Holding on the Genetic Potential of Calves

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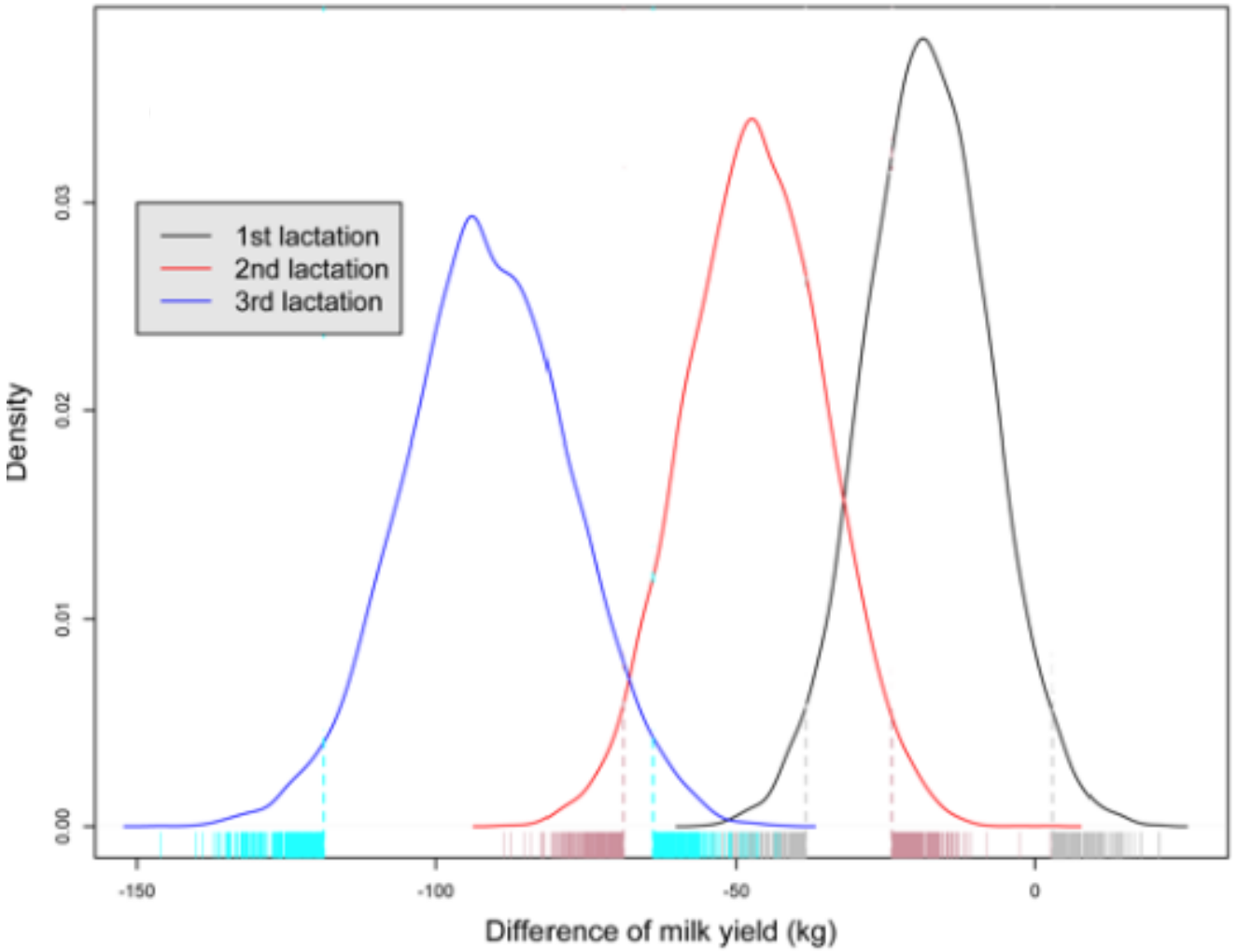
IRTA
INVESTIGACIÓN Y TECNOLOGÍA AGROALIMENTARIAS

ICREA

Introduction

- Milk production by cow has doubled in the last 20 years
- Milk production per capita is 14% lower now than in 1960
- About 17% of the ‘new products’ of the dairy industry fail

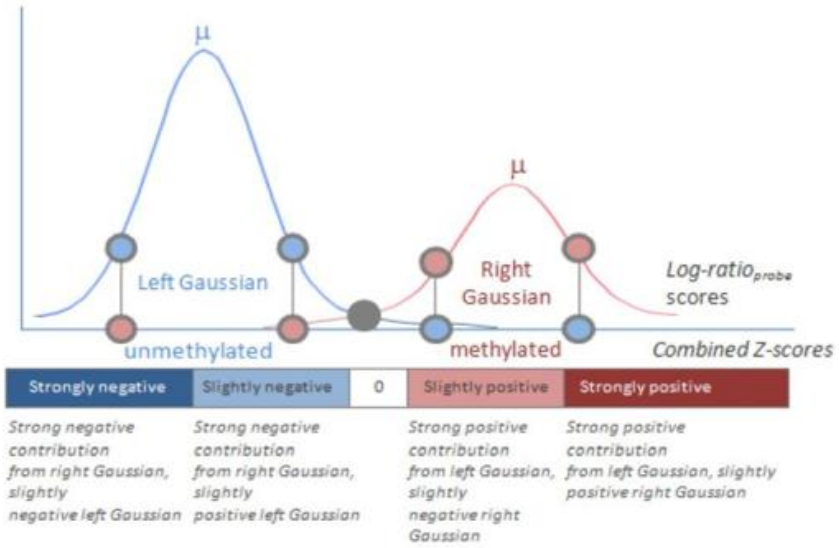
Introduction

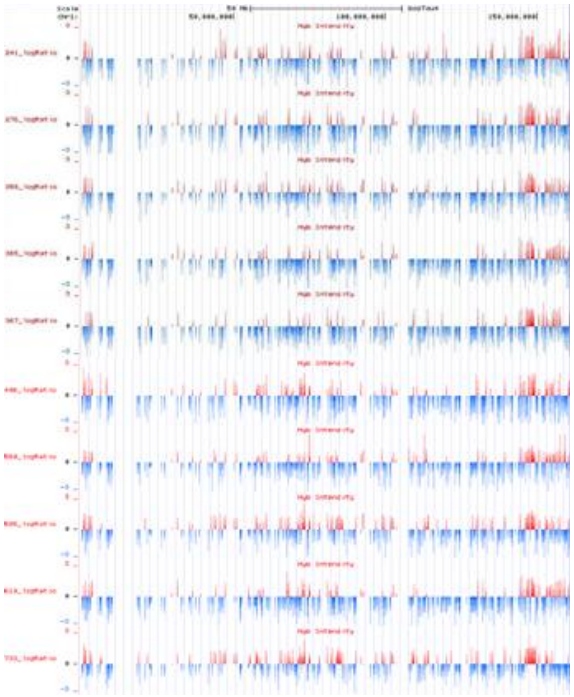


González-Recio et al., 2012

Introduction

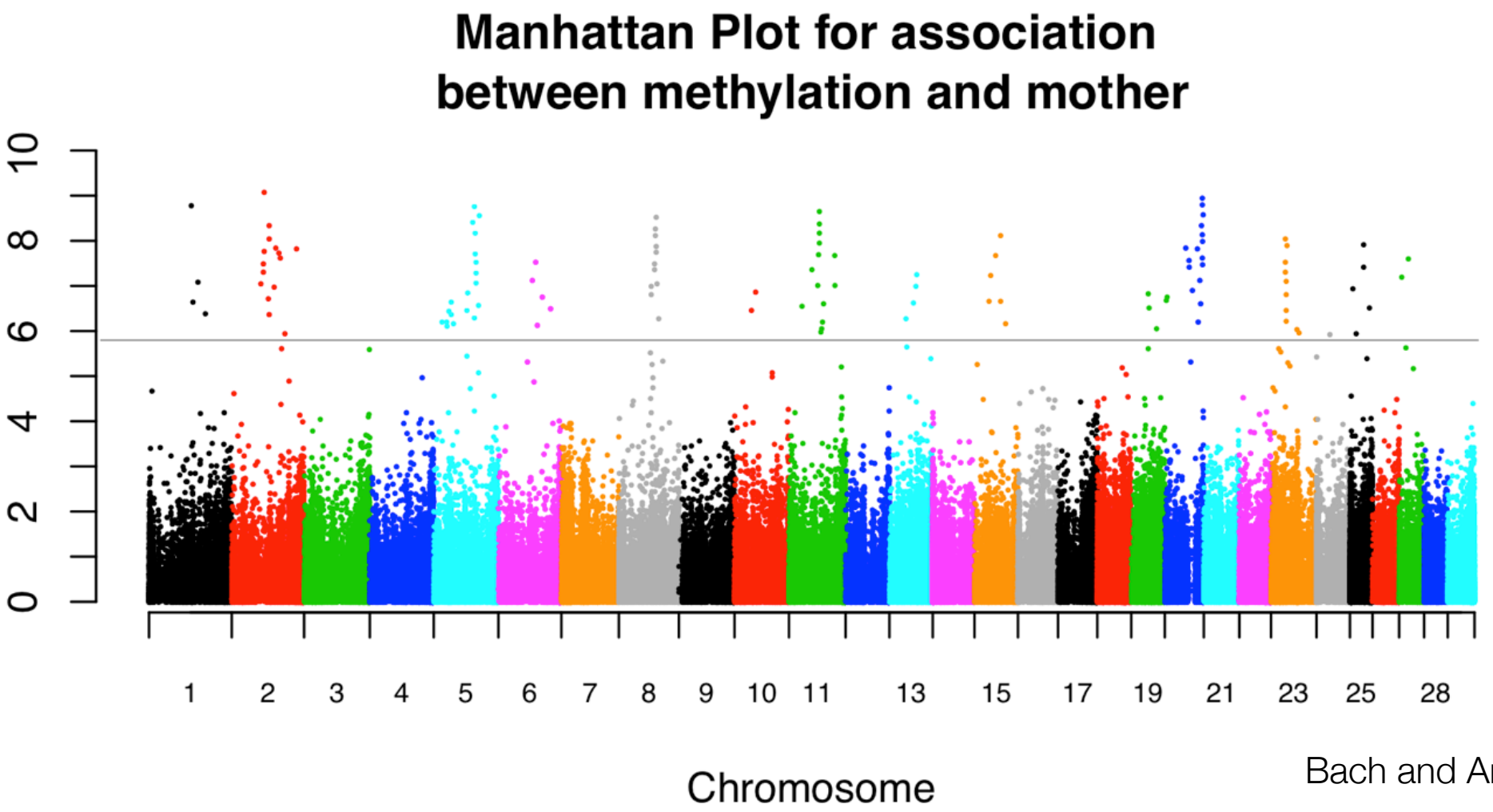
- 10 half-sisters born to heifers (n=5) or to multiparous (n=5)
  - Results from gene expression INDIA





- All 5 calves born to multiparous had 50 pb coding for ZP-1 100% methylated, whereas the 5 calves born to heifers had these pb unmethylated

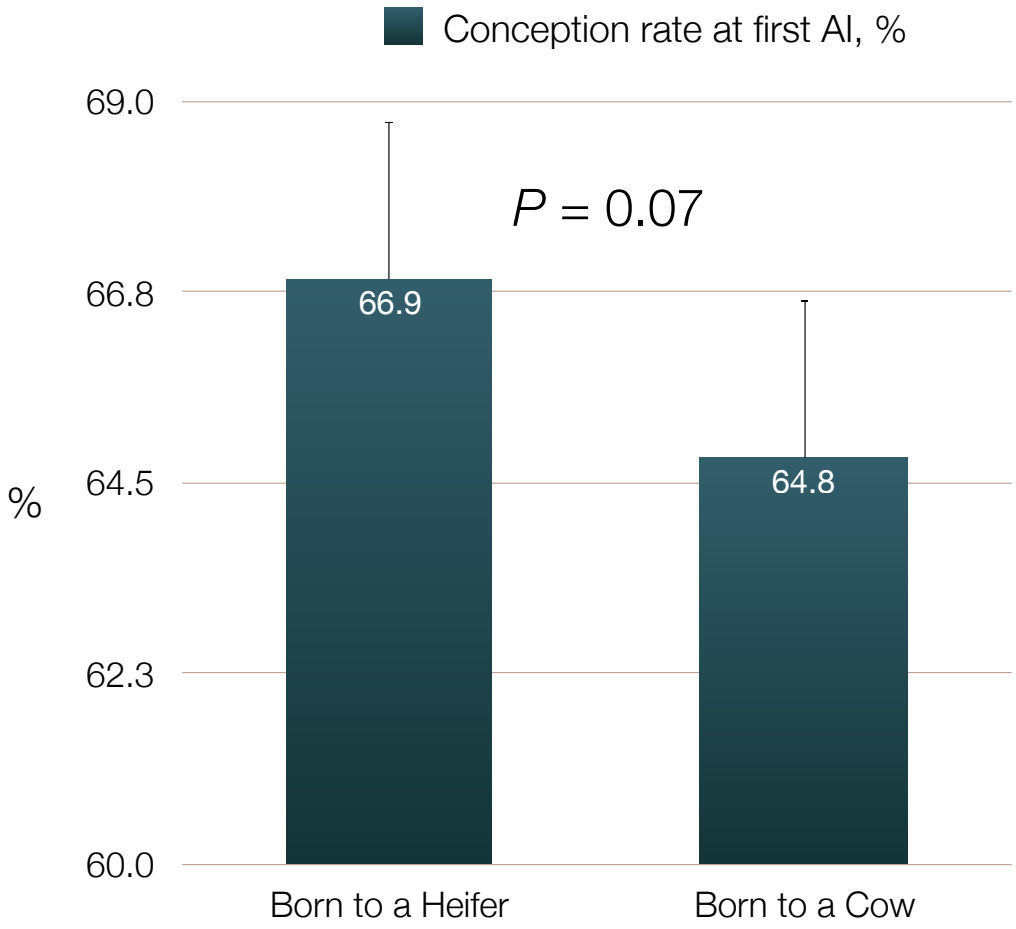
Introduction



Bach and Aris, 2013

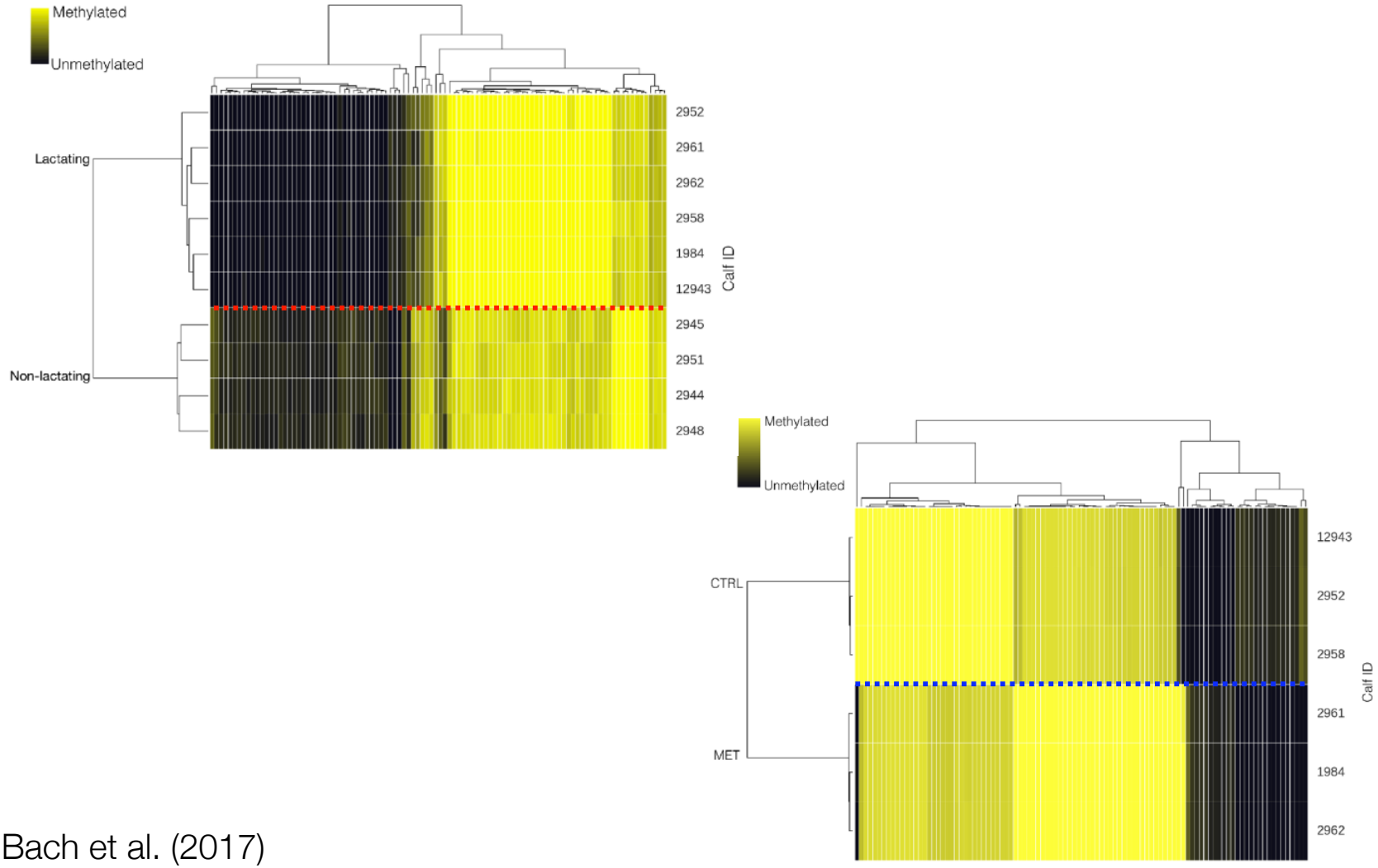
Introduction

n=9,786 (3,861 born to heifers; 5,925 born to cows)



Bach (2019)

Introduction



Bach et al. (2017)

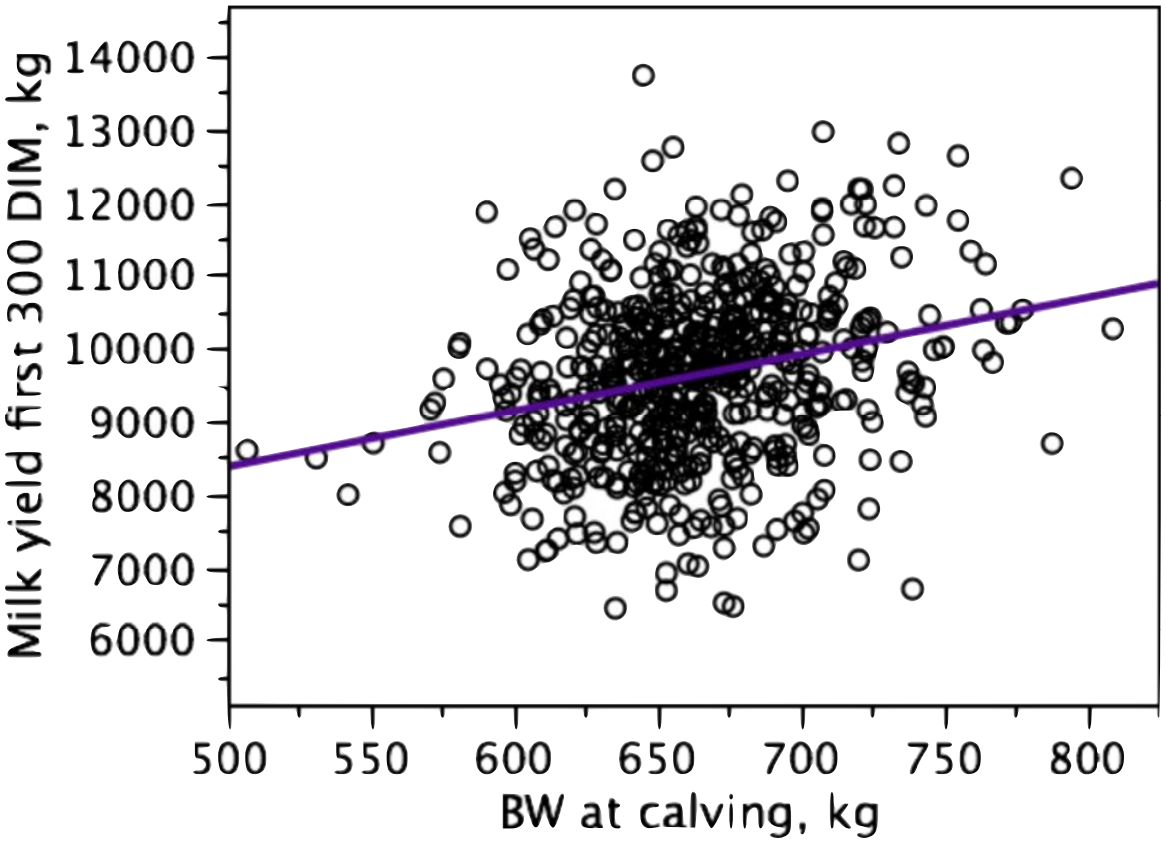
Introduction

- The most common objective is to have a first-calf heifer at about 22-23 months weighing about 620 kg before calving and be 137-147 cm tall at the withers

- However, the mean AFC in the US is about 27 months (Hare et al., 2006), and in Europe ranges between 25 and 29 months depending on the country (Berry and Cromie, 2009)

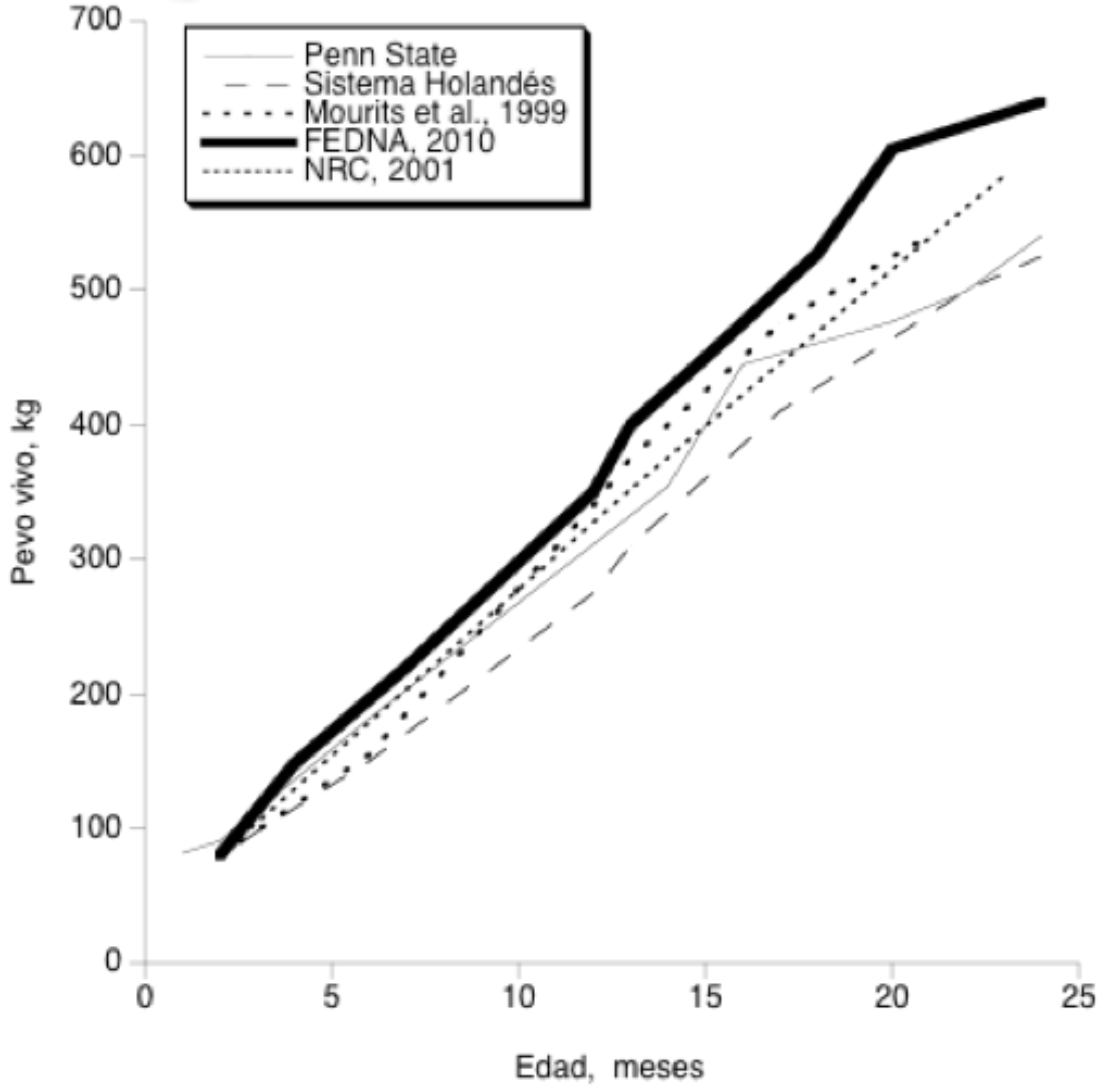
Economic Aspects

- For every additional kg of BW at calving, on average, an increase of 14.5 kg of milk could be expected in the first lactation (70 kg are equivalent to 1,000 kg of milk)

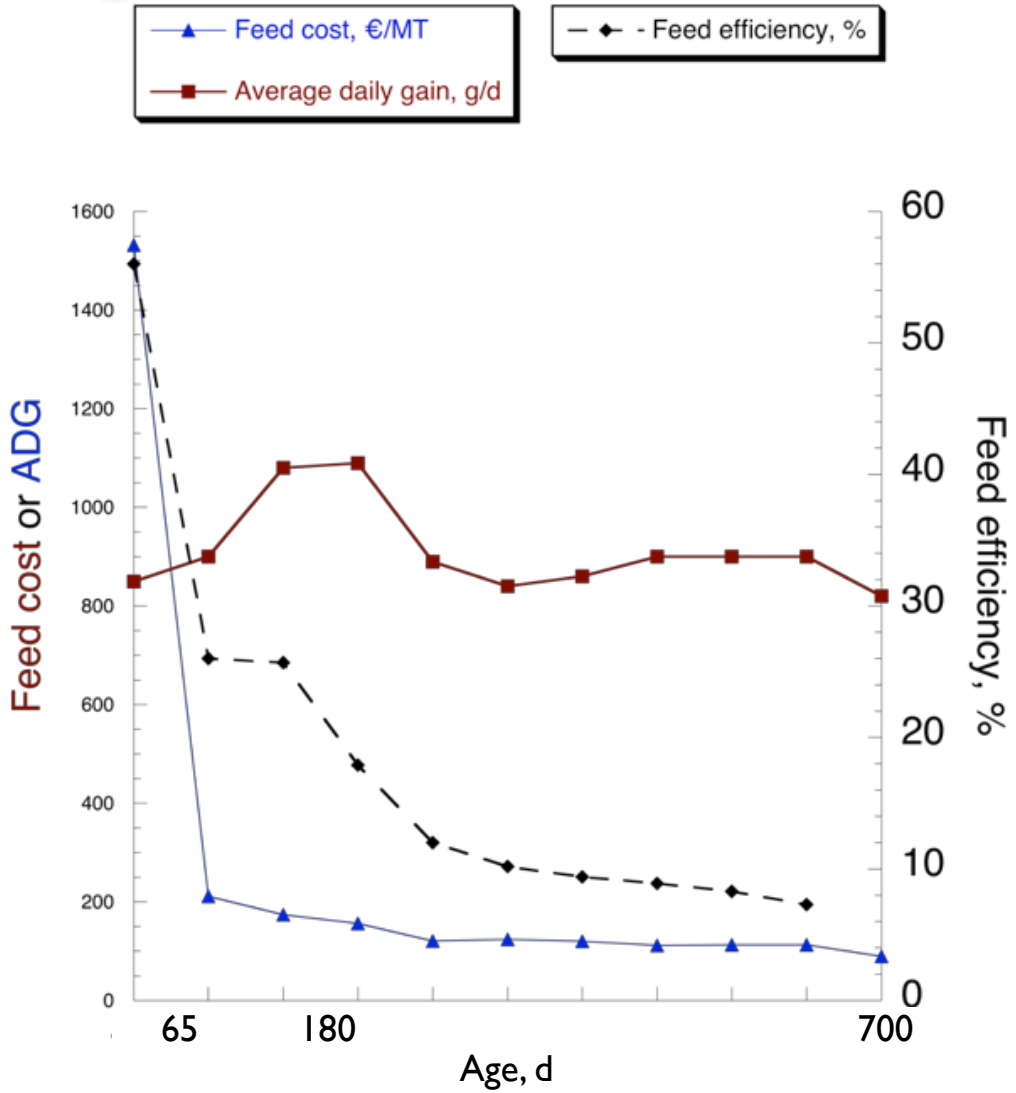


Bach and Ahedo, 2008

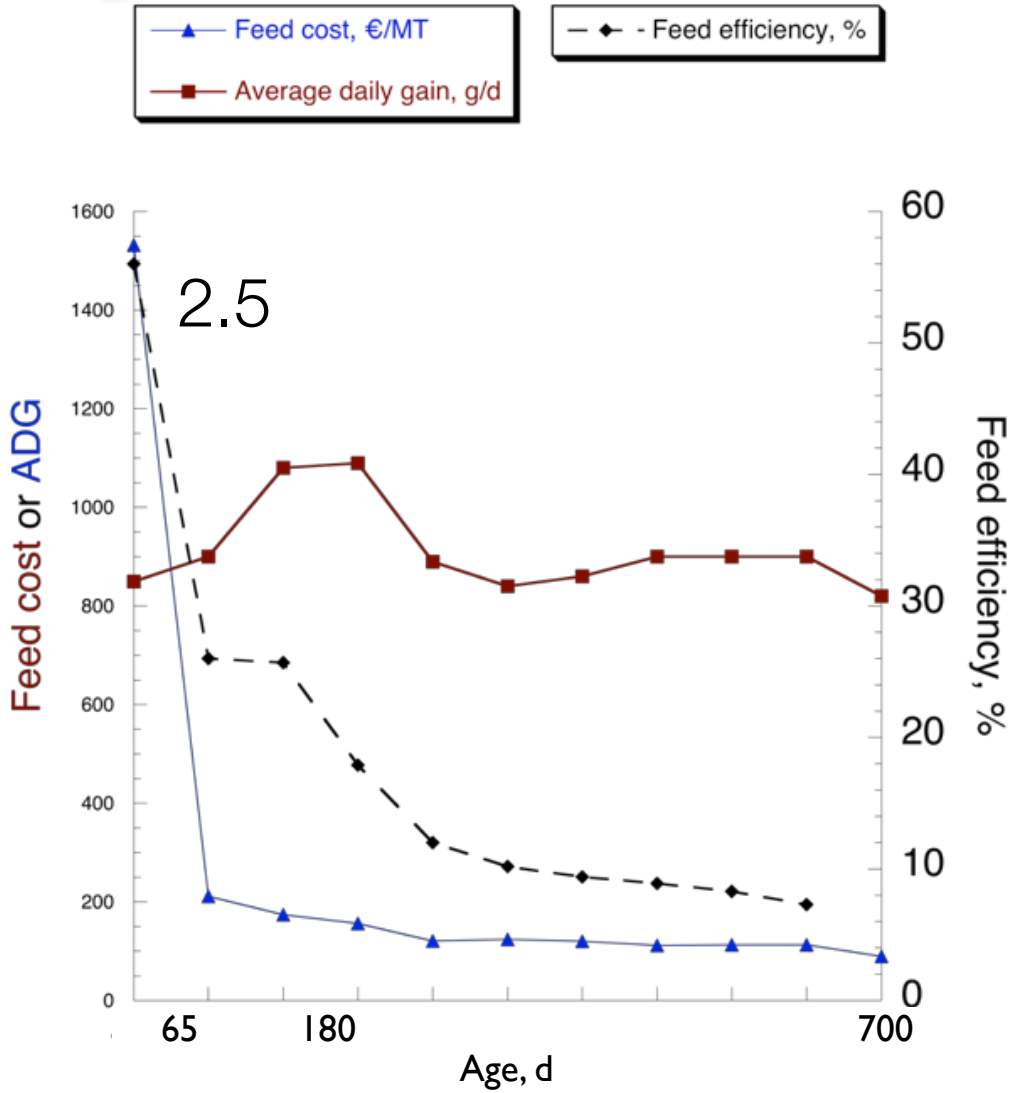
Economic Aspects



Economic Aspects



Economic Aspects



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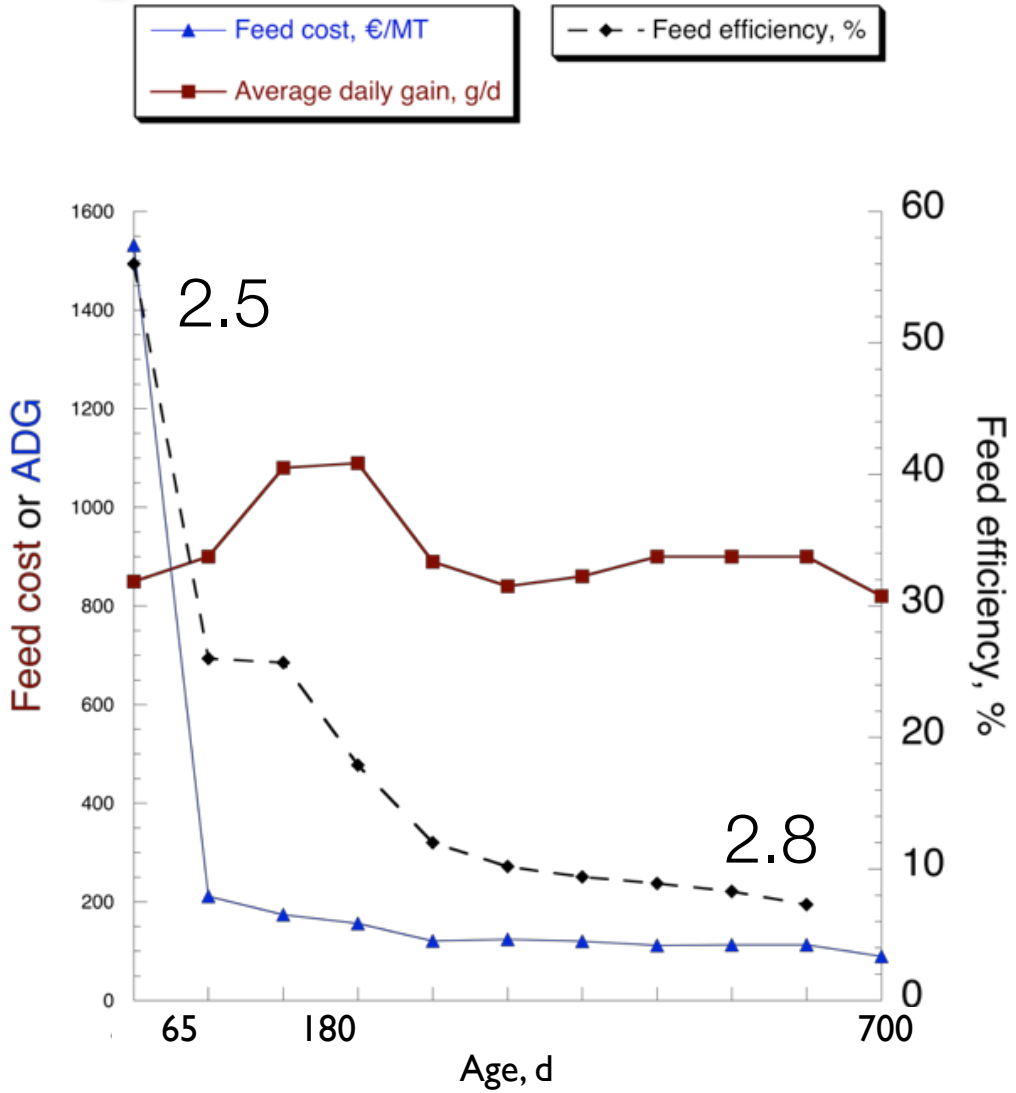

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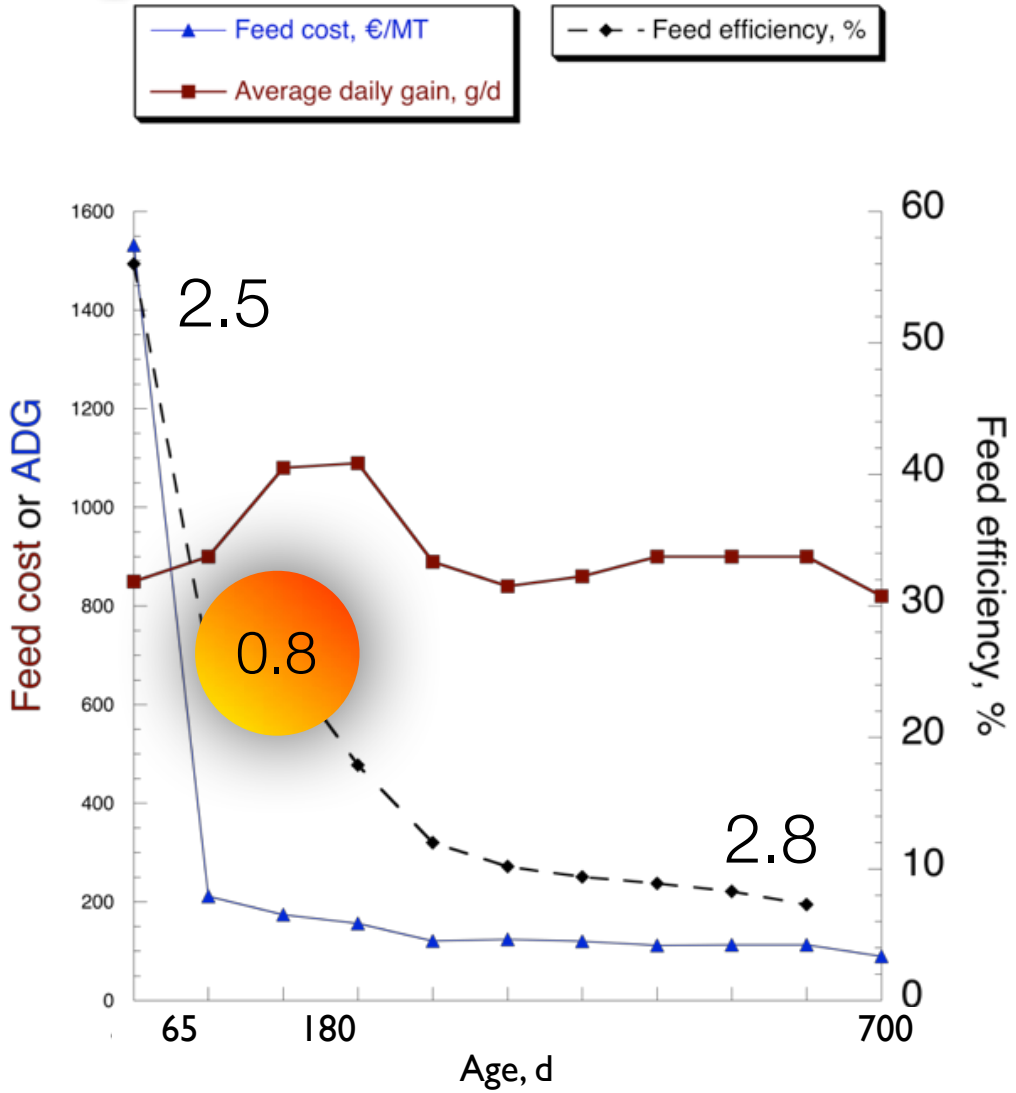

Setting the stage

Authors	X	ADG	Milk	Significance
Holloway and Totusek, 1973	Mom	N/A	+10%	$P < 0.10$
Bar-Peled et al., 1997	Mom 3X vs MR 2X	+100 g	+4%	$P < 0.10$
Shamay et al., 2005	WM 2X vs MR 1X	+300 g	+4%	$P < 0.05$
Moallem et al., 2010	WM 2X vs MR 2X	+100 g	+10%	$P < 0.05$
Davis Rincker et al., 2009	MR 2X	+200 g	+4%*	$P < 0.10$
Terré et al., 2009	MR 2X	+100 g	+6%	NS
Raeth-Knight et al., 2009	MR 2X	+150 g	+5%	NS
Morrison et al., 2009	MR 2X	+150 g	-1 %	NS

Several abstracts omitted

Bach, 2012 (JAS)

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Several abstracts omitted

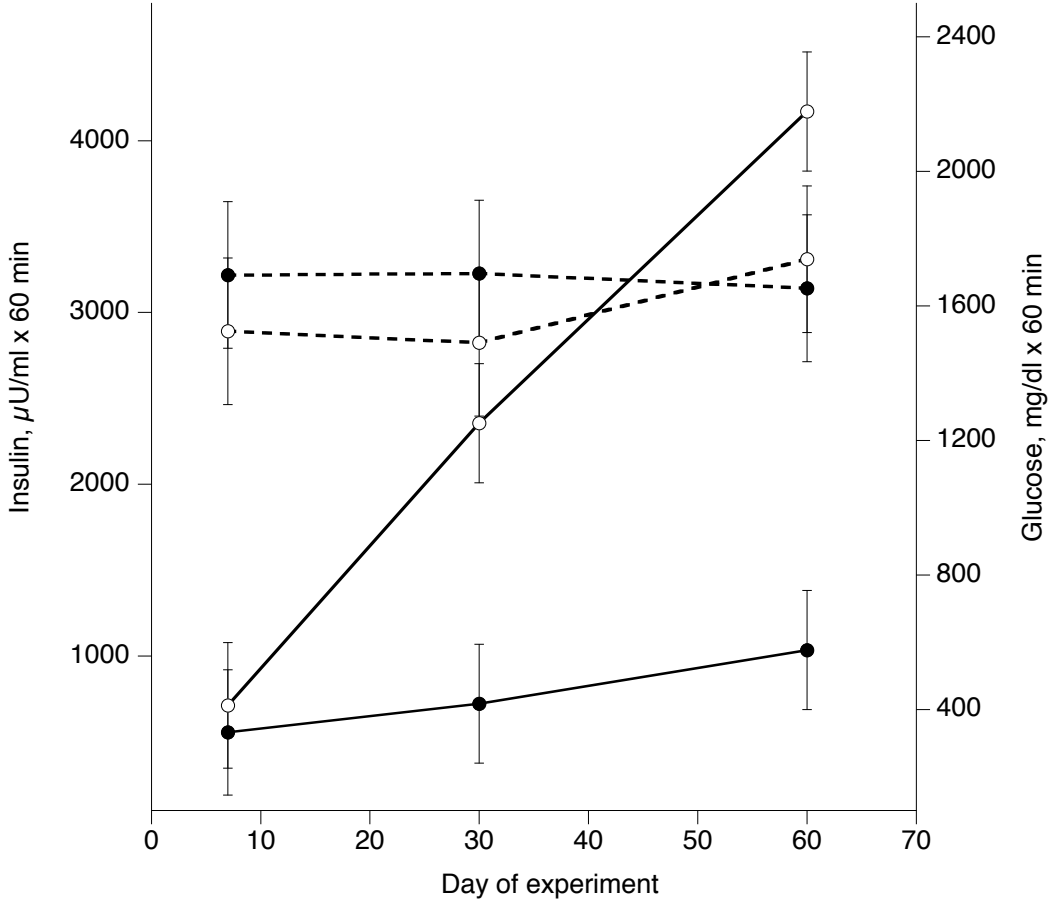
226 kg Milk/100 g
$P < 0.05$

Bach, 2012 (JAS)

Nutrition

Nutrition

- Supplying 4 L of MR per dose (8 L/d) increases blood glucose and the amount of insulin needed to maintain glycemia (insulin resistance)

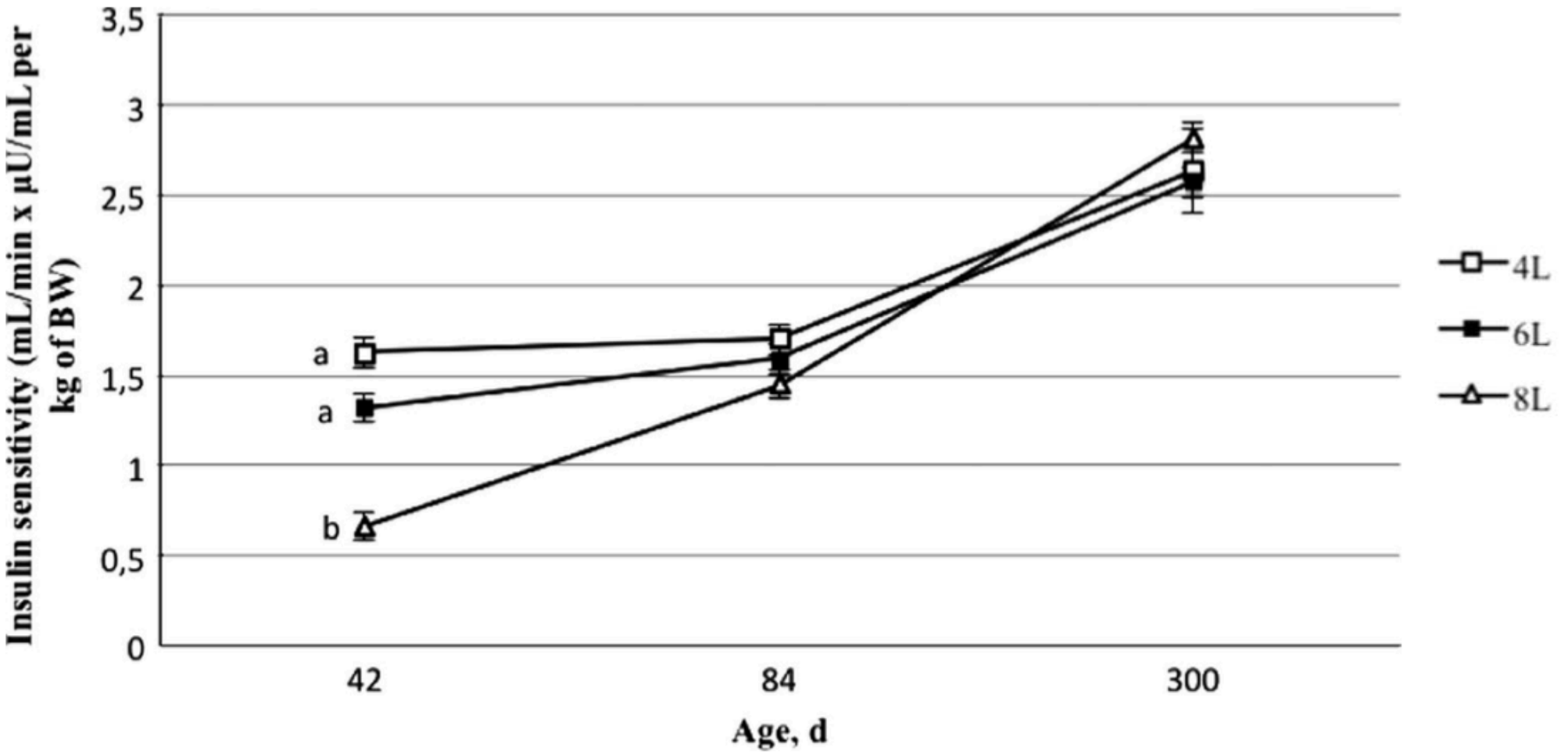


● 4 L/d

○ 8 L/d

Bach et al., 2013 (JDS)

Nutrition



Yunta et al., 2015 (JDS)

Palatability

- Offer starter with 18% CP, 18-10% NDF, < 4% fat, and 2.9 Mcal of ME/kg
- Use palatable ingredients

Wheat	Soybean meal
Sorghum	
Corn	
Barley	DDGs
Wheat midds	Sunflower
Oats	Peas
Rice	Rapeseed meal
Corn gluten feed	Corn gluten meal

Montoro et al., 2009

How the feed is offered matters

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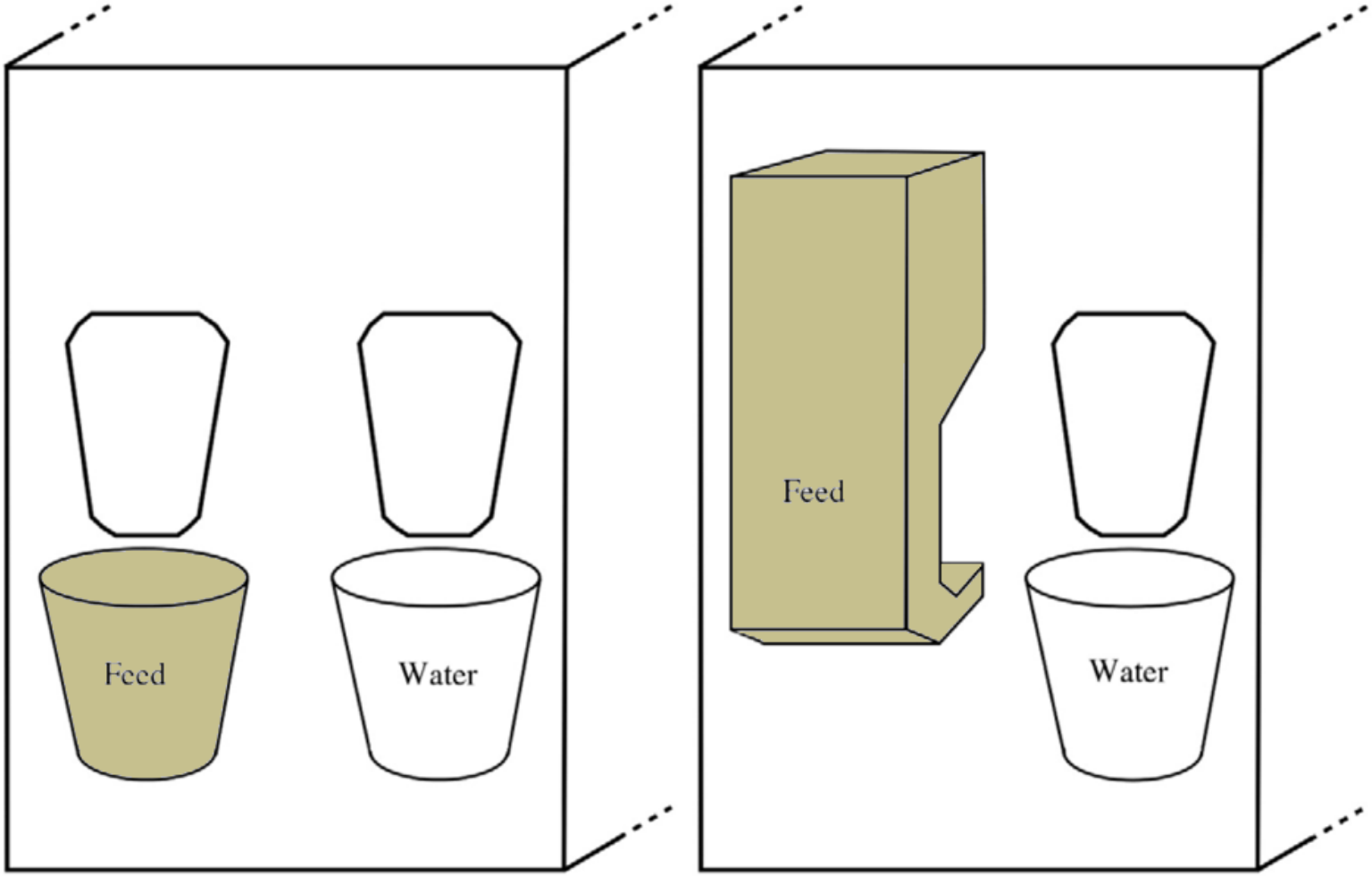

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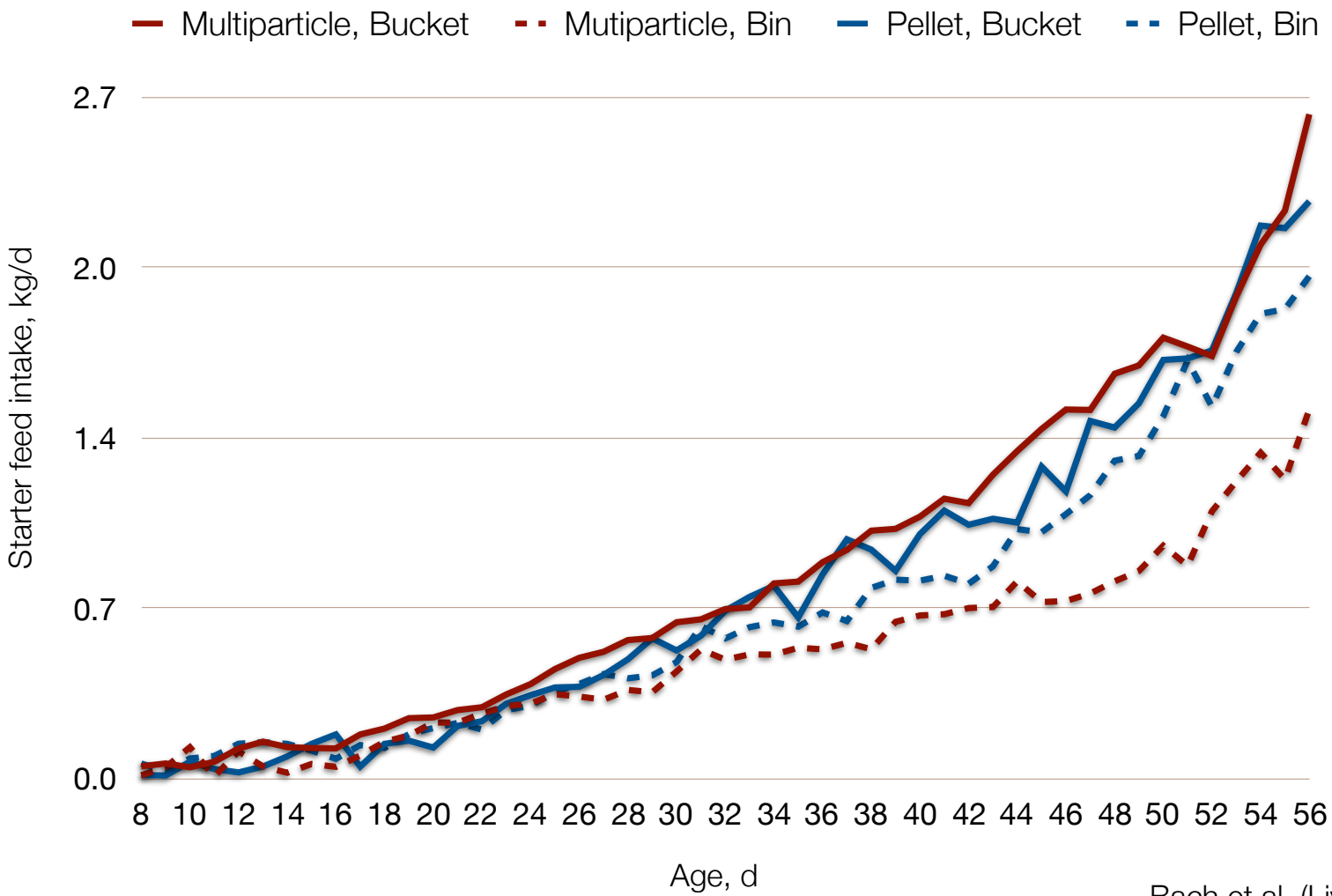
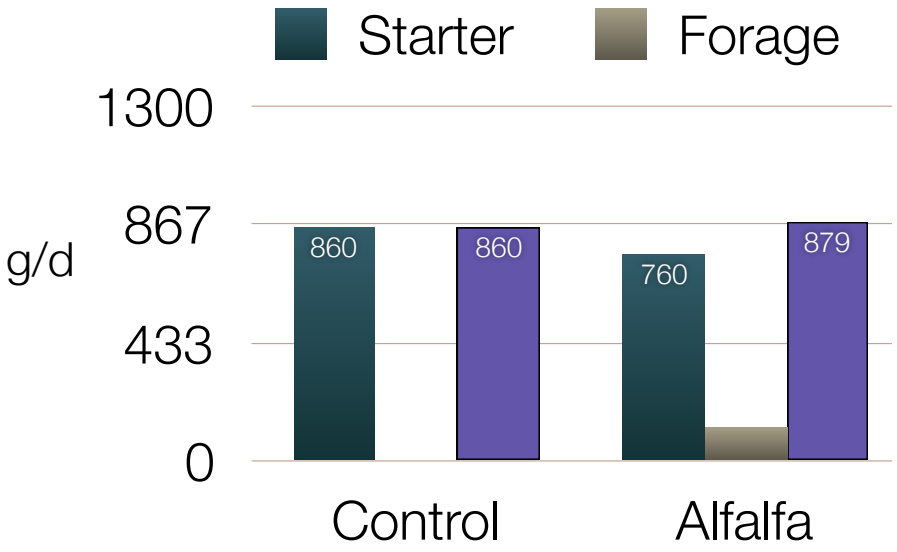


Bach et al. (Livestock Sci., 2010)

Nutrition

- The most common recommendation for feeding calves is to offer just starter and no forage before weaning (NRC, 2001)
- Recent evidence (Castells et al., 2012) indicates that offering chopped forages (2 cm) may increase total intake



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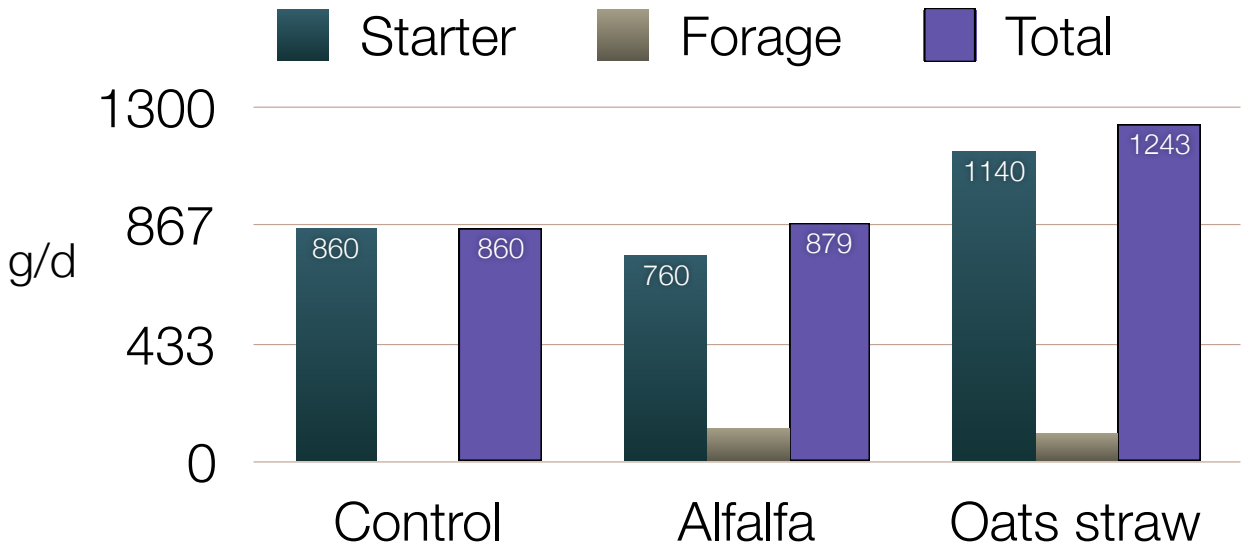

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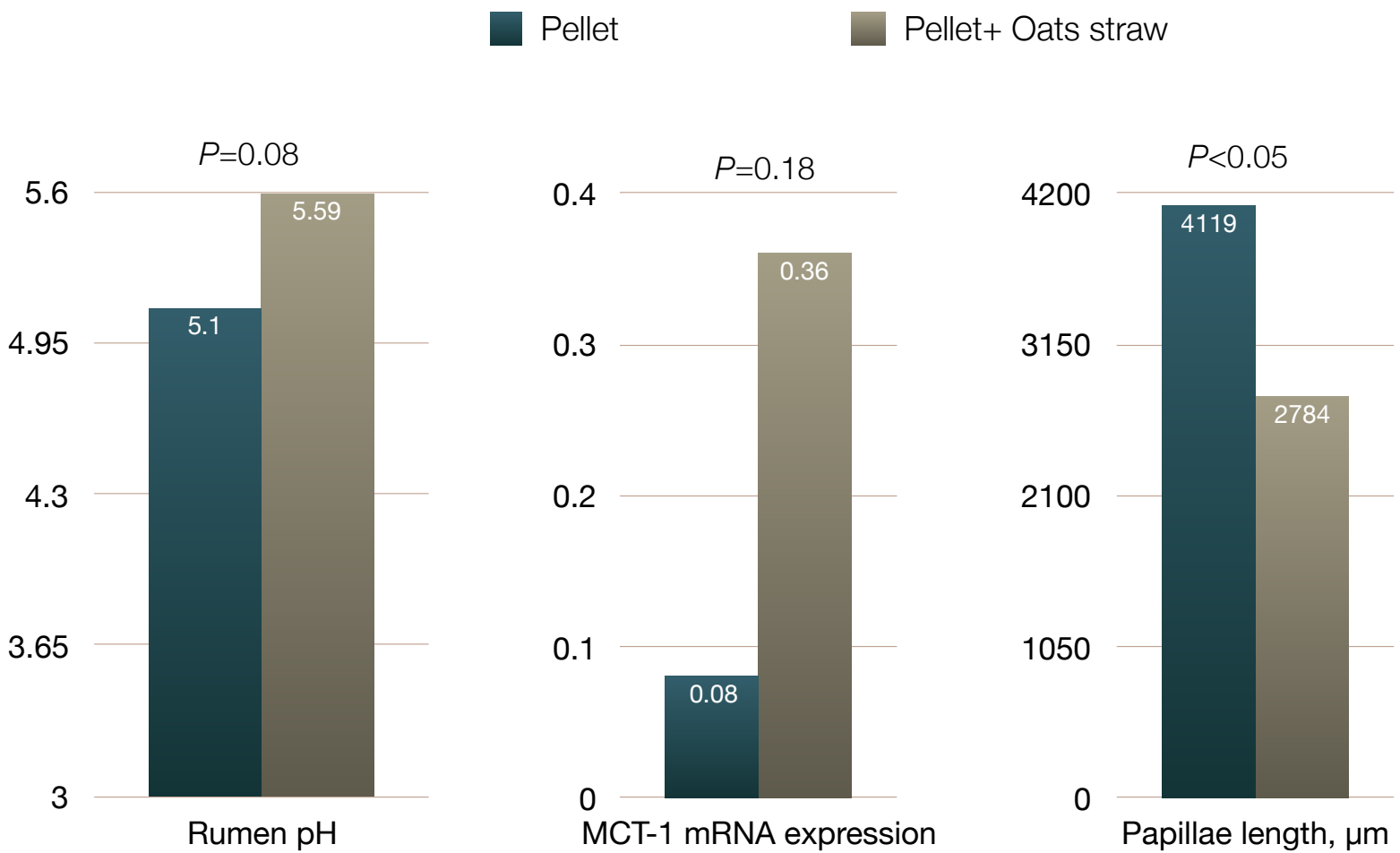
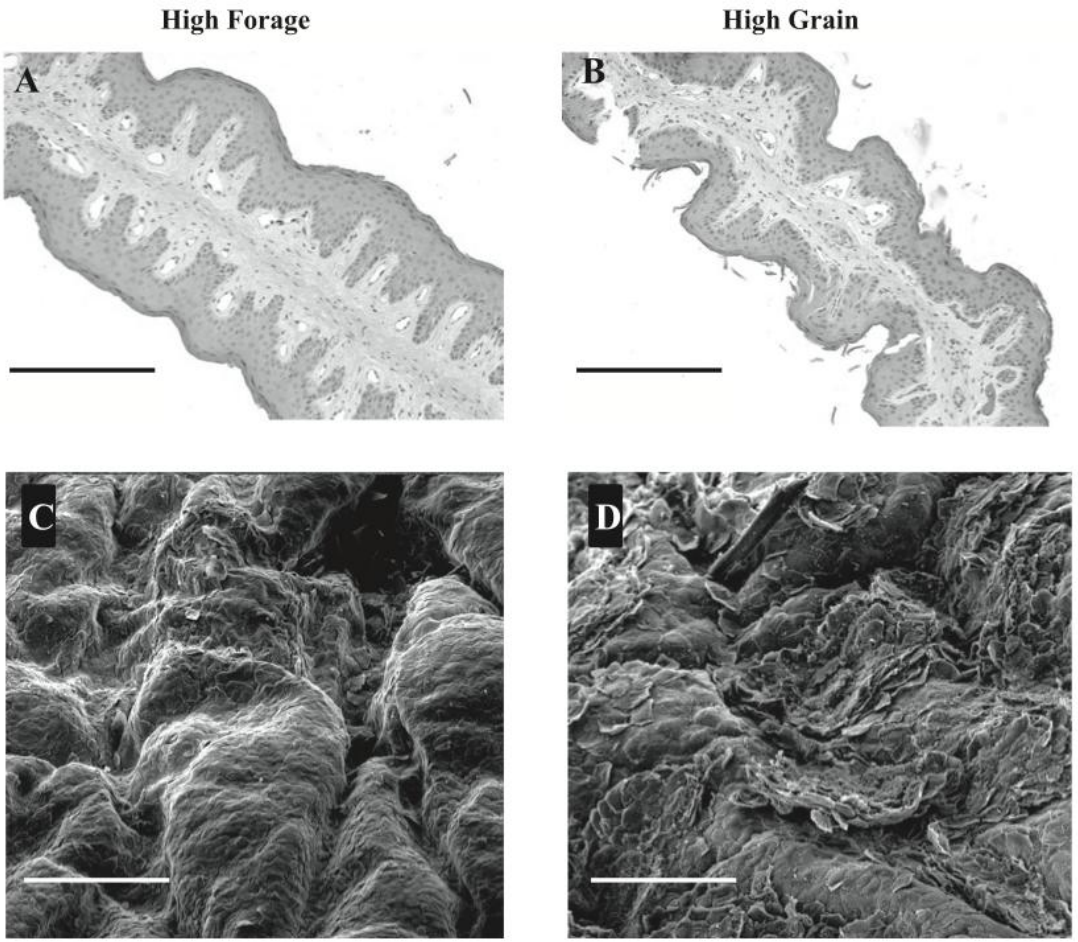


Castells et al. (JDS, 2013)

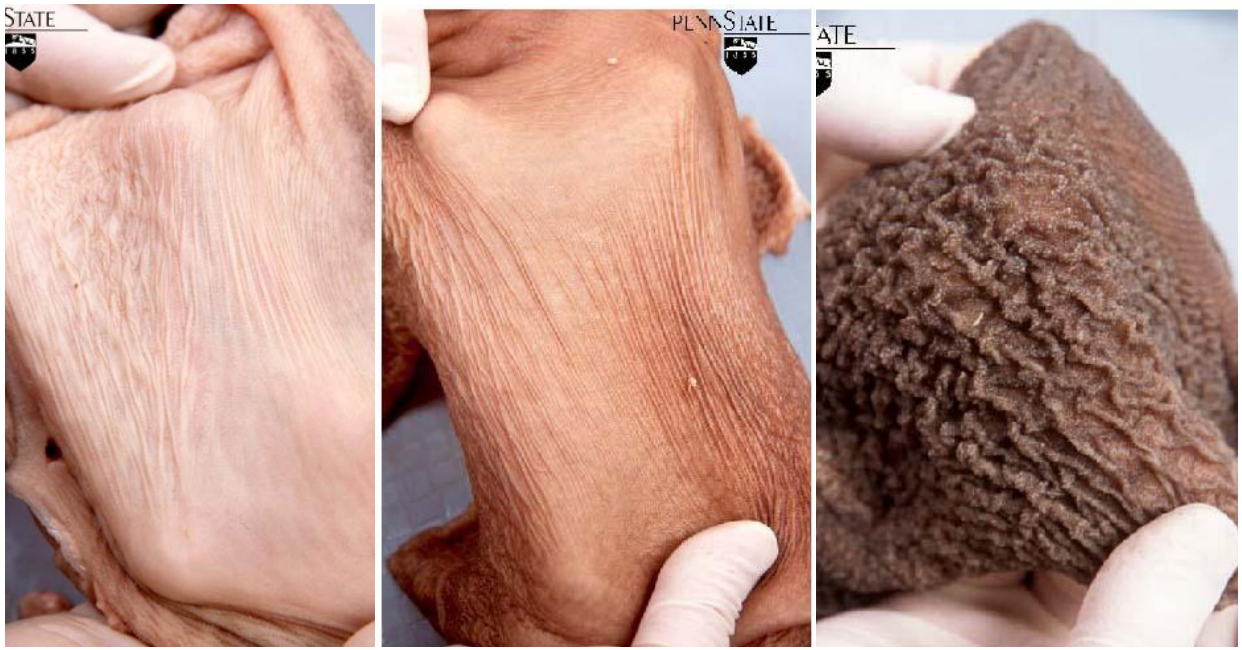
Nutrition

Mature Cows



Steele et al. (AJP Regul. Integr. Comp. Physiol., 2011)

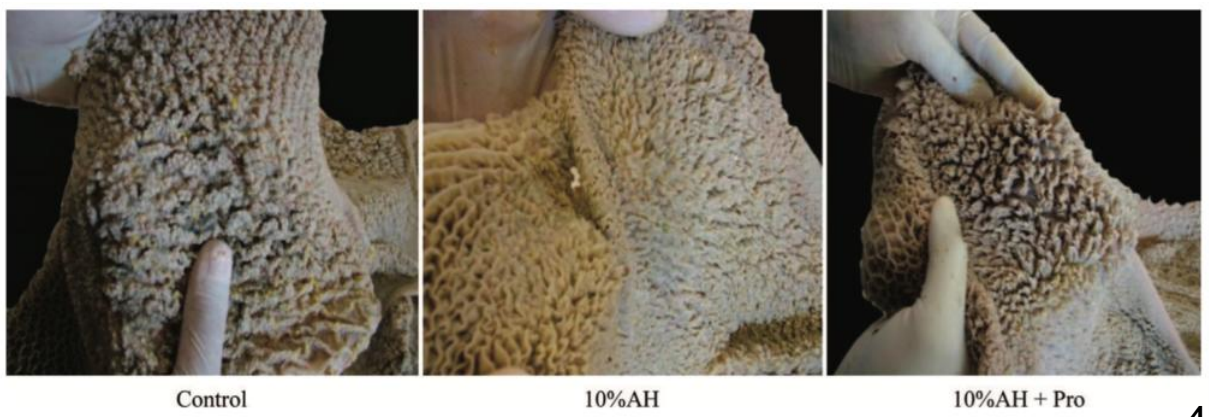
Rumen development



Milk Milk + hay Milk + grain

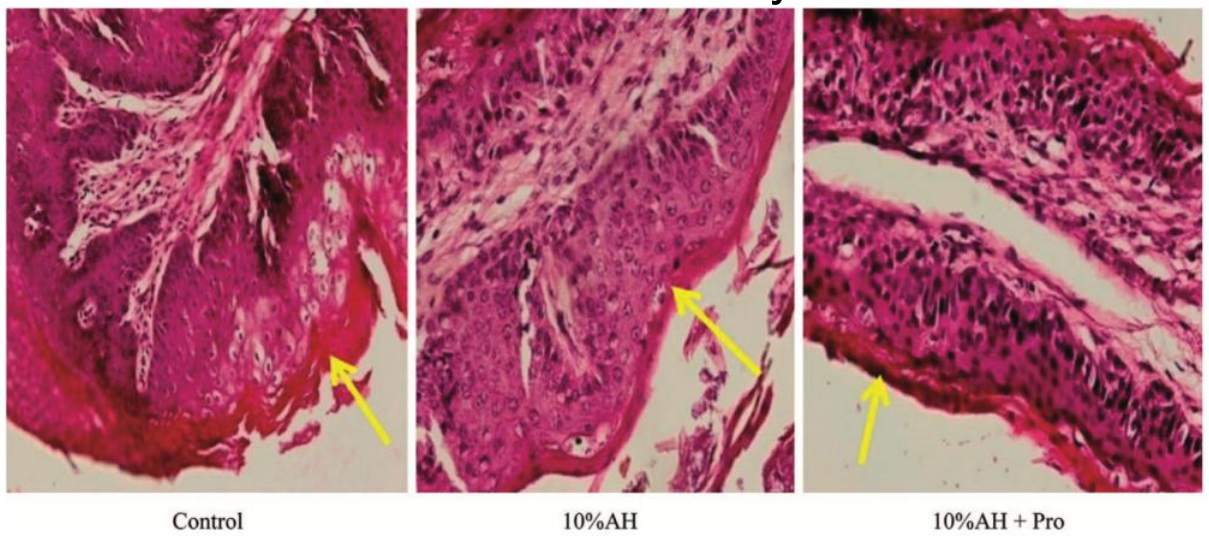
Pazoki et al., 2017

Reduced plaque formation



46 vs 40% starch

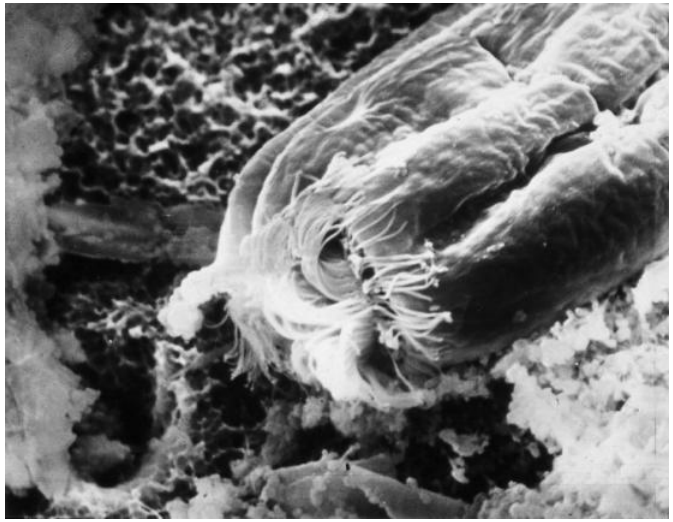
Thinner Keratin layer

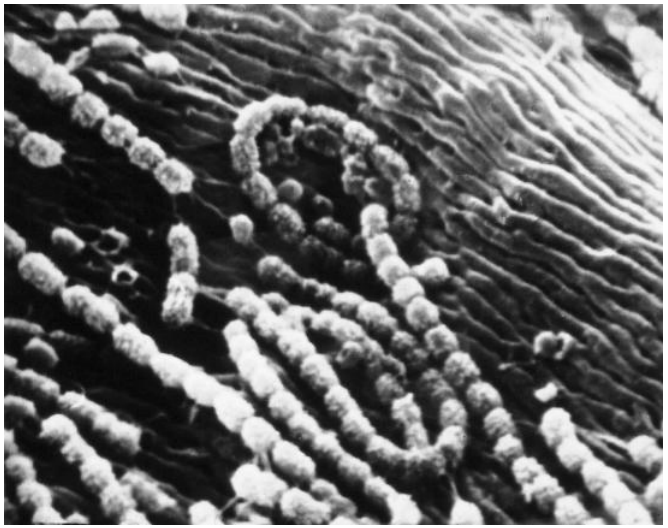


Beiranvand et al., 2014

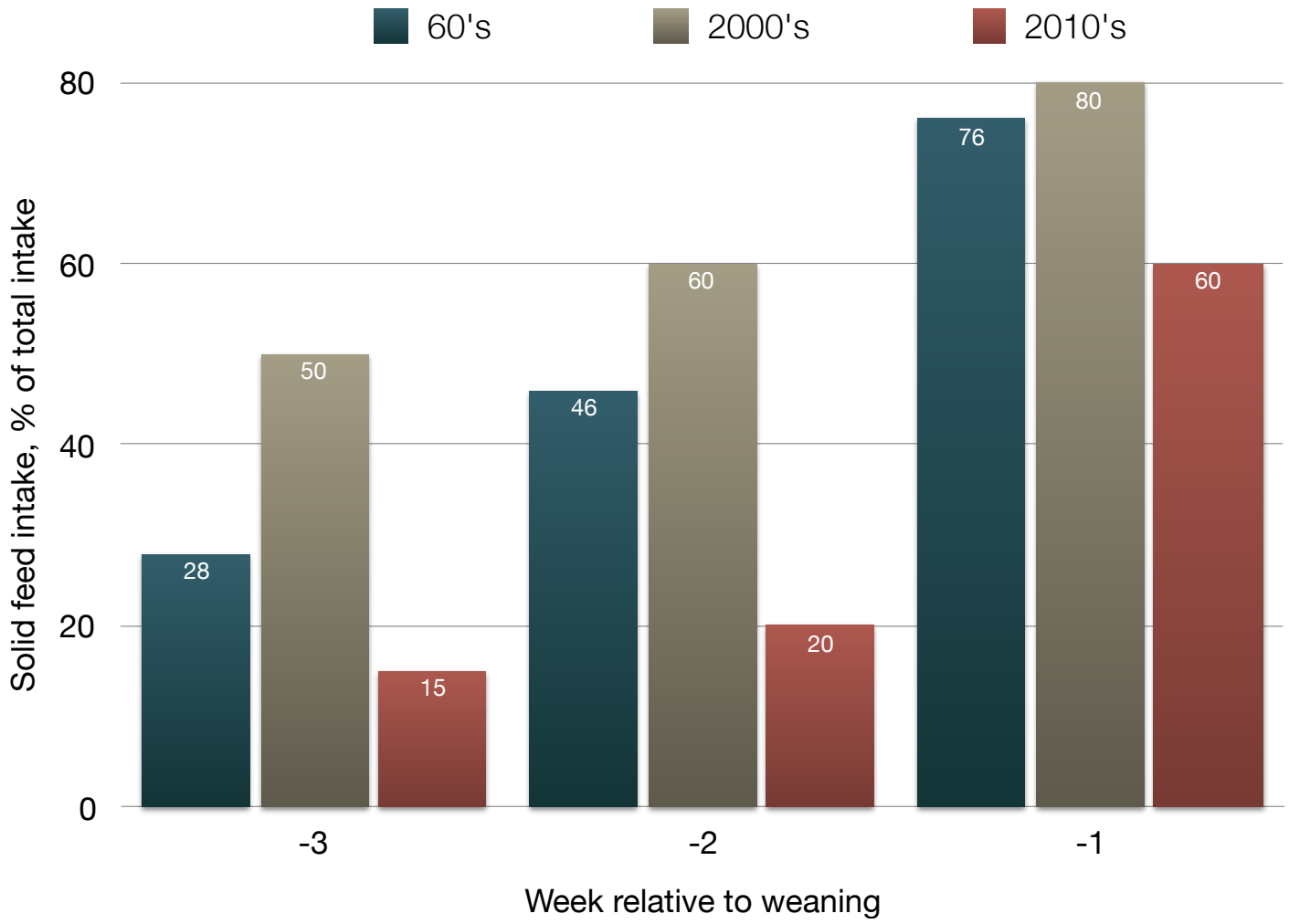
Rumen Function

- Fibrolytic bacteria do not do well with rumen pH < 5.8
- When no forage is provided, rumen pH is typically < 5.8
- It makes little sense to provide fiber in the starter





Management Aspects



Management Aspects

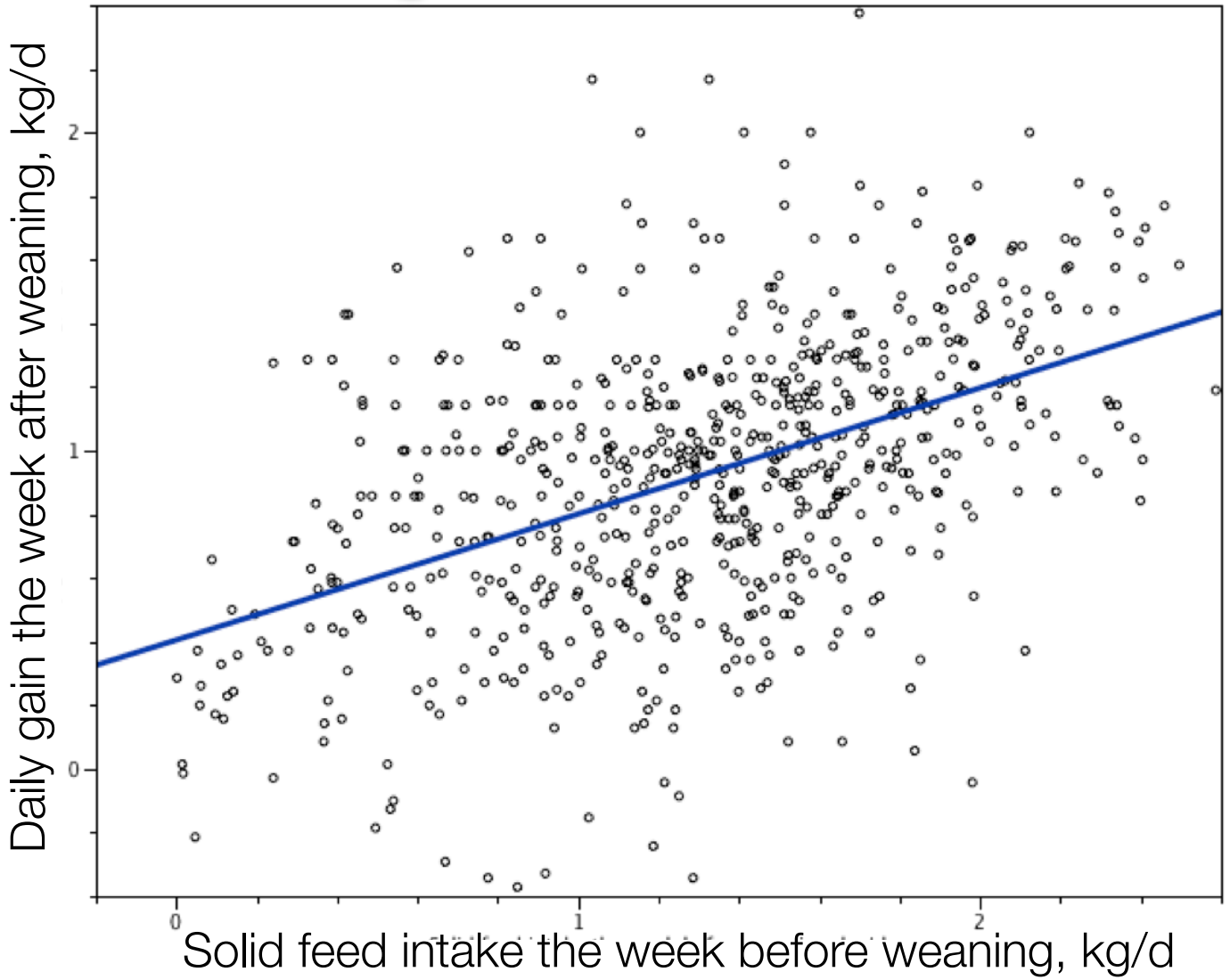
- When to wean?

Management Aspects

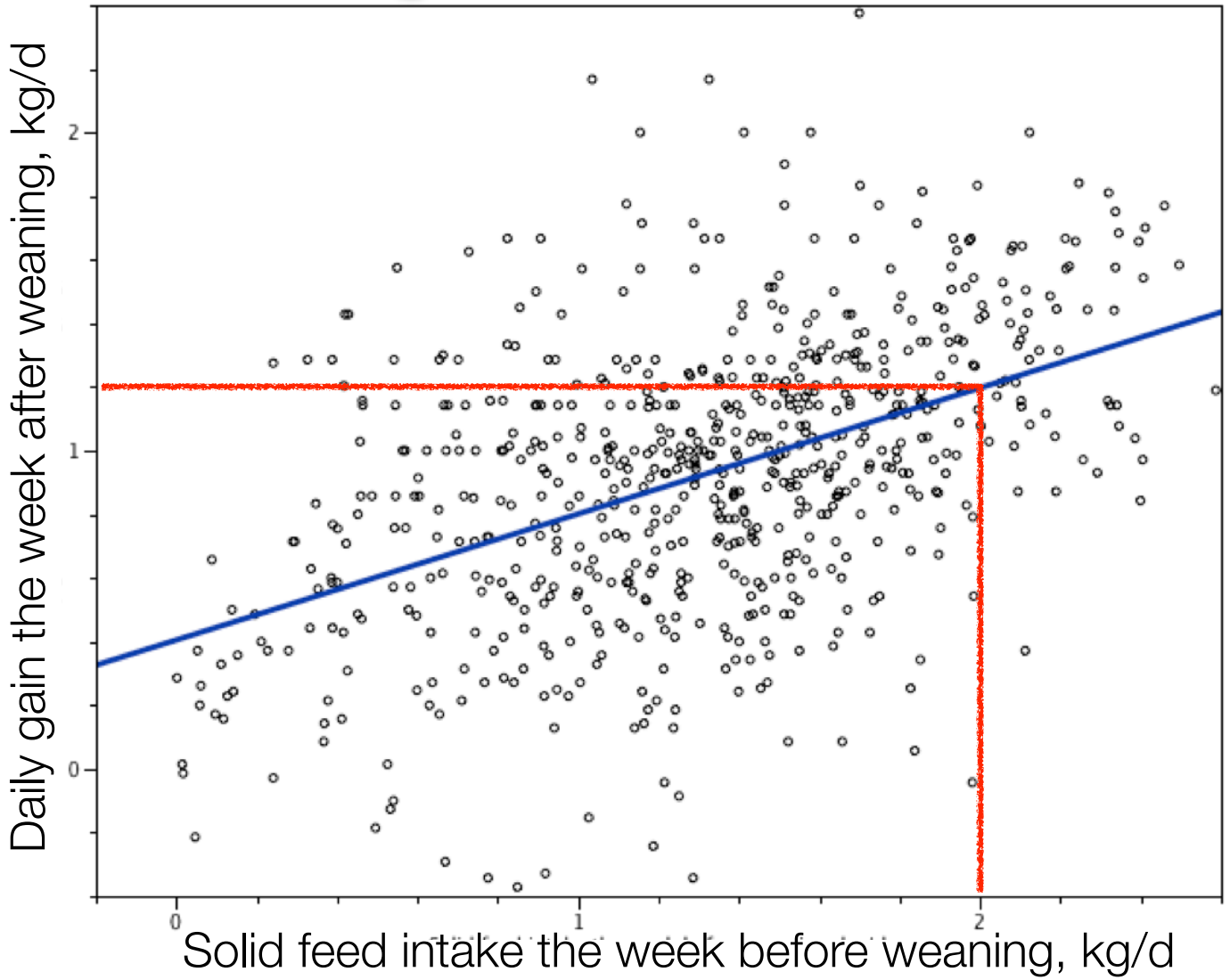
- When to wean?

Tell us how much do you want to grow after weaning and then we can answer

Management Aspects

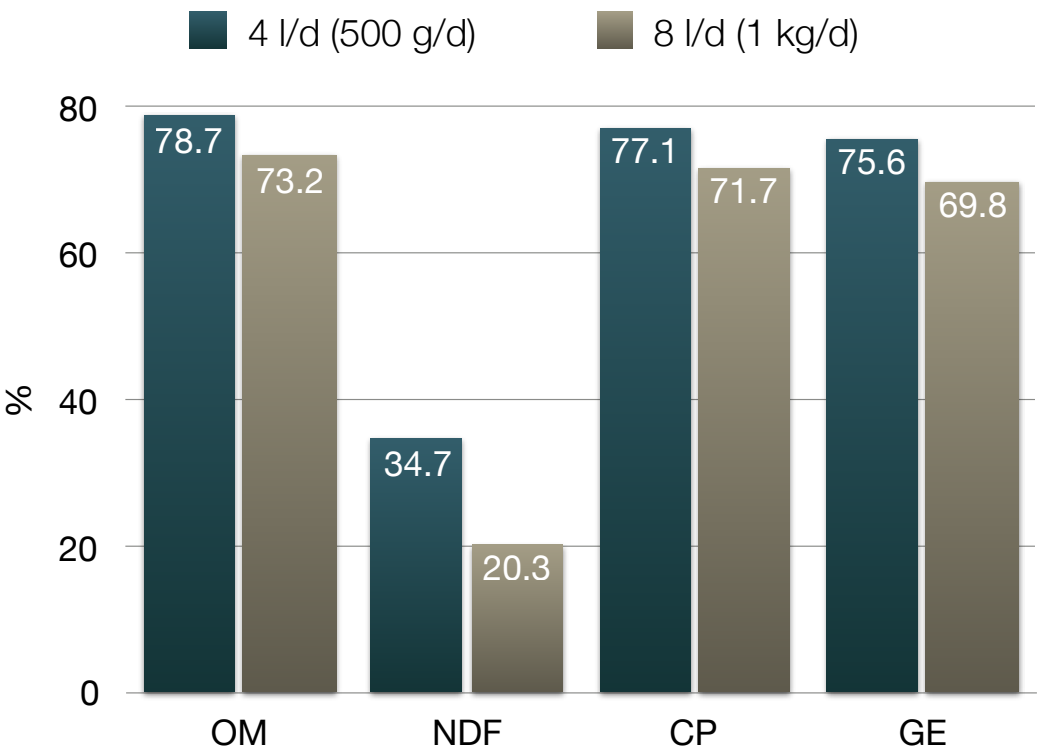


Management Aspects



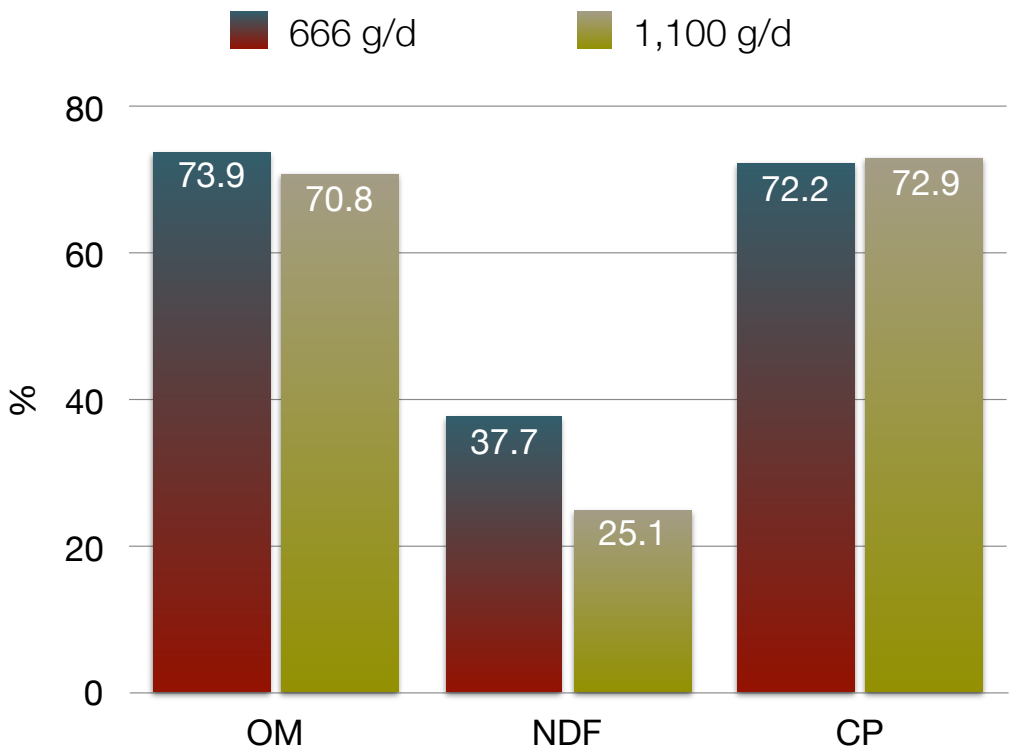
Transition

Digestion efficiency



Apparent total tract digestibility the week after weaning

Terré et al. (2007)

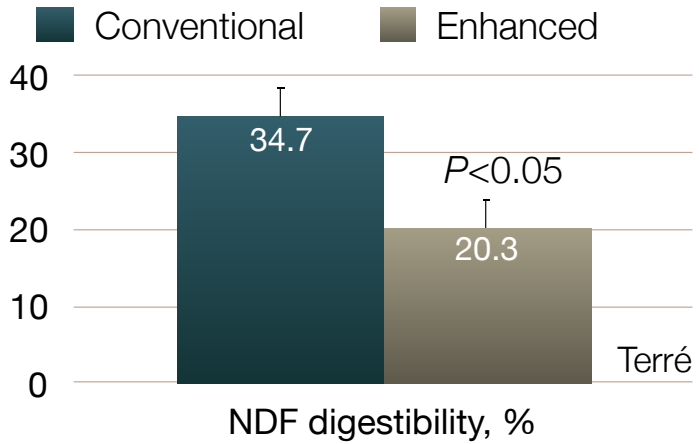


Apparent total tract digestibility 3 weeks after weaning

Hill et al. (2016)

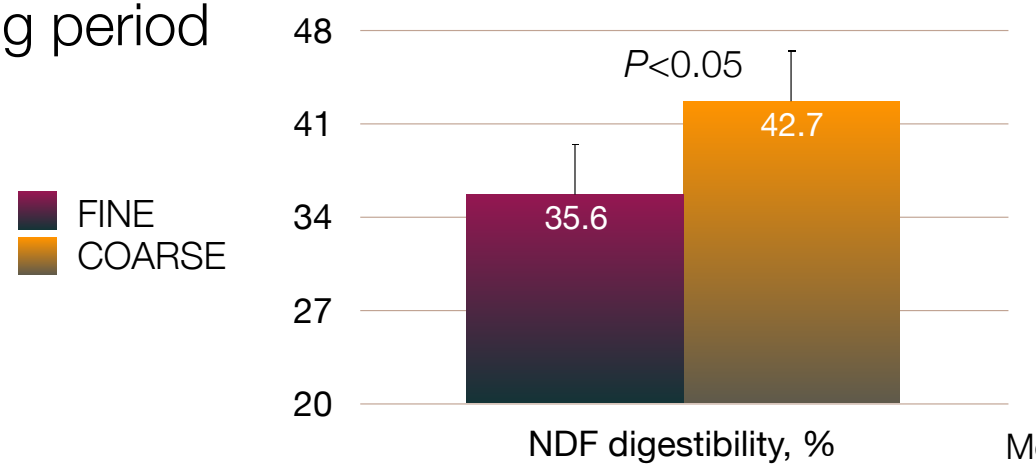
Transition

- Digestibility of fiber is diminished post-weaning when feeding enhanced growth programs



Terré et al. (Livestock Sci., 2007)

- Digestibility (and performance) can be improved by offering chopped hay or straw during the suckling period



Montoro et al. (JDS, 2013)

Transition

- Reduce the amount of milk at each milk offer (AM and PM) 3 or 2 weeks before weaning

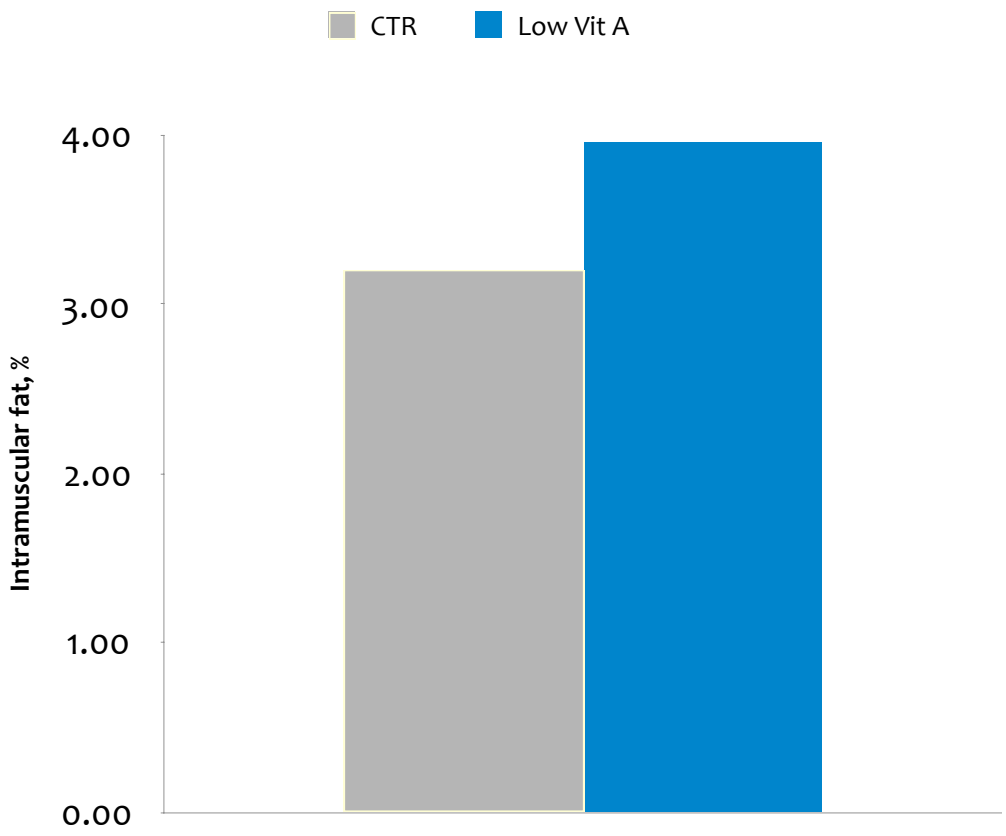
- Reduce the frequency of milk offer the week before weaning

Transition

Transition

Growing

- Avoid hypo-vitaminosis A



Martí et al., 2010

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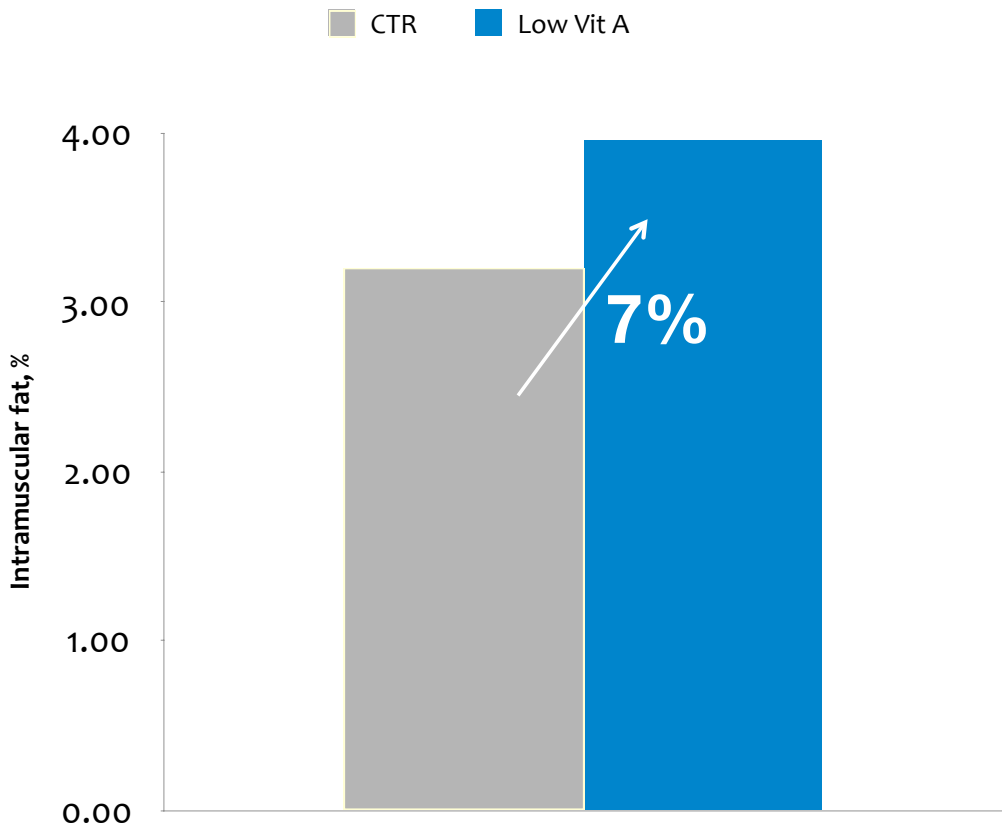

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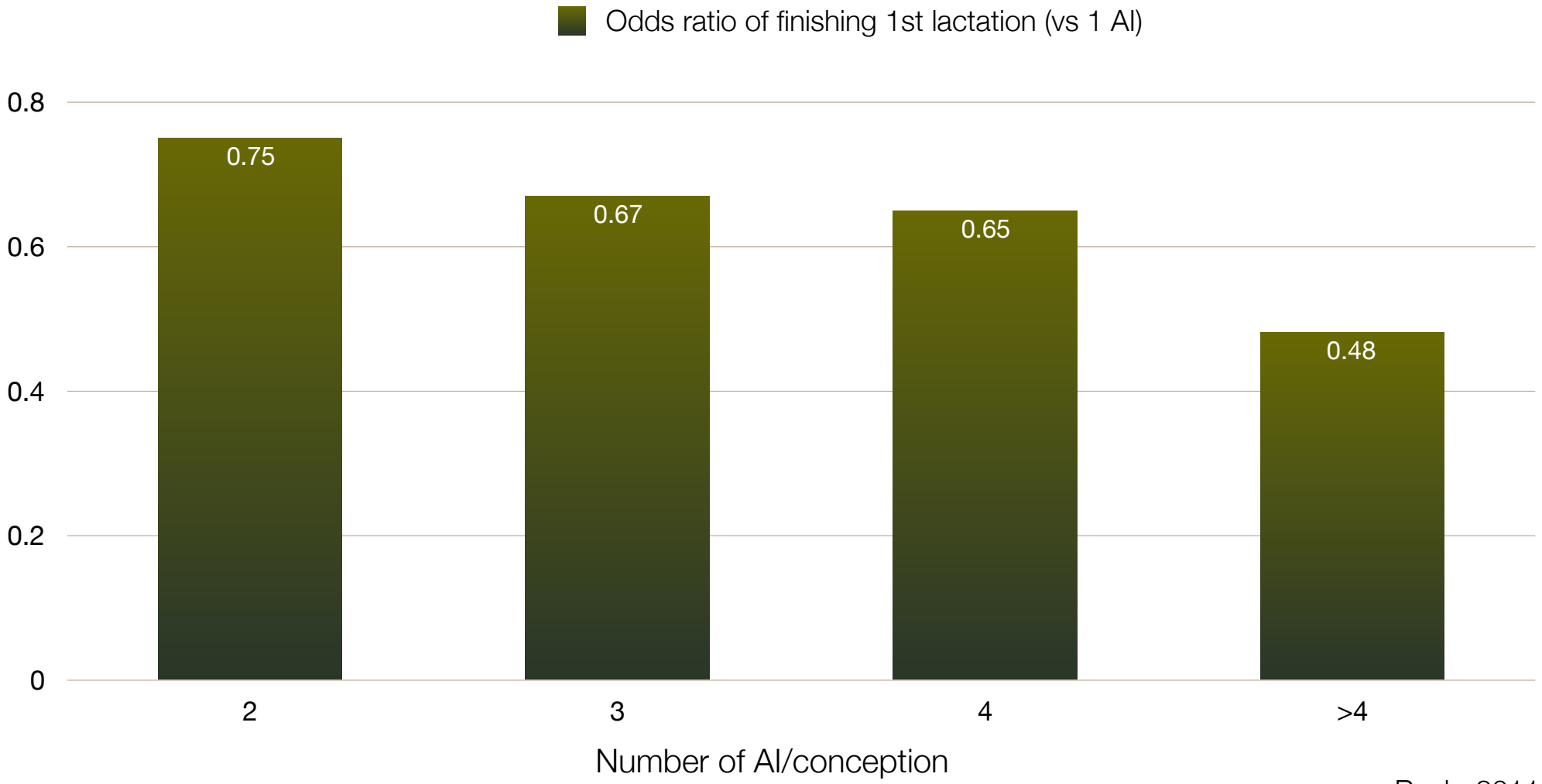

Bach, 2011

Growing

- Growing at high rates after breeding is negatively correlated with future milk production

$$Yield = 4211 + 9.9557 \times BWc - 1403.74 \times ADG_{after\ breeding}$$

$$R^2 = 0.03,\ P < 0.05,\ n=743$$

Take Home Messages

- The calf just born today was already shaped about 280 d ago…
- The first 60-70 days of life are crucial
- Be careful when feeding large volumes of milk
- Offer chopped high-NDF grass to calves since day 1
- After that, smooth transition to solid feed is necessary
- Target ADG above 1.2 between 70 and 200 d of life
- Implement quality control programs, be pro-active
- After breeding, your homework is done


Thank you
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