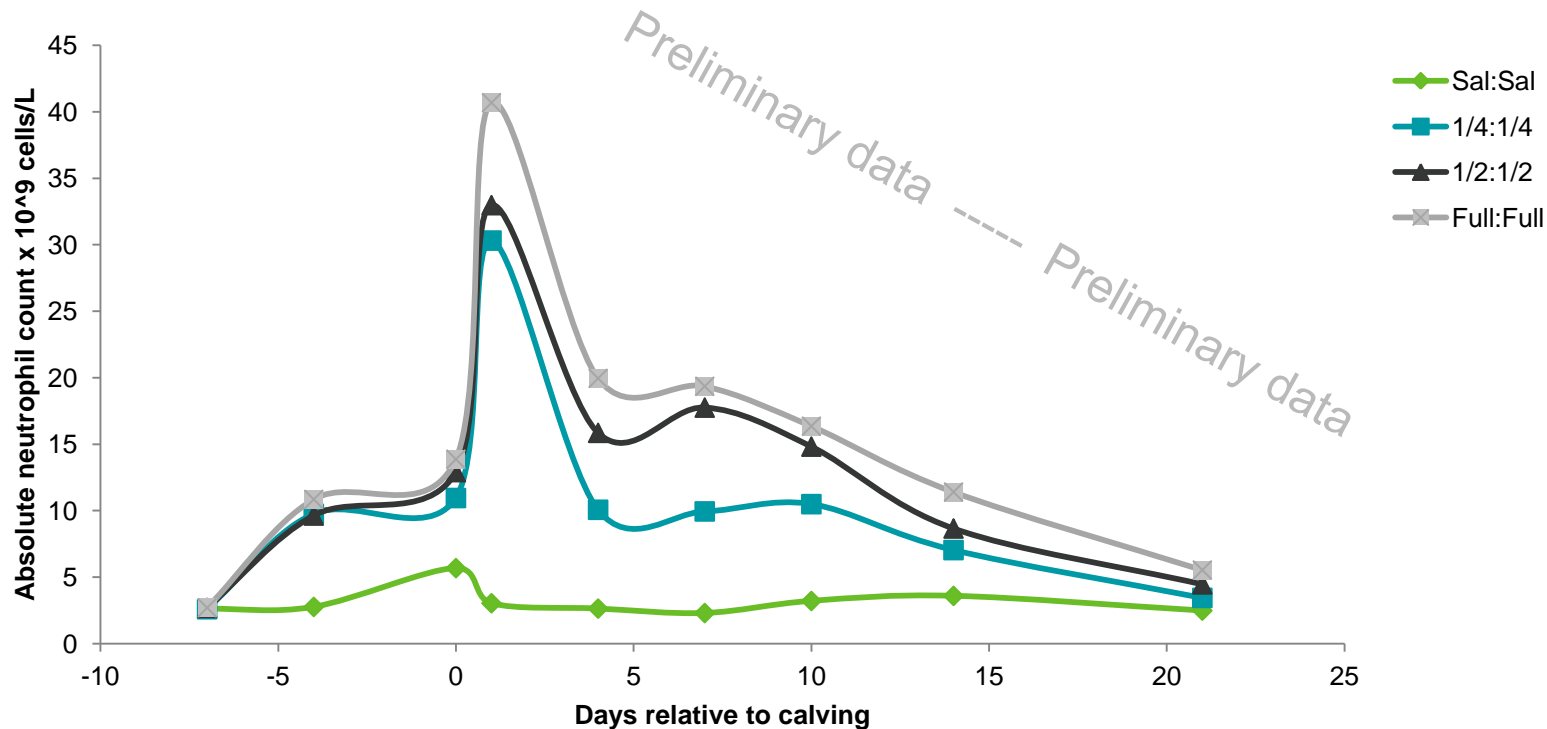
- “Pegbovigrastim”- used in human medicine in patients undergoing chemotherapy
- Two injections at -7 and within 24 hrs of calving
- Stimulate immune response



reduce clinical mastitis, retained placenta
increased chance of cycling within 80 d

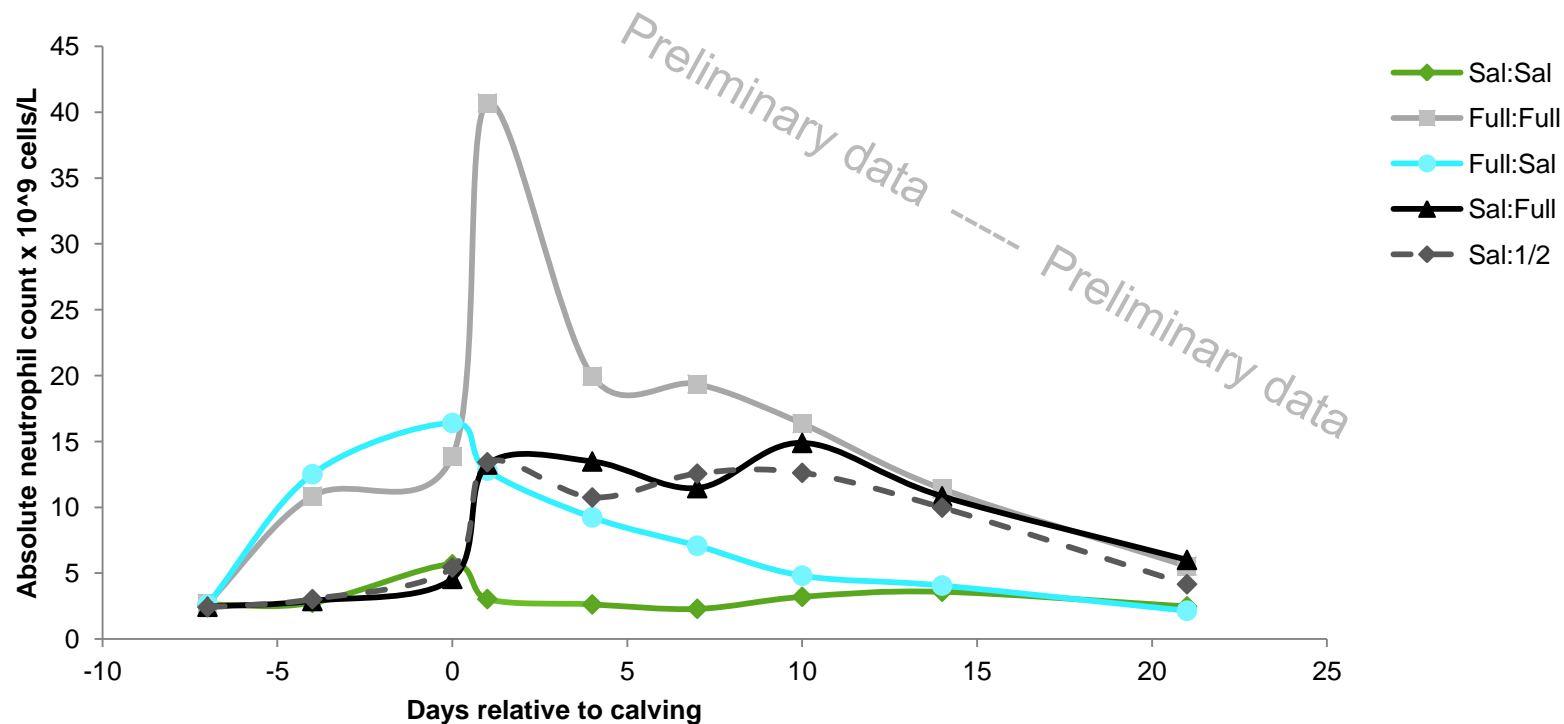


Dose response



1/2 dose as effective as full dose

Timing



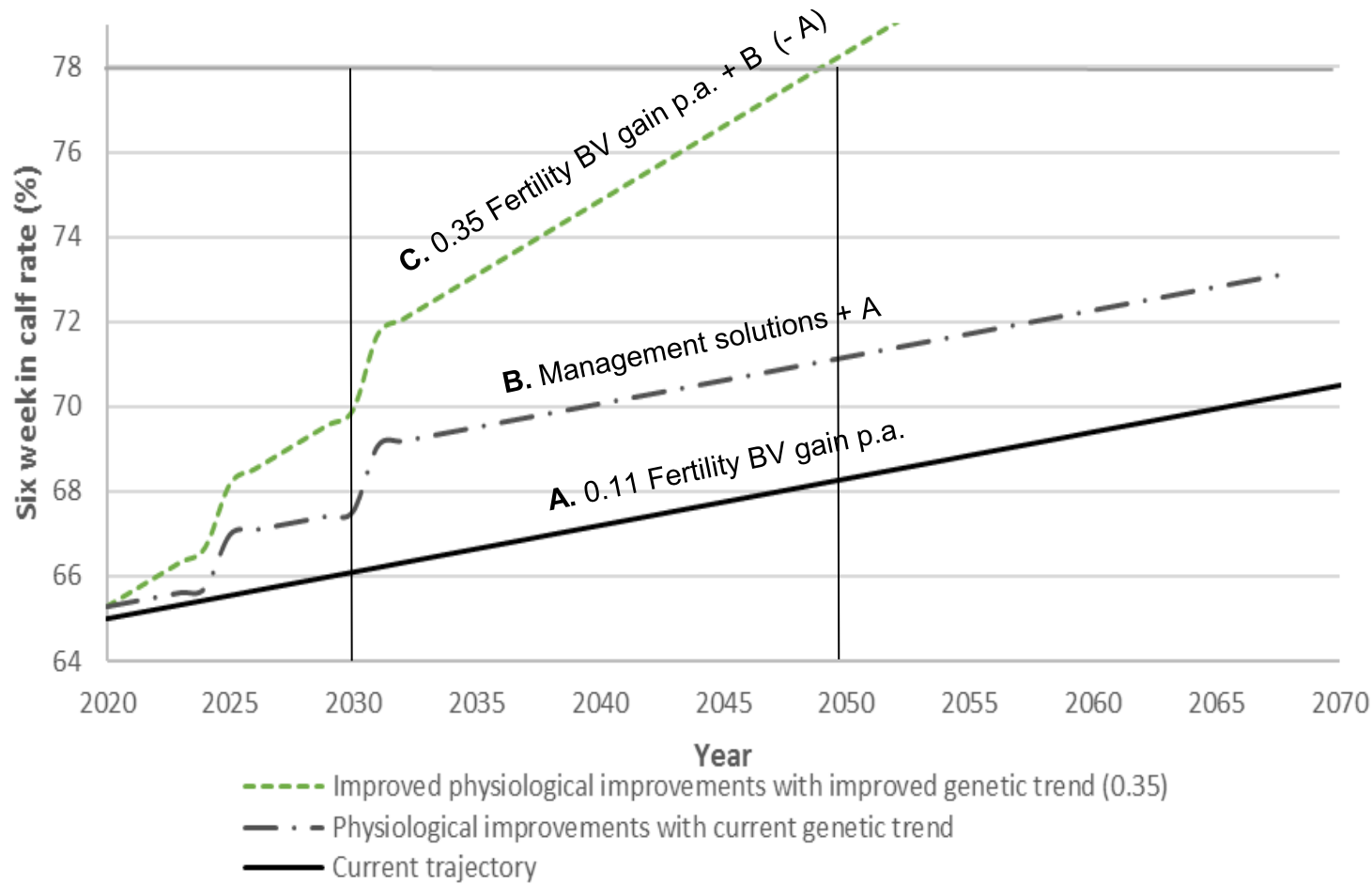
One dose on day of calving?

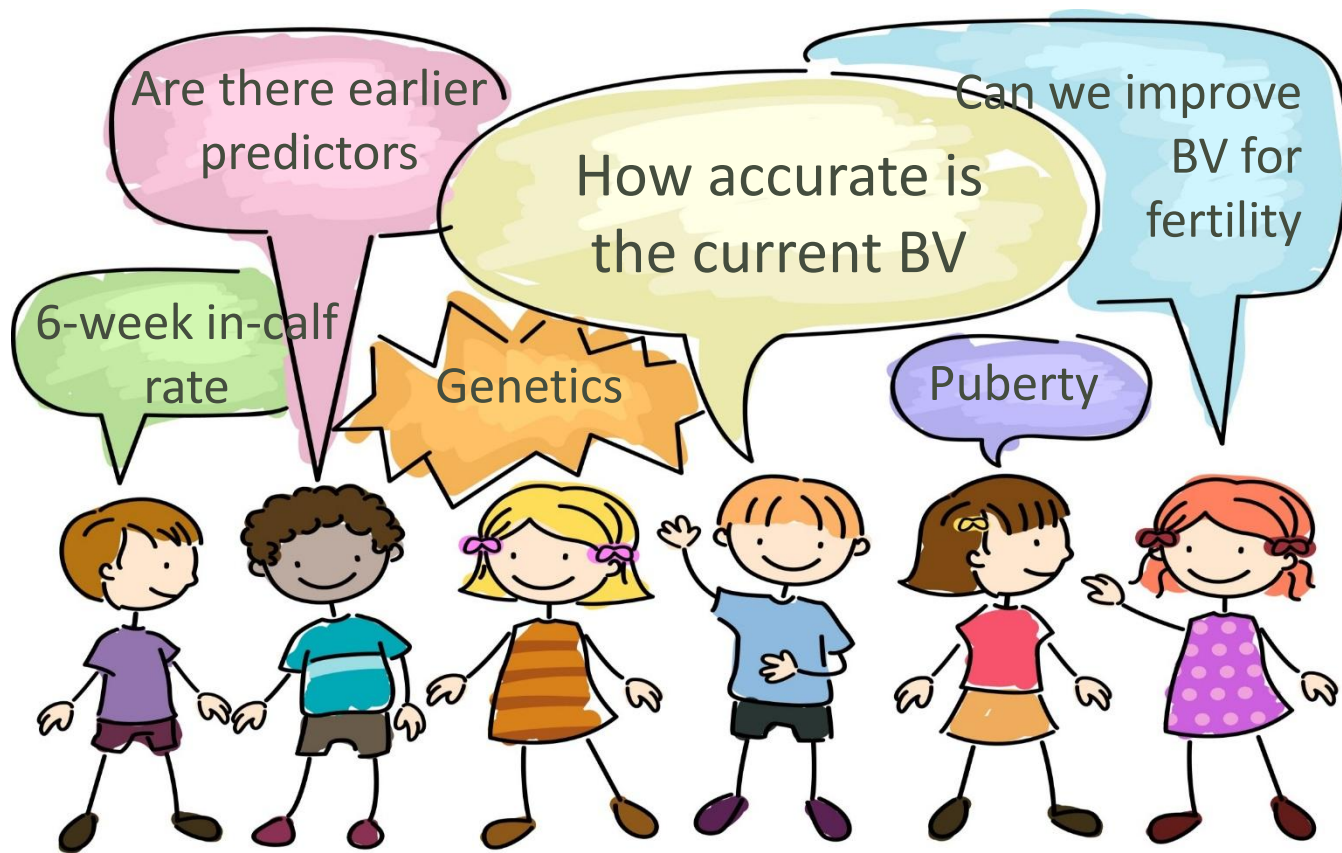
What does this mean

- Potential
 - Impact on disease?
 - Needs refinement to fit with out system
 - Dosage
 - Timing
 - Cost



Modelled effect of phenotypic and genetic improvements



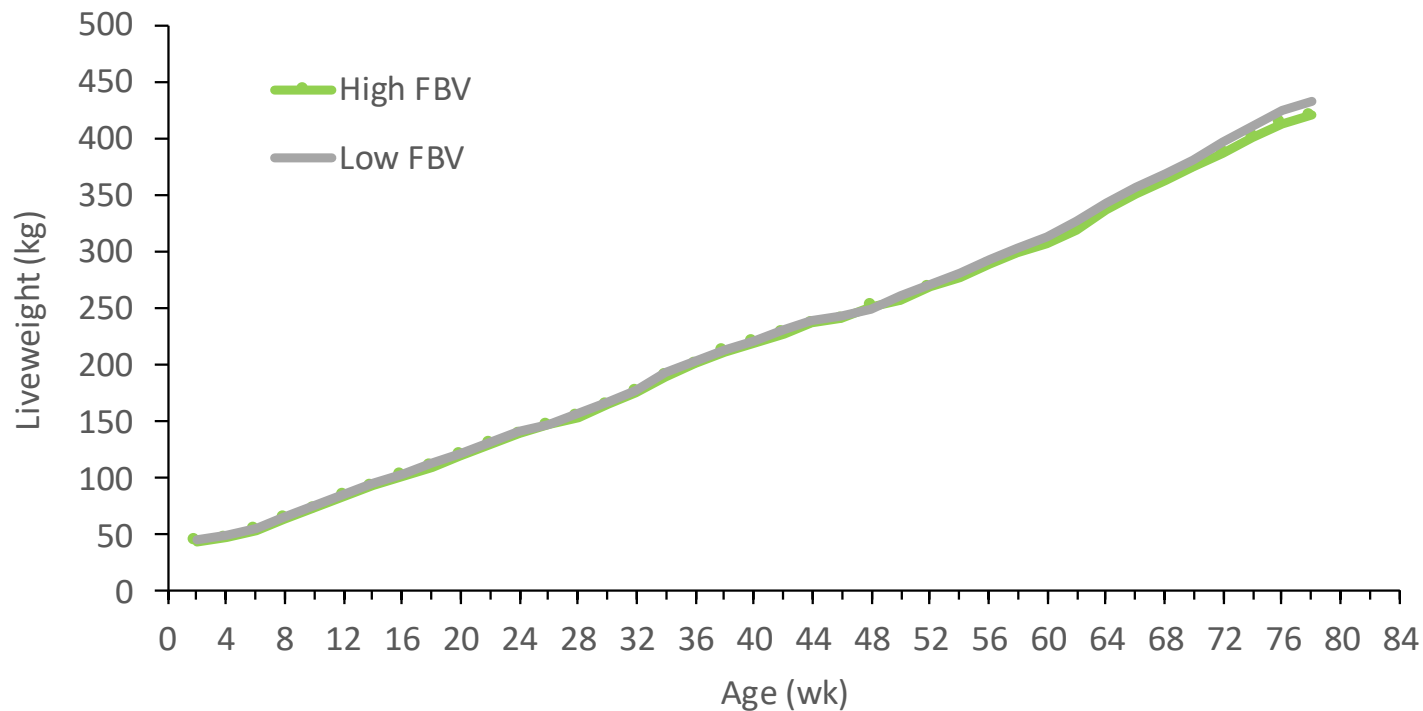


Animal model

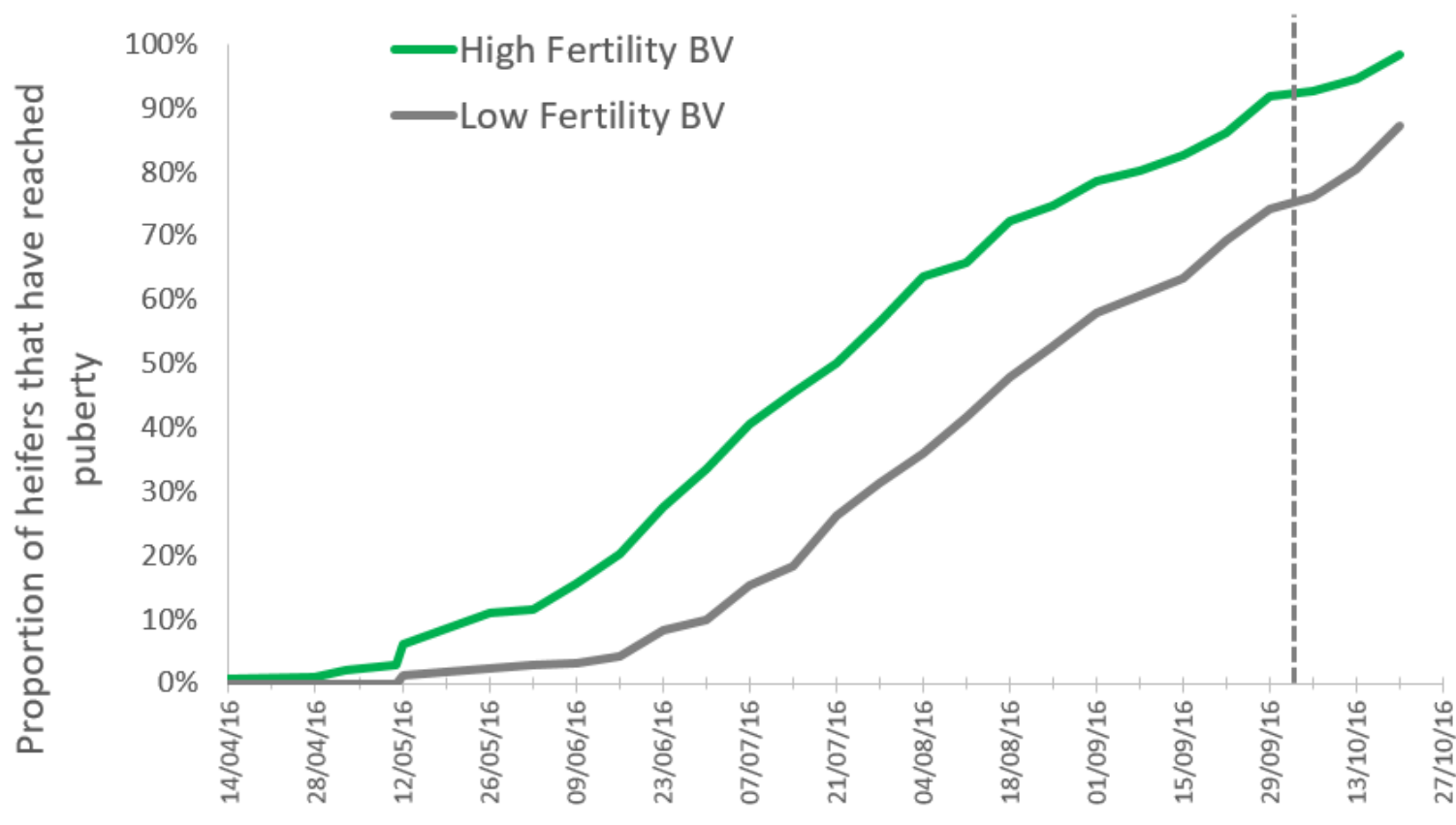
- 500 cow herd with divergence in Fertility BV
 - HIGH FBV +5 BV units
 - LOW FBV -5 BV units



Liveweight



Puberty



Age and Liveweight (LWT) at puberty

Trait	High FBV (275)	Low FBV (249)	Diff
Age at puberty (d)	358	379	*
LWT at puberty (kg)	271	296	*
Percentage mature LWT	51	55	*

21 DAYS
SOONER

25 KGs
LIGHTER

Heifer pregnancy outcomes

Measures (%)	High FBV (275)	Low FBV (249)	Diff
6-wk in-calf rate	90	81	*
Not in-calf	2	6	NS
Pregnancy losses	2	4	NS

Lactating cows

Measures	High FBV (257)	Low FBV (224)	Diff
Calved by 3 wks	78%	72%	NS
Calved by 6 wks	92%	91%	NS
Calved by 9 wks	97%	97%	NS

Lactating cows

Measures	High FBV (257)	Low FBV (224)	Diff
Calved by 3 wks	78%	72%	NS
Calved by 6 wks	92%	91%	NS
Calved by 9 wks	97%	97%	NS
PPAI (d)	47d (96%)	54d (56%)	*
3-wk submission rate	85%	49%	*
6-wk submission rate	94%	56%	*

Lactating cows

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Calved by 3 wks	78%	72%	NS
Calved by 6 wks	92%	91%	NS
Calved by 9 wks	97%	97%	NS
PPAI (d)	47d (96%)	54d (56%)	*
3-wk submission rate	85%	49%	*
6-wk submission rate	94%	56%	*
CIDR treated at 7 th wk mating	5% (13 cows)	48% (105 cows)	*
No response to CIDR (of CIDR cows)	15% (1 cow)	25% (20 cows)	*

What does this mean



- FBV is a good predictor of fertility
- Opportunity to improve the accuracy of the fertility BV by incorporating puberty measures
- “Scale up” Differences in commercial herds with range of BV

Summary

- Conception loss occurs in first week of pregnancy
 - Oocyte quality, follicular fluid
- Greater understanding of health and immune function of transition cow
 - Management solutions such as Zeolite, Imrestor
 - Ketosis
- Opportunity for accelerated rate of genetic gain



Acknowledgements

- Dairy Inc (NZ dairy farmers)
- MBIE
- DNZ R&D team
- AbacusBio, AgResearch, Anexa FVC Cognosco, NZAEL, Massey University, University of Queensland, Monash University, Victoria University, VetEnt, VetSouth



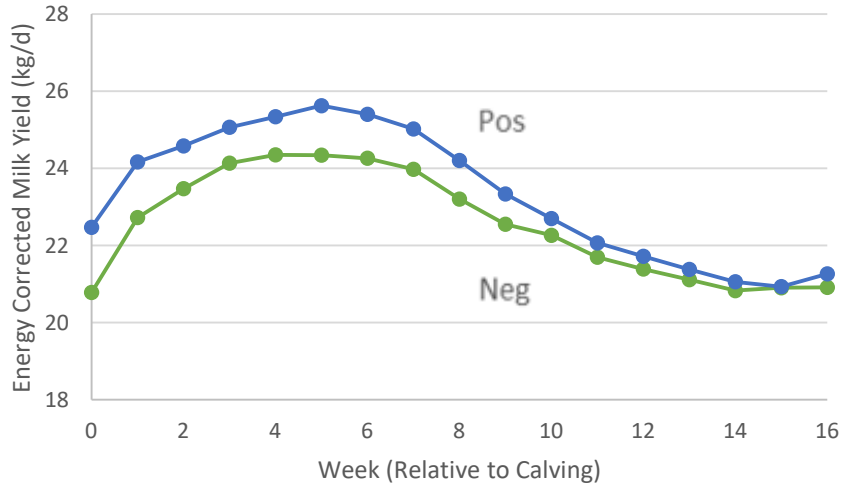
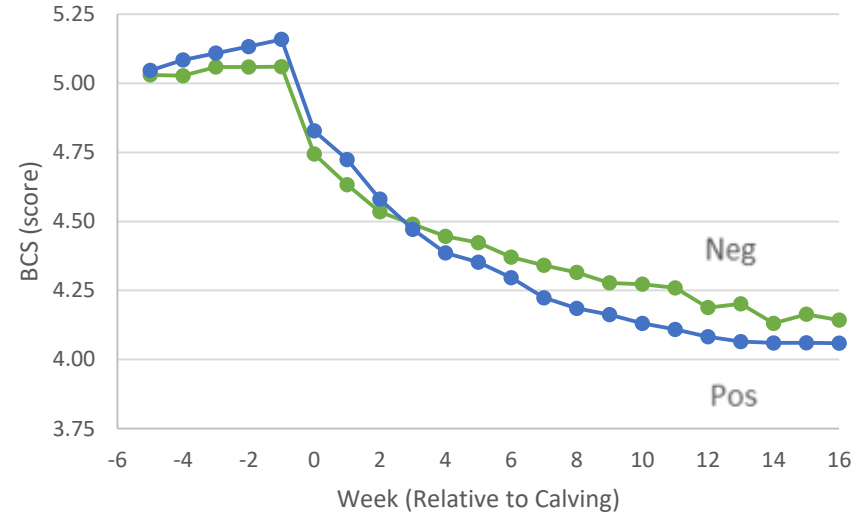
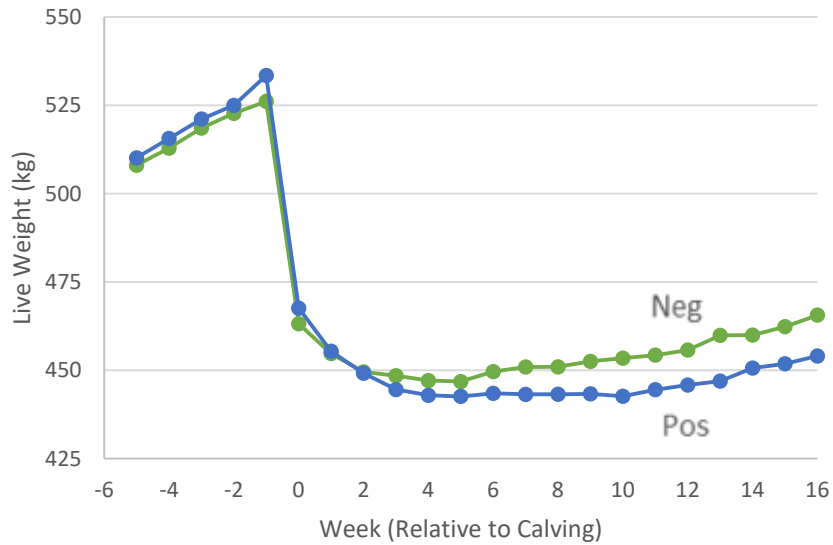
Metabolic diseases

High blood ketones (ketosis)

- “Sub Clinical Ketosis” (1.2 – 3.0 mM)
- “Clinical Ketosis” (> 3.0 mM)

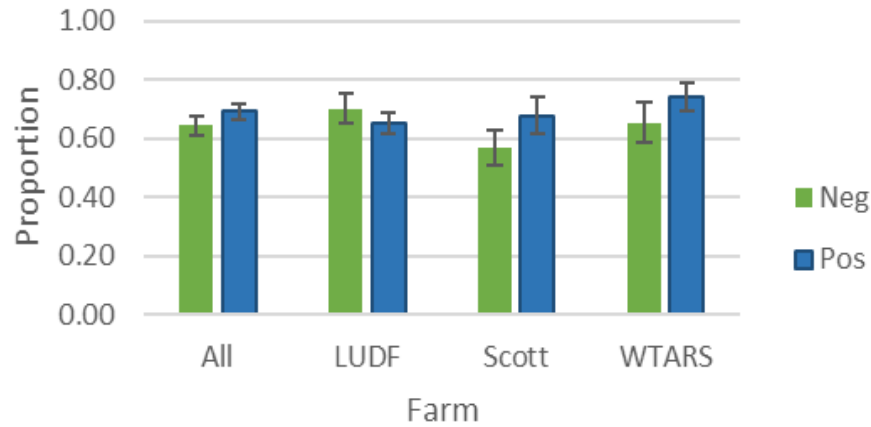


Incidence	Scott	WTARS	LUDF	ALL
No. of cows	292	249	426	967
% cows with “SCK”	65%	80%	82%	75%
% cows with “CK”	12%	18%	6%	12%



When threshold BHB 1.2 mM
- cows had greater LWT and
BCS loss post-calving
and produced more milk

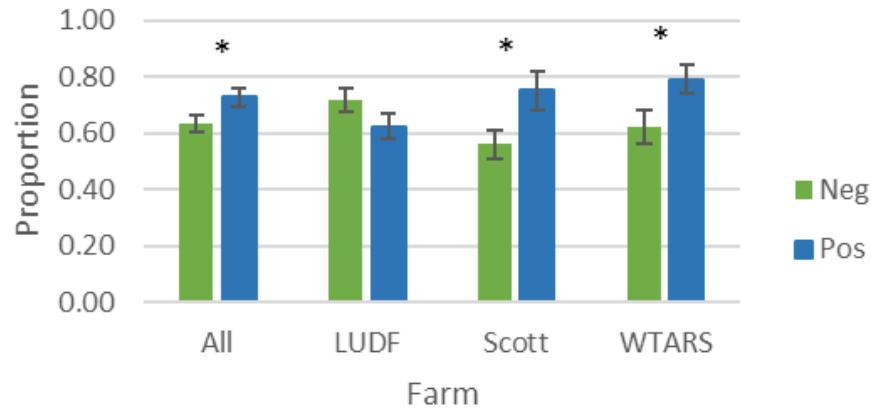
6-week in-calf rate (1.2 mM)



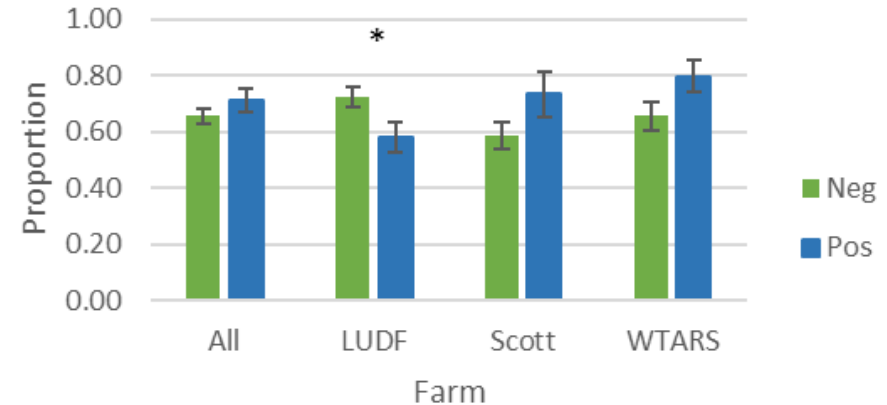
When threshold BHB 1.2 mM –
no difference in 6-week in-calf
rate

When threshold BHB 1.4 or 1.6
mM – farm specific

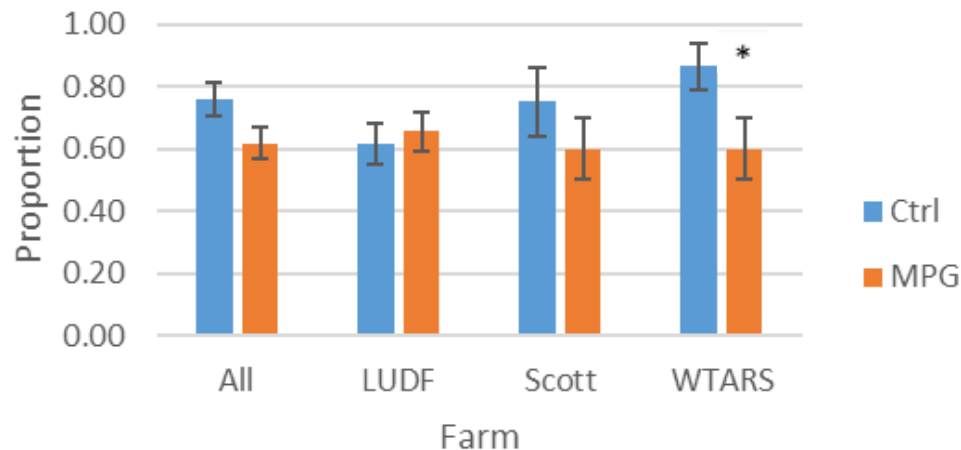
6-week in-calf rate (1.4 mM)



6-week in-calf rate (1.6 mM)



6-week in-calf rate (1.6 mM)



When threshold BHB 1.6 mM -
MPG treatment did not
improve 6-week in-calf rate
MPG treatment decreased 6-
week in-calf rate at WTARS

BHB levels alone are not a good indicator of SCK or CK

MPG treatment not recommended unless other signs of ill-
health