



Milk Fat Depression: How Important is Rumen pH?

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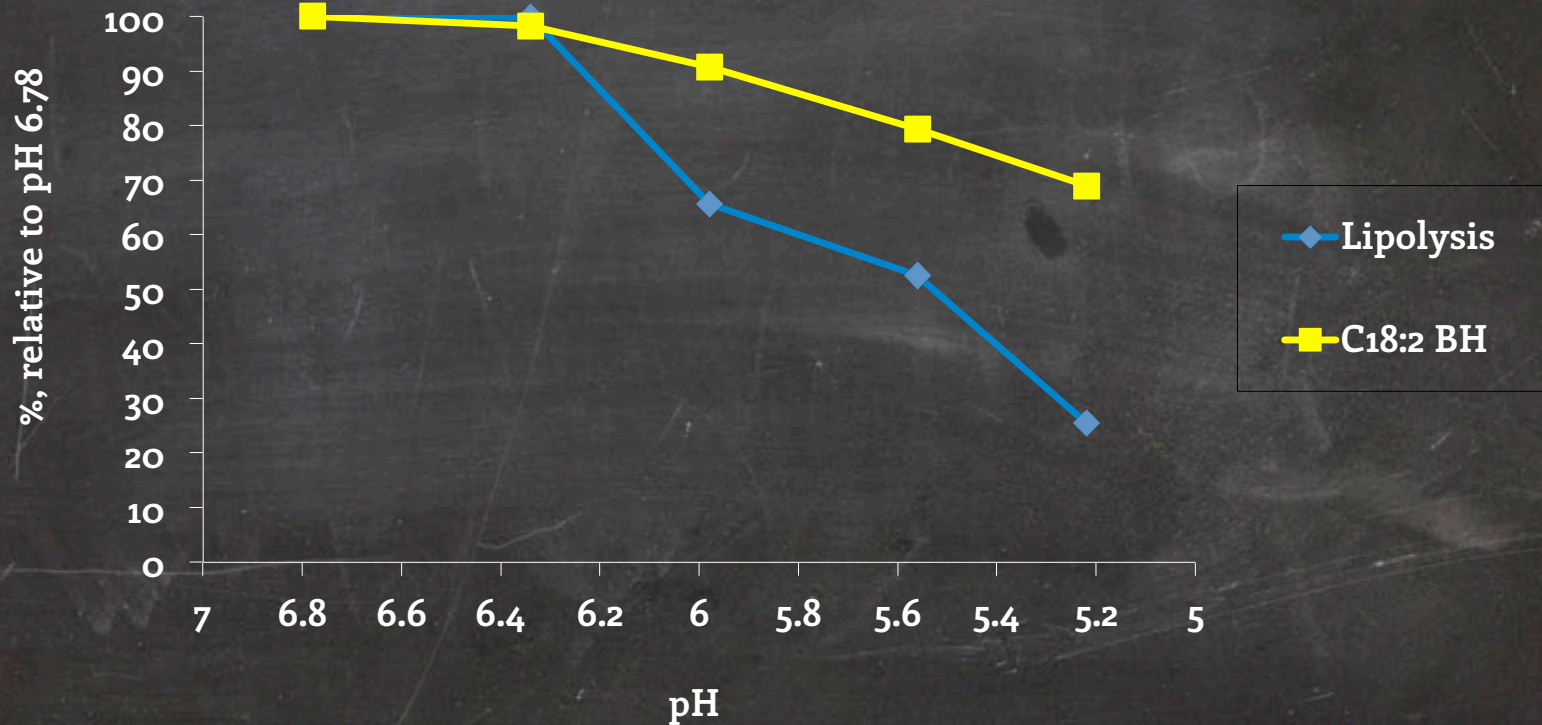


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Milk Fat Depression: How Important is Rumen pH?

Influence of pH on Lipolysis and Biohydrogenation In Vitro

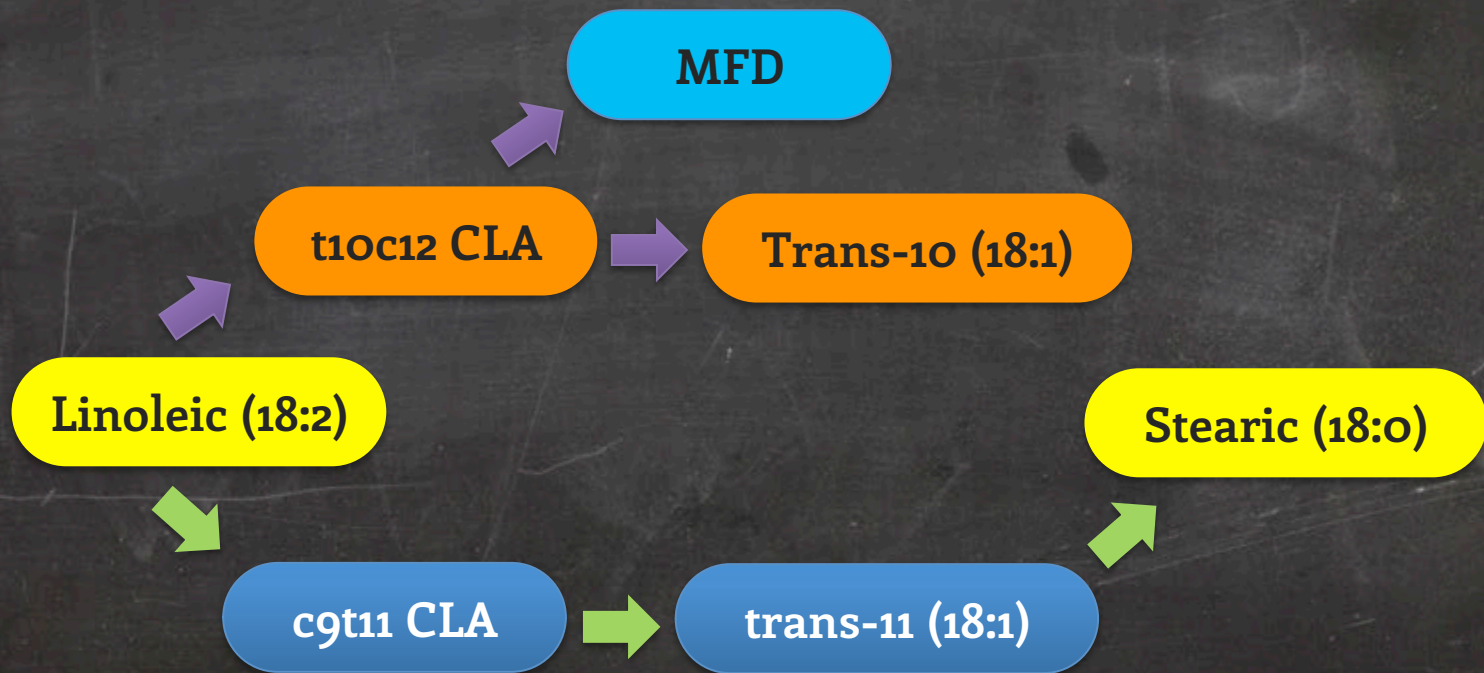


Van Nevel and Demeyer. 1996. *Reprod Nutr. Dev* 36:53.



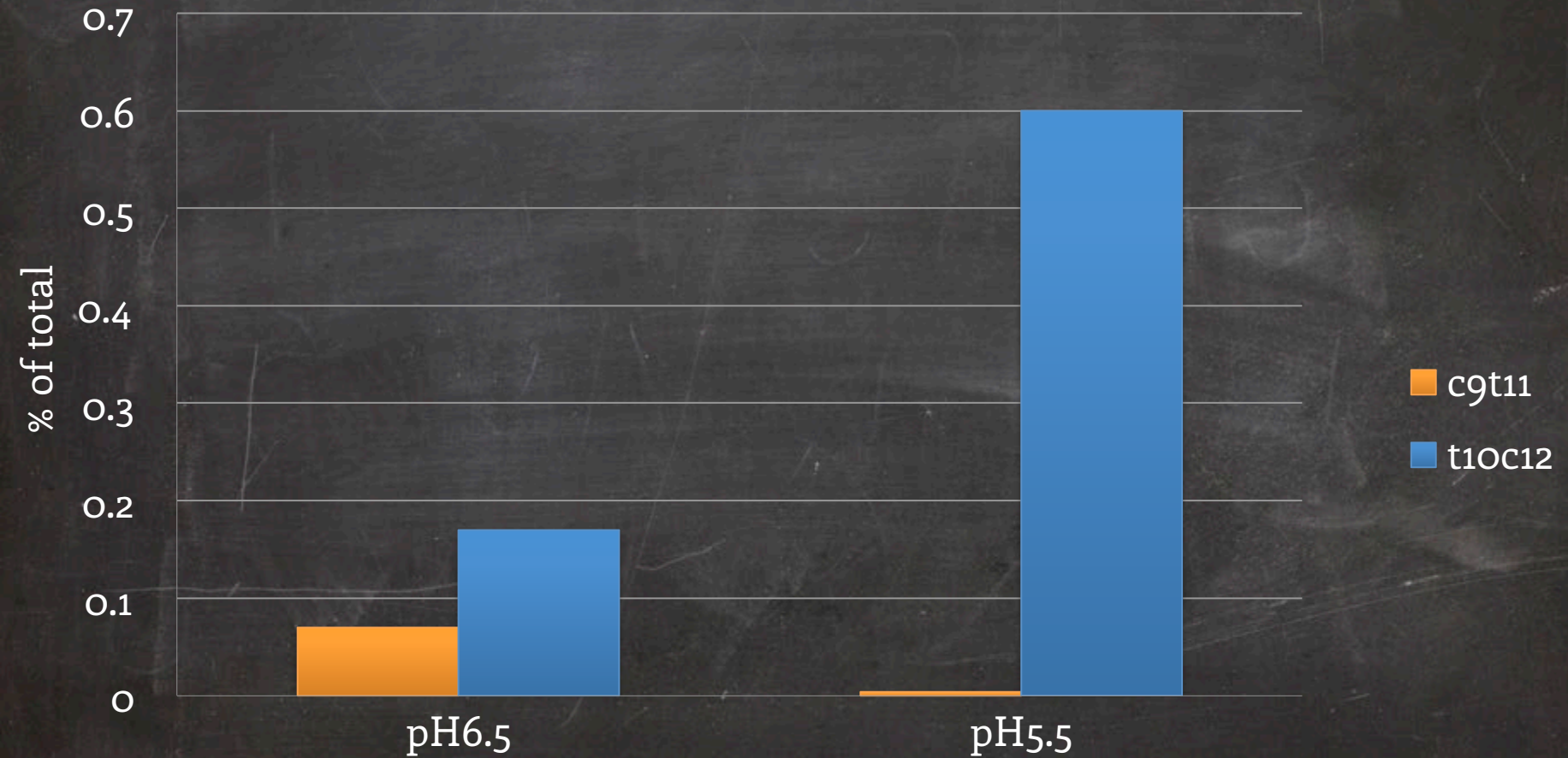
Milk Fat Depression: How Important is Rumen pH? CLA Shift vs. pH

Shift in biohydrogenation intermediates!





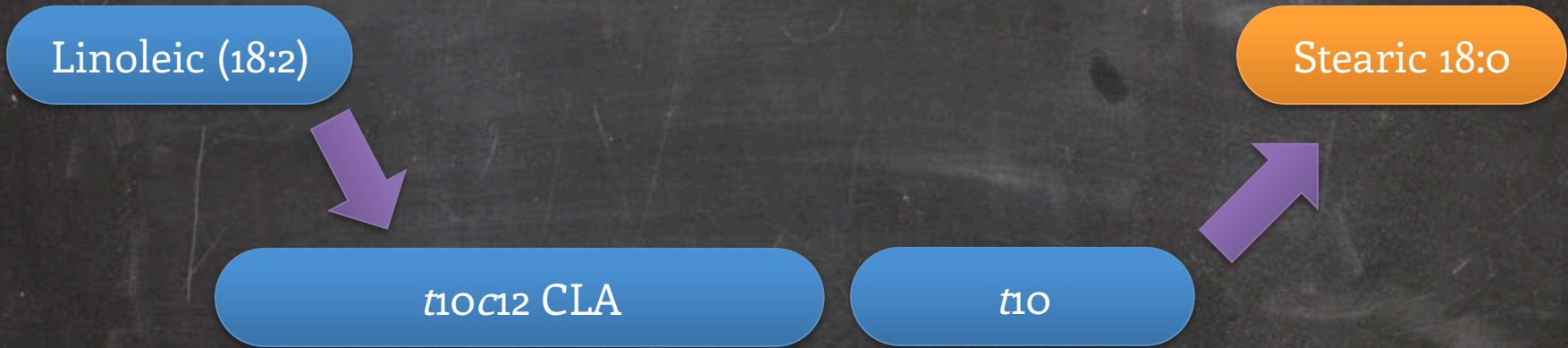
Milk Fat Depression: How Important is Rumen pH? CLA Shift vs. pH



Continuous culture data taken from Fuentes et al, 2009.

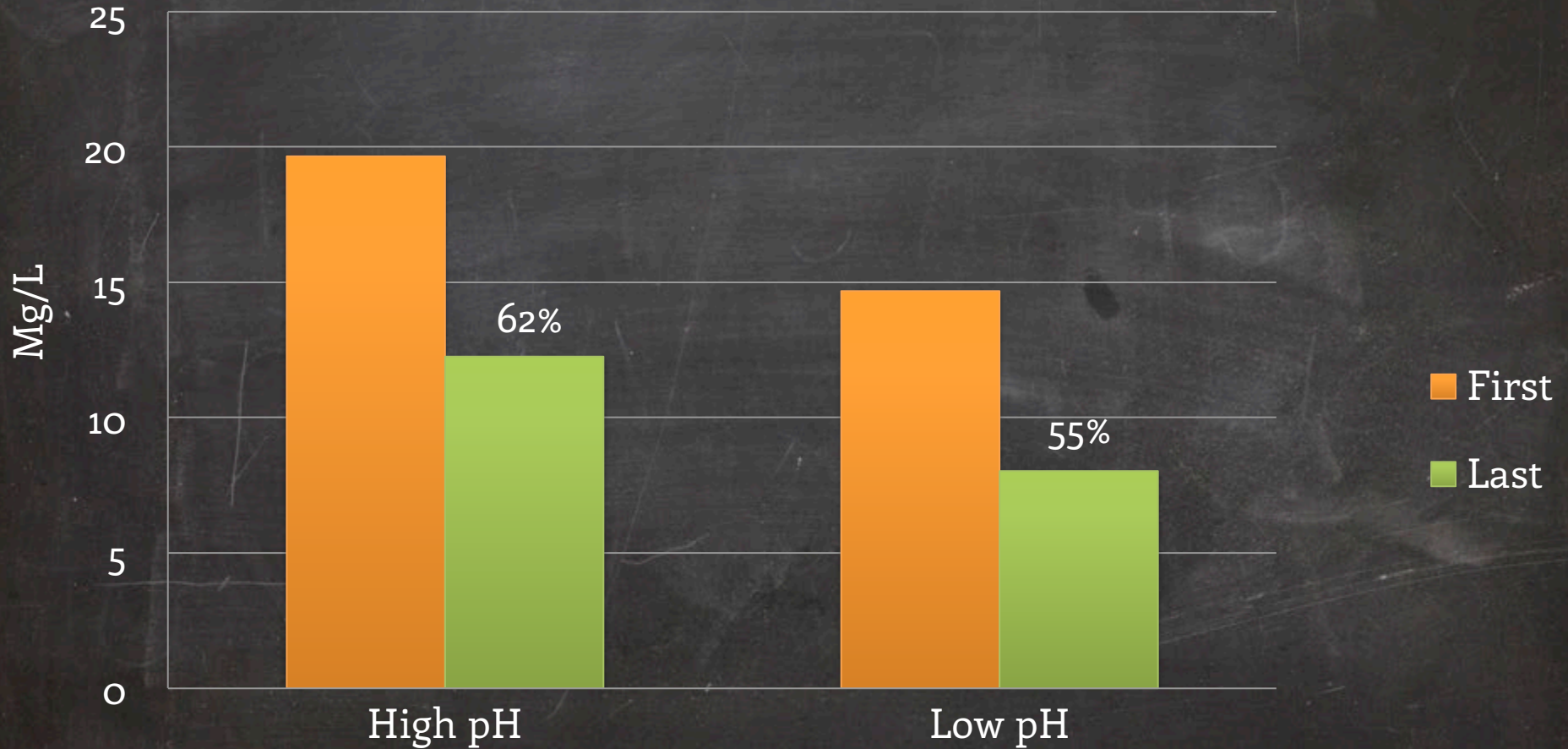


Milk Fat Depression: How Important is Rumen pH? Bottleneck vs. pH





Milk Fat Depression: How Important is Rumen pH? Bottleneck vs. pH



Continuous culture data taken from Fuentes et al, 2009.



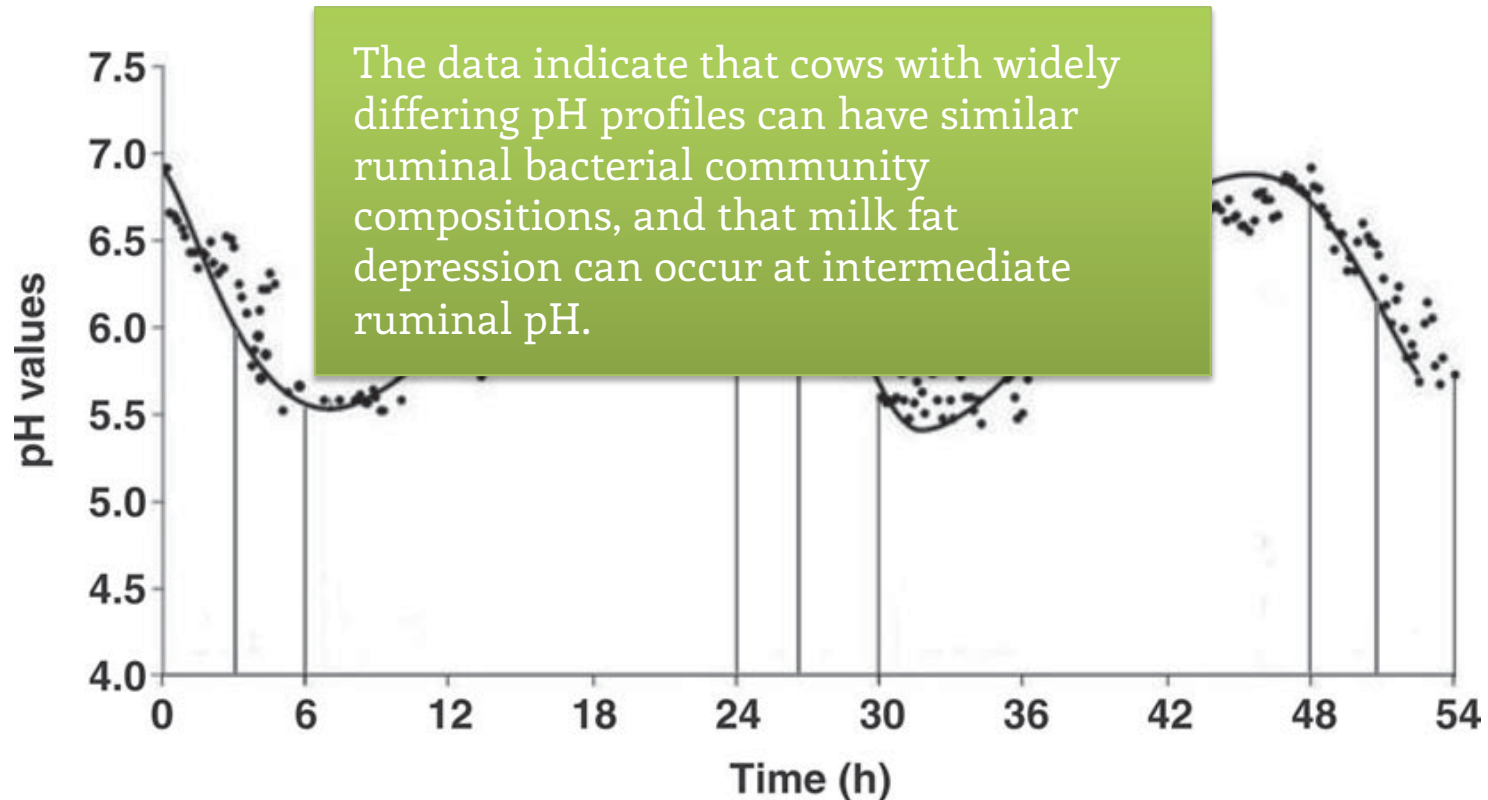
Milk Fat Depression: How Important is Rumen pH?
Dr. Tom Jenkins, Clemson University

How Much Does pH Need to Change?



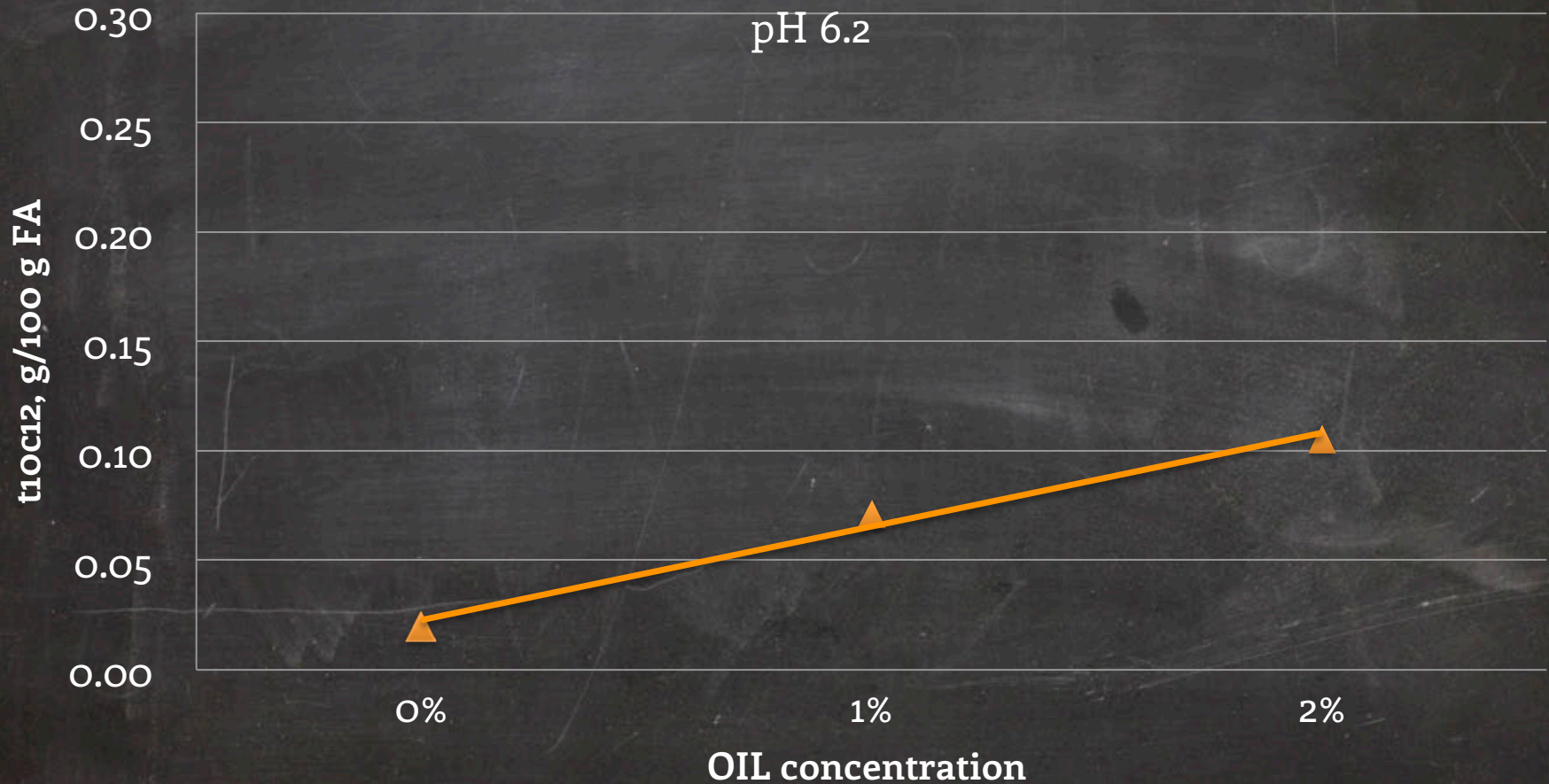
Milk Fat Depression: How Important is Rumen pH? pH Dynamics and Bacterial Community Composition in the Rumen of Lactating Dairy Cows

A. Palmonari ,* D. M. Stevenson ,† D. R. Mertens ,† C. W. Cruywagen ,‡ and P. J. Weimer †§2



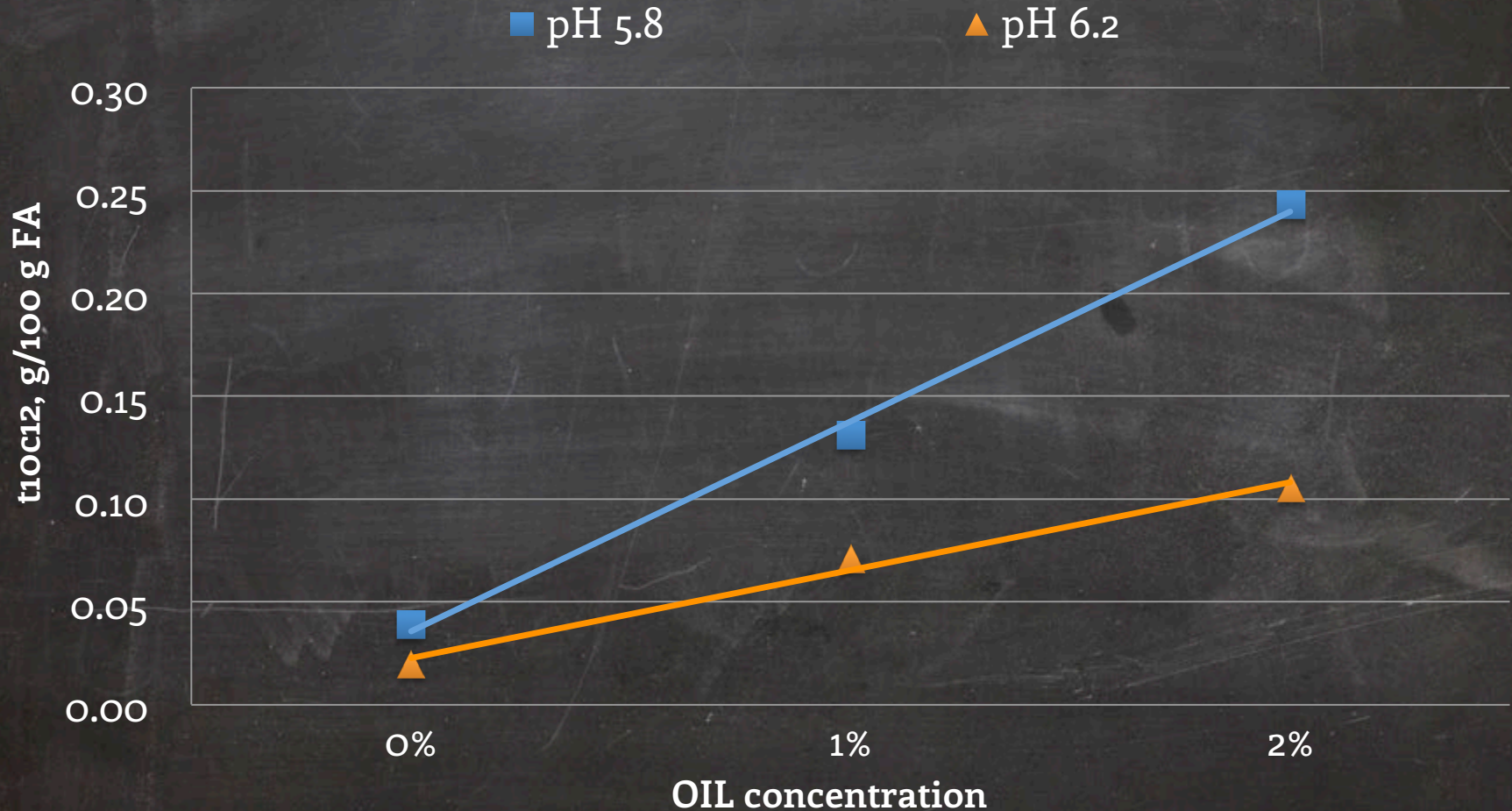


Milk Fat Depression: How Important is Rumen pH? pH & Corn Oil Interactions





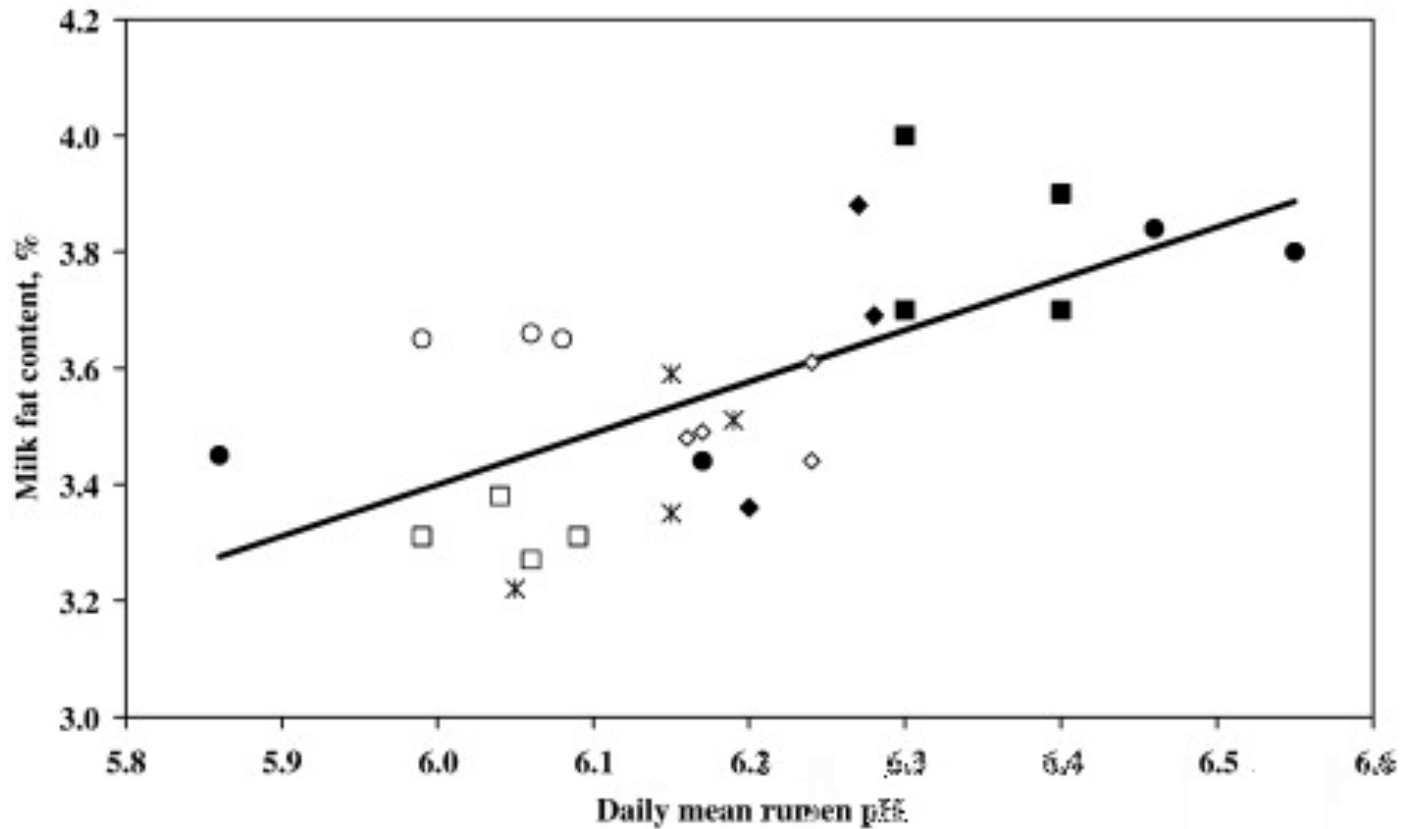
Milk Fat Depression: How Important is Rumen pH? pH & Corn Oil Interactions





Milk Fat Depression: How Important is Rumen pH?

Rumen pH vs. Milk Fat





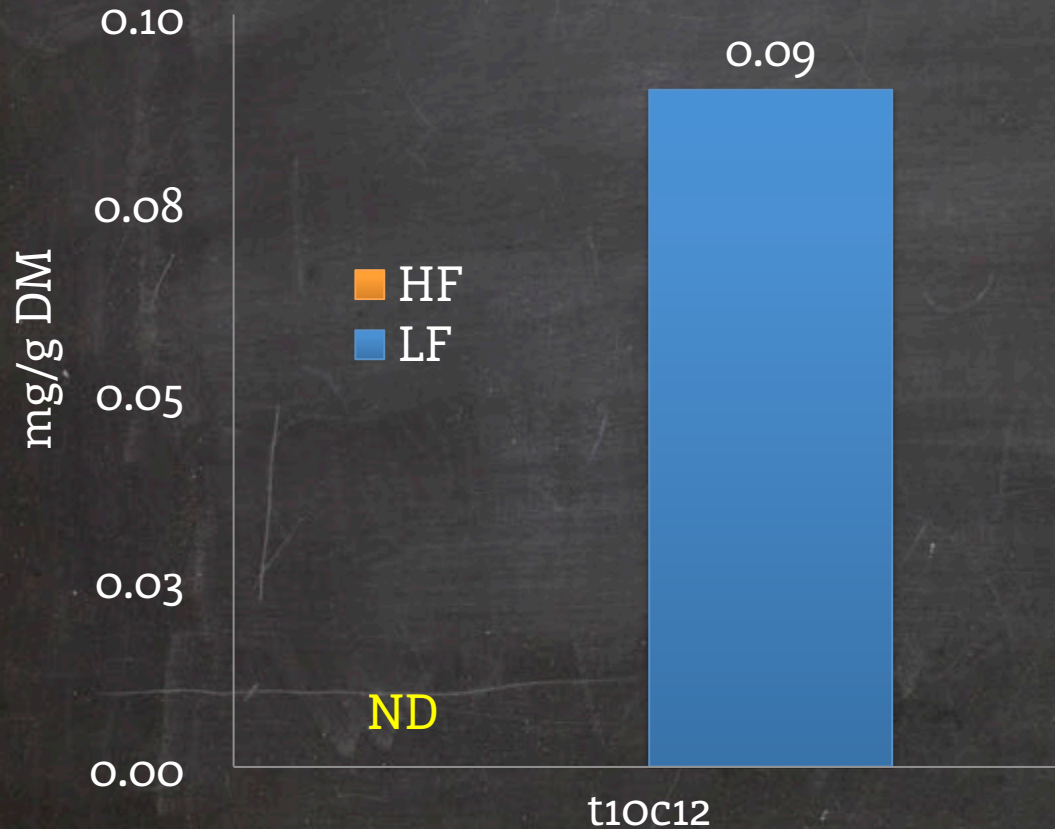
Milk Fat Depression: How Important is Rumen pH? Does pH Explain Other Nutritional Effects on Milk Fat Depression?

Starch

**Potassium
Carbonate**



Milk Fat Depression: How Important is Rumen pH? High Forage vs. High Grain Effects in Continuous Cultures



High Starch

- Shifts rumen microbial population
- Shifts BH pathways to yield more t10c12
- Increases risk of MFD

Is this because of low pH?



Milk Fat Depression: How Important is Rumen pH? Starch x pH Interactions

	Hay-HpH	Starch-LpH	Starch-HpH
Initial pH	6.75	6.25	6.78
Final pH	6.71	5.82	6.56
c9, t11 CLA, % ^a	94.3	68.4	83.2
t10, c12 CLA, % ^a	3.6	24.6	9.2

^a% of total CLA

20 min incubations rumen in vitro

2 (starch levels) x 2 (pH) but hay LpH not shown

3g meadow hay or 1.5g corn starch plus 200mg grapeseed oil

Calculated from Anim. Physiol Anim. Nutr. 2014. 98:704-713



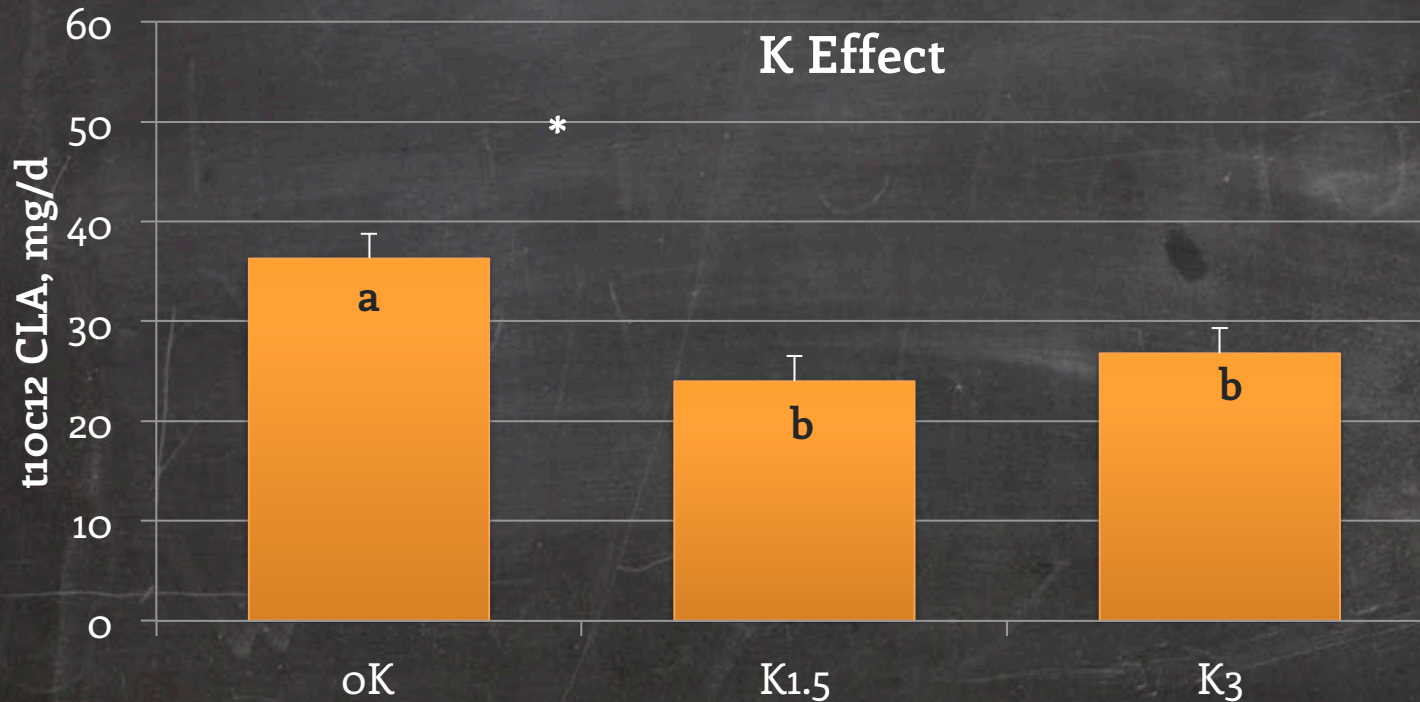
Milk Fat Depression: How Important is Rumen pH? K Carbonate¹ Effects on Milk Fat

Δ TMR K	Milk Fat, %		P<	Reference
	-K	+K		
1.2 to 2.0%	4.01	4.38	0.05	Harrison et al. 2012
1.2 to 2.2% (LF)	2.74	2.99	0.05	Kamar and Weiss, 2013
1.2 to 2.2% (HF)	2.39	2.64	0.05	Kamar and Weiss, 2013
1.8 to 2.3%	4.06	4.28	0.05	Ma et al., 2013

¹Added as K carbonate sesquihydrate (DCAD Plus, C&D, Inc.)



Milk Fat Depression: How Important is Rumen pH? K Effect on trans-10 cis-12



^{ab} K means with the same letter are significantly different ($P \leq 0.05$).



Milk Fat Depression: How Important is Rumen pH?

Resolve MFD – Manage Rumen pH

- Effective fiber
 - Particle Length (Cornell Epi)
 - Bottom Pan of Penn State Shaker Box <54%
 - > 49% on middle screen
 - Top screen didn't matter
- Grain – amount and source
- Buffers
- Management
 - TMR mixing
 - Feeding frequency
 - Crowding





Milk Fat Depression: How Important is Rumen pH?

SUMMARY

- Low rumen pH
 - Causes a microbial shift that affects biohydrogenation
 - Leads to a t10c12 CLA shift and bottleneck that allows it to accumulate
- Dramatic changes in rumen pH are not needed
- Low pH might explain much of the MFD risk of high starch
- Manage rumen pH by following good feed and cow management practices



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