GEORGIA DAIRY CONFERENCE

2024

One

PROCEEDING



Selective Dry Cow Therapy: Possibilities for North America?

2018 NMC

Daryl Nydam, DVM, PhD Quality Milk Production Services Cornell University



~ 60% of AMU in dairy production is for control or treatment of mastitis

- ~2/3 of that 60% is for dry cow therapy
- ~6 FDA approved DCT formulations
 - No meaningful differences in bioeconomic health and production outcomes



J. Dairy Sci. 99:593–607 http://dx.doi.org/10.3168/jds.2015-10190

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Randomized noninferiority study evaluating the efficacy of 2 commercial dry cow mastitis formulations

A. P. Johnson,* S. M. Godden,^{†1} E. Royster,[†] S. Zuidhof,[‡] B. Miller,[‡] and J. Sorg[†] *The Udder Doctor, Seymour, WI 54165 †Department of Veterinary Population Medicine, University of Minnesota, Saint Paul 55108 ‡Boehringer Ingelheim Vetmedica Inc., St. Joseph, MO 64506



J. Dairy Sci. 96:6390–6399
 http://dx.doi.org/10.3168/jds.2013-6705
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Randomized noninferiority clinical trial evaluating 3 commercial dry cow mastitis preparations: II. Cow health and performance in early lactation

A. G. Arruda,* S. Godden,*¹ P. Rapnicki,* P. Gorden,† L. Timms,† S. S. Aly,‡§ T. W. Lehenbauer,‡§ and J. Champagne‡§

*Department of Veterinary Population Medicine, University of Minnesota, Saint Paul 55108 †Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames 50011 ‡Veterinary Medicine Teaching and Research Center, Tulare 93274 §Department of Population Health and Reproduction, University of California, Davis 95616

2/3 of that 60% is for Dry Cow Therapy

FDA-Approved Drugs for Intramammary Use Non-Lactating Cattle**

Active Ingredient	Drug Type	Milk Withholding Time	Meat Withholding Time	Product Name	Manufacturer/Marketer
Ceftiofur hydrochloride	Rx	None*	16 days	SPECTRAMASTTM DC	Zoetis, Inc.
Cephapirin (benzathine)	ОТС	72 hours	42 days	Tomorrow Infusion	Boehringer Ingelheim Vetmedica, Inc.
Cloxacillin (benzathine)	Rx	None	30 days	Dry-Clox®	Boehringer Ingelheim Vetmedica, Inc.
	Rx	None*	28 days	Orbenin-DC®	Merck Animal Health
Penicillin G (procaine)	ОТС	72 hours post-calving	14 days	Hanford's/US Vet go-dry™	G.C. Hanford Mfg. Co.
Penicillin G (procaine) / dihydrostreptomycin	Rx	96 hours post-calving	60 days	Quartermaster® Dry Cow	Treatment West Agro Inc.
Penicillin G (procaine) / Novobiocin	OTC	72 hours post-calving	30 days	AlbaDry® Plus Suspension	Zoetis, Inc.



Shouldn't be a complicated discussion...

Non-inferiority studies

 No meaningful differences in bioeconomic health and production outcomes:

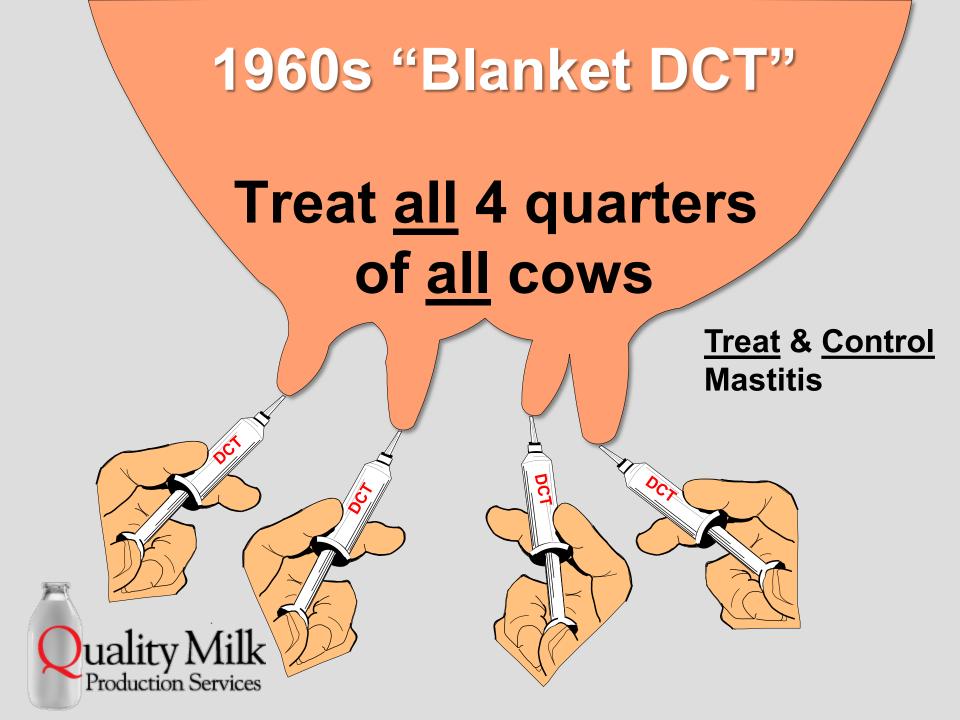
– Quartermaster v. Spectramast DC v. Tomorrow

Arruda, A.G., S. Godden, P. Rapnicki, P. Gorden, L. Timms, S.S. Aly, T.W. Lehenbauer, and J. Champagne. 2013a. Randomized noninferiority clinical trial evaluating 3 commercial dry cow mastitis preparations: I. Quarter-level outcomes. J. Dairy Sci. 96:4419-4435.

Arruda, A.G., S. Godden, P. Rapnicki, P. Gorden, L. Timms, S.S. Aly, T.W. Lehenbauer, and J. Champagne. 2013b. Randomized noninferiority clinical trial evaluating 3 commercial dry cow mastitis preparations: II. Cow health and performance in early lactation. J. Dairy Sci. 96: 6390-9.

– Dry-Clox v. Spectramast DC

Johnson AP, Godden SM, Royster E, Zuidhof S, Miller B, Sorg J. 2016. Randomized noninferiority study evaluating the efficacy of 2 commercial dry cow mastitis formulations.J Dairy Sci. Jan;99(1):593-607



Blanket Dry Cow Therapy (BDCT)



5 Point Plan

- 1. Treat and record clinical mastitis cases
- 2. Post milking teat disinfection
- 3. Dry cow therapy
- 4. Cull chronic cases
- 5. Milking machine maintenance



National Mastitis Council Recommended Mastitis Control Program

From Hillerton, Proceedings NMC 2018



Figure 5. The first publication of the Five-point plan, from the summer 1970 MMB Better Management, page 8.

Antimicrobial Dry cow therapy (aDCT)

G.2.b. Percentage of cows treated with dry-cow IMM antimicrobials at dry-off, by herd size and by region:

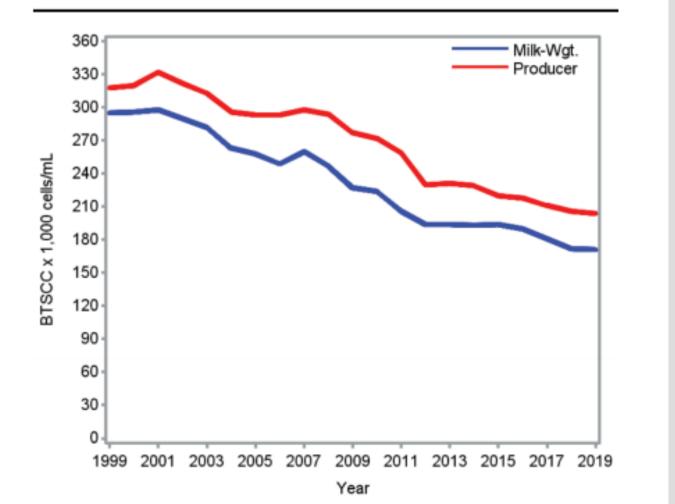
Percent Cows											
Herd size (number of cows)					Region						
	Medium -99) (100-499)			Large (500+) West		East		All operations			
Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. error	Pct.	Std. erro
81.9	(4.5)	82.6	(4.6)	96.4	(1.6)	94.3	(2.7)	91.9	(1.8)	93.0	(1.6)



BDCT was awesome when:

- average dry cow infected or likely to acquire a new infection
- high prevalence of "contagious" pathogens

Figure 5. Milk-weighted and producer BTSCCs for the four monitored FMMOs, by year



1985: ~45% of quarters = negative culture result

Today: 75-90% of quarters = negative culture result

24

Summary: Teat sealants



New IMI reduced by 25% (RR = 0.75) **Clinical mastitis** reduced by 29% (RR = 0.71)

↓new IMI at calving & Clinical mastitis

Rabiee & Lean, 2013 (Meta-analysis of 12 trials)



J. Dairy Sci. 103 https://doi.org/10.3168/jds.2019-17884

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Randomized equivalence study comparing the efficacy of 2 commercial internal teat sealants in dairy cows

S. M. Rowe,¹* [©] S. M. Godden,¹ [©] D. V. Nydam,² [©] A. Lago,³ [©] A. K. Vasquez,² [©] E. Royster,¹ [©] and J. Timmerman¹

¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108

²Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853 ³Research and Development Department, DairyExperts, 1814 Rothschild Street, Tulare, CA 93274

Conclusion

- Lockout® is likely to perform similarly to Orbeseal® when used in a blanket dry cow therapy program
 - Reduce new intramammary infection
 - Reduce clinical mastitis
 - Reduce SCC





A randomized equivalence study evaluating the efficacy of two commercially available teat sealants in dairy cows

Michelle P. Buckley,¹ MS, DVM; ^{**}Jenna Bayne,² DVM; Tiago Tomazi,³ DVM, MS, PhD; Brian E. Miller,³ DVM; Sandra M. Godden,⁴ DVM, DVSc; Gustavo S. Silva,² DVM, MS, PhD; *Patrick J. Gorden,² DVM, PhD

¹Department of Veterinary Microbiology and Preventative Medicine, Iowa State University, Ames, IA 50011 ²Department of Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames, IA 50011 ³Dairy Technical Services, Merck Animal Health, Lenexa, KS 66219 ⁴Department of Veterinary Population Medicine, University of Minnesota, St. Paul, MN 55108

No meaningful differences in bioeconomic health and production outcomes







Contents lists available at ScienceDirect

Preventive Veterinary Medicine

journal homepage: www.elsevier.com/locate/prevetmed





Evaluating the efficacy of internal teat sealants at dry-off for the prevention of new intra-mammary infections during the dry-period or clinical mastitis during early lactation in dairy cows: A systematic review update and sequential meta-analysis

S.D. Pearce^{a,*}, E.J. Parmley^a, C.B. Winder^a, J.M. Sargeant^a, M. Prashad^b, M. Ringelberg^a, M. Felker^a, D.F. Kelton^a

^a Department of Population Medicine, Ontario Veterinary College, University of Guelph, Guelph, ON N1G 2W1, Canada
^b Data Resource Centre, University of Guelph, Guelph, ON N1G 2W1, Canada

"Based on all the evidence available, sufficient research exists for practical use, and cessation of future research until substantial changes to Teat Sealant application occurs"



Selective Dry Cow Therapy for Treatment and Control of Mastitis Why do this?

Make More Money while not compromising animal health

- Save money on tubes (and maybe labor)
- Decrease risk of residues
- Bogey man
 - > Someone tells you that you have to
 - > Mitigate risk of antimicrobial resistance
- >(Sell more milk?)

STATE OF NEW YORK

5742--A

2019-2020 Regular Sessions

IN SENATE

May 14, 2019

Introduced by Sens. KAVANAGH, HOYLMAN -- read twice and ordered printed, and when printed to be committed to the Committee on Higher Education -- committee discharged, bill amended, ordered reprinted as amended and recommitted to said committee

AN ACT to amend the education law and the state finance law, in relation to protecting medically important antimicrobials for human public health

The People of the State of New York, represented in Senate and Assembly, do enact as follows:

1 Section 1. Legislative findings. The legislature declares that the 2 overuse and misuse of medically important antimicrobials poses a serious 3 public health threat.



AMERICAN ASSOCIATION OF BOVINE PRACTITIONERS

Senator Brian Kavanagh Legislative Office Building Room 512 Albany, NY 12247

The American Association of Bovine Practitioners (AABP) is an association of cattle veterinarians serving society as leaders in cattle health, welfare and productivity. Our organization of more than 5,000 members represents cattle veterinarians primarily in the U.S. and Canada with members also in 34 countries. AABP has 193 member veterinarians in New York.

I am writing to oppose S. 5742 for the specific reasons that are outlined in this letter.

Similar legislation passed or proposed in Maryland, Illinois, Oregon, California



Selective Dry Cow Therapy (SDCT)

Why is it important to consider if your dairy is a good candidate for SDCT?

Legislation is likely to enforce selective use of dry cow antibiotics one day.



Example #2

 European Union Jan 2022: banned prophylactic use of antibiotics on farms (44) Antimicrobial medicinal products should not be used for prophylaxis other than in exceptional cases only for the administration to an individual animal.

(16)

'prophylaxis' means the administration of a medicinal product to an animal or group of animals before clinical signs of a disease, in order to prevent the occurrence of disease or infection;

Selective Dry Cow Therapy (SDCT)

Identifying and treating ONLY cows/quarters that currently have or are at risk for infections

Which cows/quarters to treat?

NEEDS: accurate, quick, cheap

Currently available tools for identifying cows:



The question?

If an on-farm algorithm was used to identify and not treat "low risk" cows, would the cows experience negative outcomes?



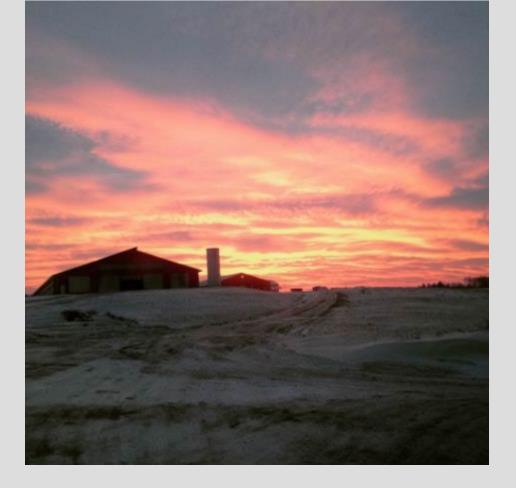
J. Dairy Sci. TBC:1–17 https://doi.org/10.3168/jds.2017-13807 © American Dairy Science Association[®], TBC.

Use of a culture-independent on-farm algorithm to guide the use of selective dry-cow antibiotic therapy

A. K. Vasquez,* D. V. Nydam,*¹ C. Foditsch,* M. Wieland,* R. Lynch,† S. Eicker,‡ and P. D. Virkler* *Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, and †Pro-Dairy, Department of Animal Science, Cornell University, Ithaca, NY 14853 ‡Valley Agricultural Software, King Ferry, NY 13081



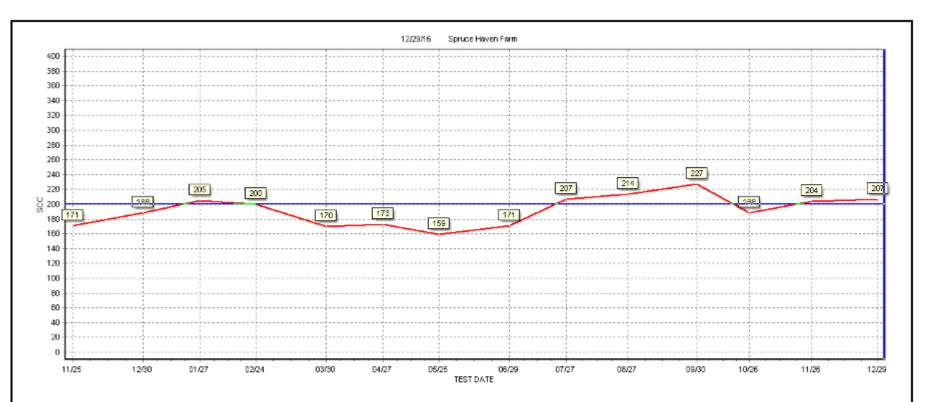




- = NY
- 1800 milking cows
- DHIA testing
- Dry once per week

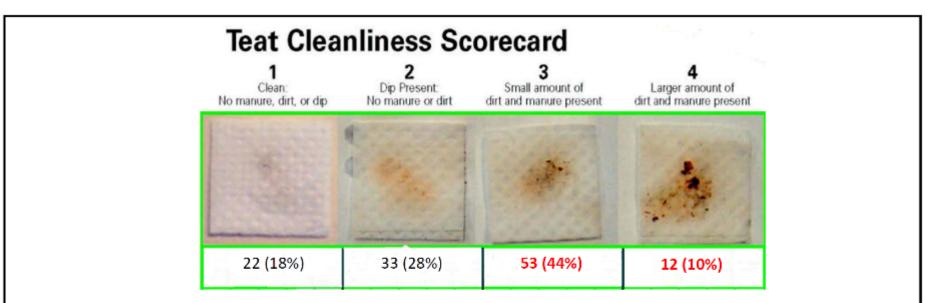


BT SCC during trial 171 k – 227 k



 Bulk tank test day SCC remained in a similar range for the December test day.

A good herd, but not the best...



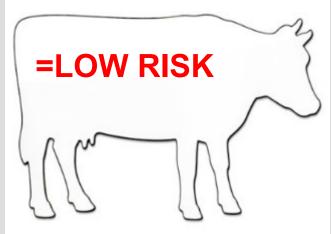
- <u>54% of the teat ends that we scored were too dirty</u>. This is still a large opportunity area to improve as the goal would be to have less than 10% in category 3 or 4. The number of cows with poor teat ends is not making it easy for the milkers but they should be able to get much closer to the goal with the proper technique.
- <u>I would recommend that you start scoring teat end cleanliness by milker on a regular basis</u> and include a refresher on this topic in your next milker training session.



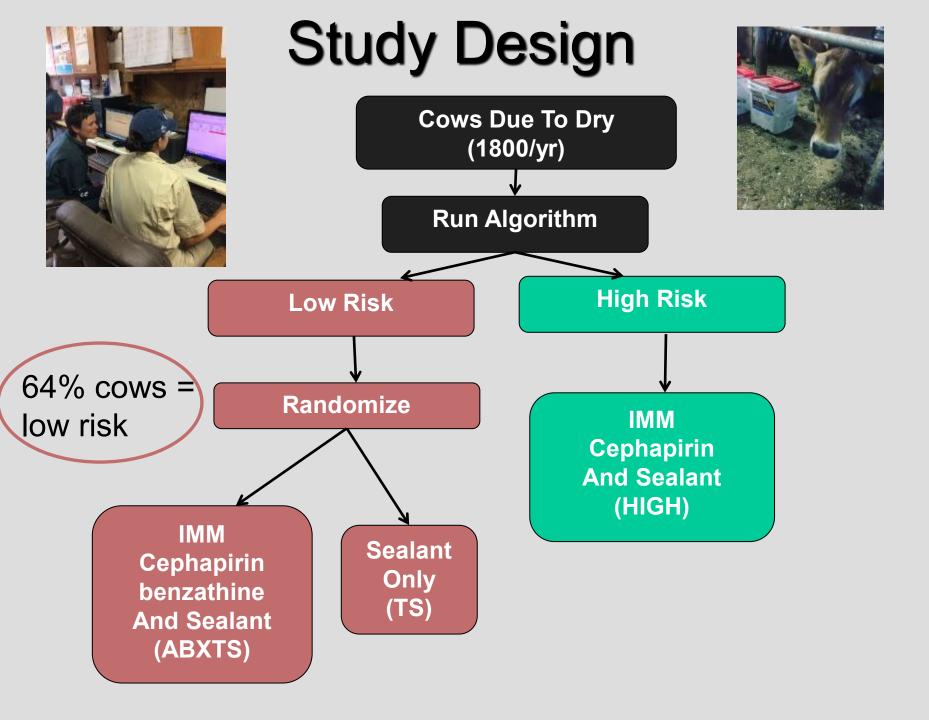


Computer Algorithm

- Last test SCC ≤ 200k
- Avg SCC last 3 test-days ≤200k
- ≤1 case of clinical mastitis
- No current symptoms of clinical mastitis
- No mastitis in the last 30 days







There were similar numbers of cows and quarters in each treatment group

	ABXTS	TS	Total
Cows	304	307	611
Quarters	1040	1058	2098
Percentage	50%	50%	



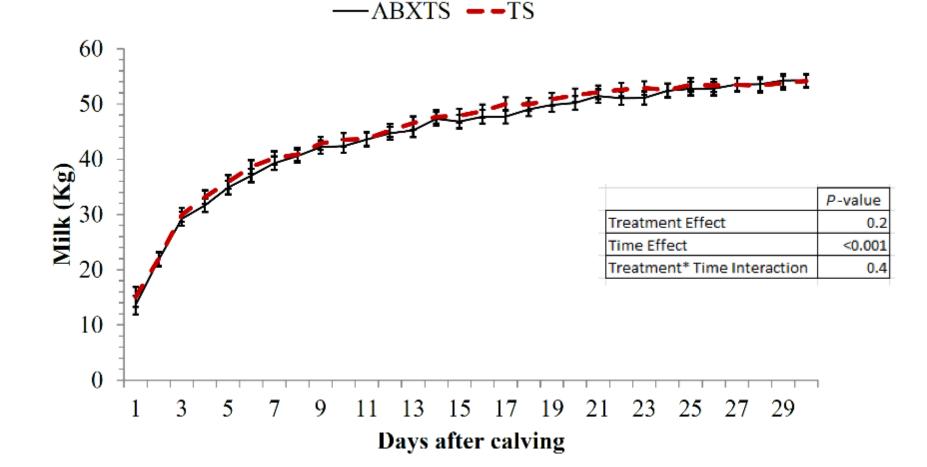
Pre "treatment" quarter-level culture results at dry-off

	Treatment Group					
	Teat Sealant		Antibiotics &			
	(n=120	4)	Teat Sea	lant		
			(n =118	3)	<i>P</i> -value	
	<u>n</u>	<u>%</u>	<u>n</u>	<u>%</u>		
Negative	1086	90.2	1064	90.0	0.84	
Coagulase negative Staphylococcus spp.	59	4.9	78	6.6	0.08	
Mixed Growth	22	1.8	20	1.7	0.88	
Corynebacterium spp.	24	2.0	12	1.0	0.06	
Lactococcus spp.	5	0.4	4	0.3	> 99.99	
Streptococcus spp.	2	0.2	1	0.1	> 99.99	
Other	6	0.5	4	0.3	0.75	
Total intramammary infections	114	9.5	115	9.7	0.84	
		Lacto	coccus_C	ontamin	ationStr	ep spp/dys
			3%	<u> </u>		, 1.4%
	Co	oryne. s	spp		0.7%	
		2.5%			0.77	0
	Mi	xed Cu	lture			
		4.9%				
				NS		
			13	.9%	Negat	ive
					69.4	0/0
	High	Risk	Quarte			
		n =	553			



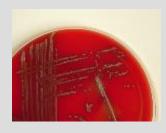


Milk yield over the first 30 days was similar between groups





Summary:



1. Bacteriological Cure



= YES



2. New Infection Risk



= NO

3 & 4. First test milk production and linear score (LS) = NO





5. Risk of survival and mastitis 30 days **= NO**



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Randomized controlled non-inferiority trial investigating the effect of 2 selective dry-cow therapy protocols on antibiotic use at dry-off and dry period intramammary infection dynamics

S. M. Rowe,¹* S. M. Godden,¹ D. V. Nydam,² P. J. Gorden,³ A. Lago,⁴ A. K. Vasquez,² E. Royster,¹ J. Timmerman,¹ and M. J. Thomas⁵ ¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108 ²Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853 ³Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames 50011 ⁴Research and Development Department, DairyExperts, Tulare, CA 93274 ^bDairy Health and Management Services, Lowville, NY 13367 **Acknowledgements**



In-kind support



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Randomized controlled trial investigating the effect of 2 selective dry-cow therapy protocols on udder health and performance in the subsequent lactation

S. M. Rowe,¹* S. M. Godden,¹ D. V. Nydam,² P. J. Gorden,³ A. Lago,⁴ A. K. Vasquez,² E. Royster,¹ J. Timmerman,¹ and M. J. Thomas⁵ ¹⁰ ¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108 ²Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853 ³Veterinary Diagnostic and Production Animal Medicine, Iowa State University, Ames 50011 ⁴DairyExperts, Tulare, CA 93274 ⁵Dairy Health & Management Services, Lowville, NY 13367

Study type

- Randomized controlled trial
- Enrollment
 - Summer 2018
 - 7 herds from 4 sites
 - 1275 cows randomly assigned
 - Blanket DCT (n = 429)
 - Culture based SDCT (n = 432)
 - Algorithm based SDCT (n = 414)





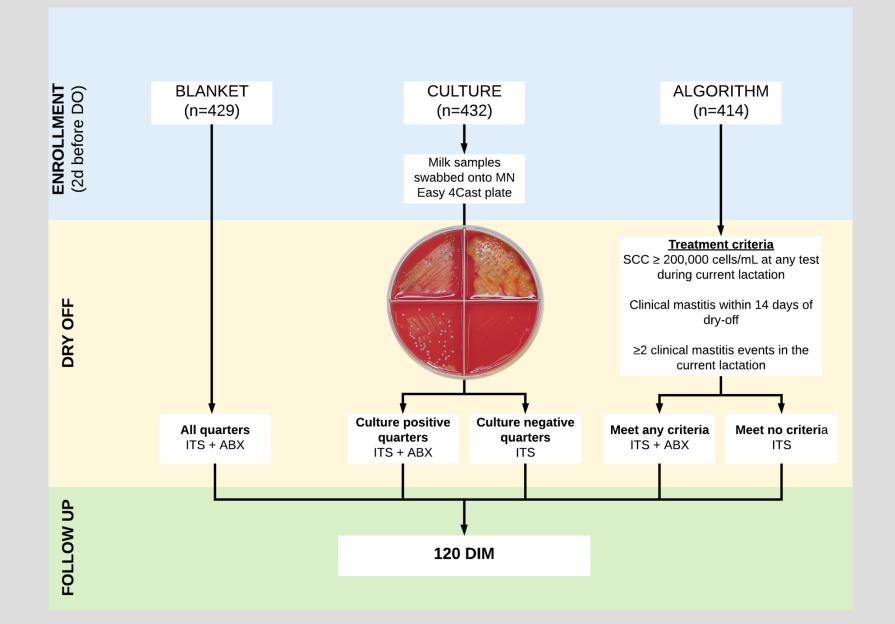
Herds

	Milking				
Herd	herd	BTSCC	Dry cow bedding	Lactating cow bedding	Vax
Α	850	200	Sand	Sand	J-vac
В	1150	100	Sand	Sand	J-vac
С	1500	150	Sand	Sand / Compost pack	Enviracore
D	5700	230	Manure solids (dry lot)	Manure solids (Freestall)	J-vac
E	3600	220	Manure solids (dry lot)	Manure solids (Freestall)	J-vac
F	950	110	Compost pack	Manure solids (Freestall)	Enviracore
G	1750	90	Sand	Sand	Endovac bovi

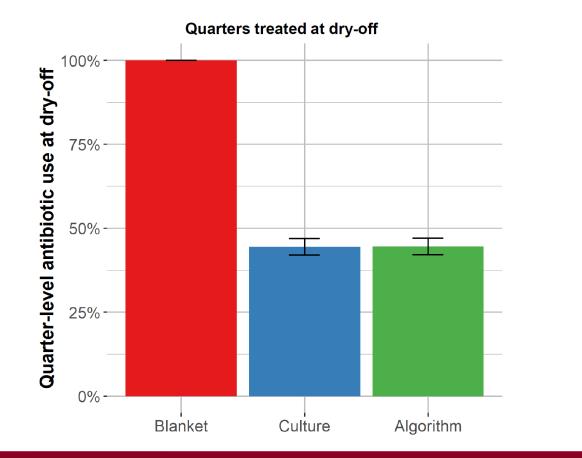




UNIVERSITY OF MINNESOTA Driven to Discover



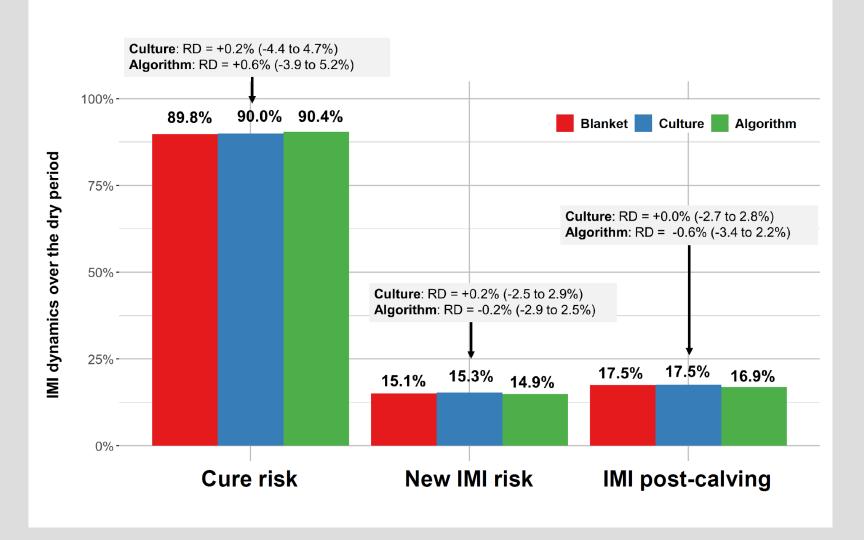
Antibiotic use was reduced by 55%



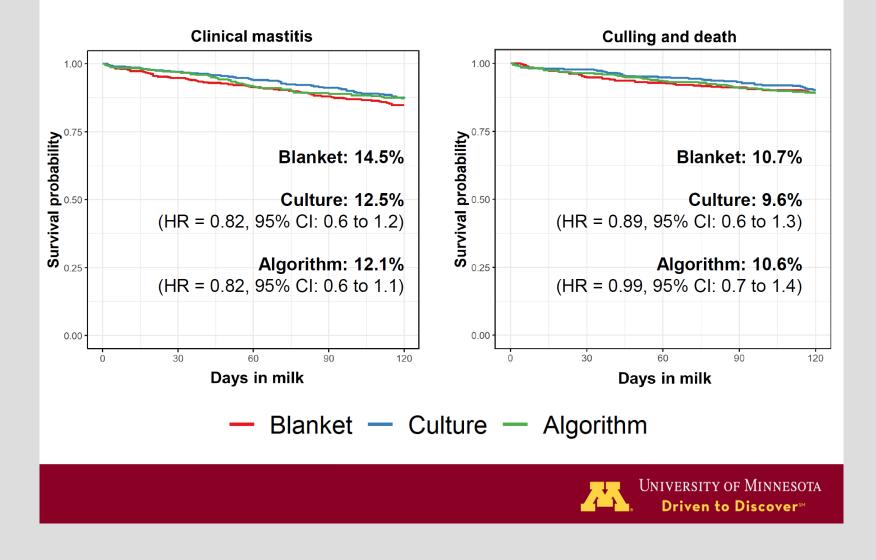


UNIVERSITY OF MINNESOTA Driven to Discover³⁴⁴

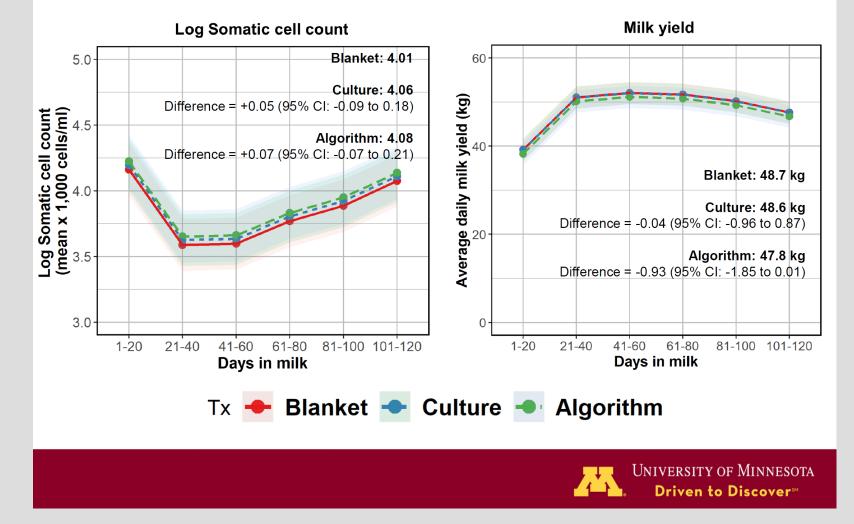
Quarter-level outcomes were similar



SDCT had similar effects on health (1 – 120 DIM)



SDCT had similar effects on milk production and quality from 1 – 120 DIM



Conclusions

- Selective DCT is an important opportunity we have to reduce antibiotic use on dairy farms
- In our study, Culture and Algorithm protocols reduced antibiotic use by 55% without any negative effects on health and productivity
- Selective DCT should be carefully implemented, under the supervision of a veterinarian



Minnesota Easy™ 4Cast® plate





UNIVERSITY OF MINNESOTA Driven to Discover⁵⁵⁴



J. Dairy Sci. 104:5652-5664 https://doi.org/10.3168/jds.2020-19366

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Partial budget analysis of culture- and algorithm-guided selective dry cow therapy

S. M. Rowe,^{1,2}* ⁽ⁱ⁾ D. V. Nydam,³ ⁽ⁱ⁾ S. M. Godden,¹ ⁽ⁱ⁾ P. J. Gorden,⁴ ⁽ⁱ⁾ A. Lago,⁵ ⁽ⁱ⁾ A. K. Vasquez,³ ⁽ⁱ⁾ E. Royster,¹ ⁽ⁱ⁾ J. Timmerman,¹ M. J. Thomas,⁶ and R. A. Lynch⁷ ¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108

²Faculty of Science, Sydney School of Veterinary Science, The University of Sydney, Camden, New South Wales 2570, Australia

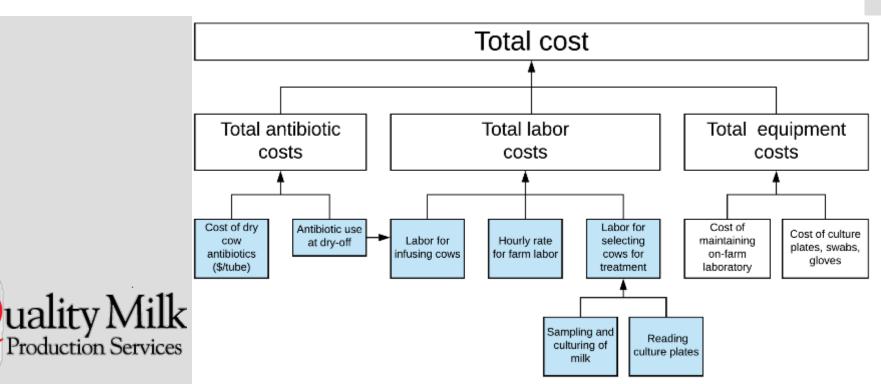
³Department of Population Medicine and Diagnostic Sciences, College of Veterinary Medicine, Cornell University, Ithaca, NY 14853

⁴Veterinary Diagnostic and Production Animal Medicine, Iowa State University Ames 50011

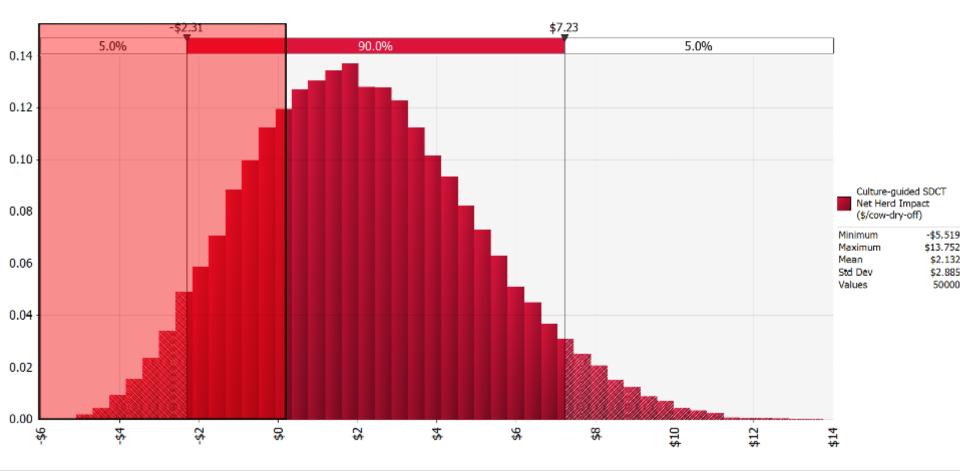
⁵DairvExperts, Tulare, CA 93274

⁶Dairy Health & Management Services, Lowville, NY 13367

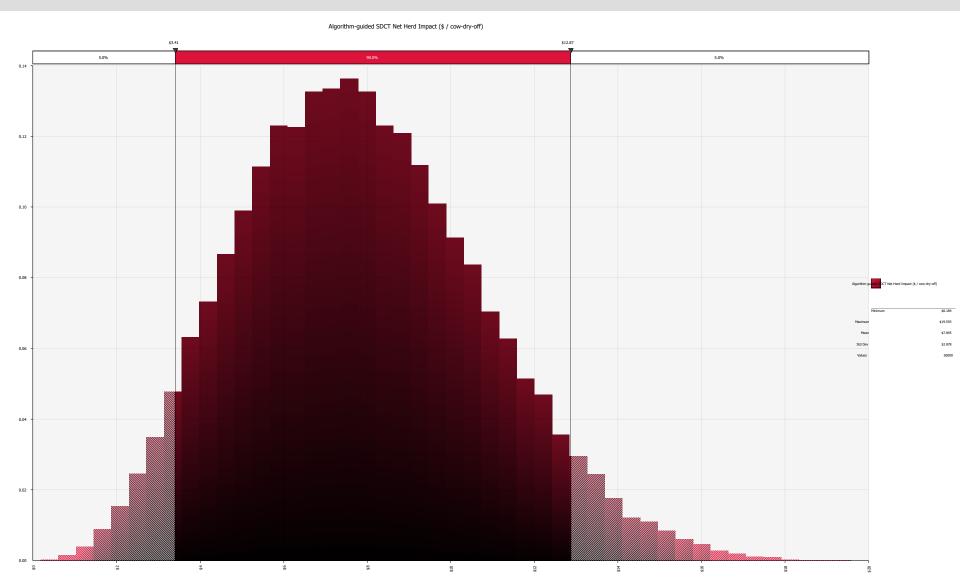
⁷Pro-Dairy, College of Agriculture and Life Sciences, Cornell University, Ithaca, NY 14853



Culture-guided SDCT



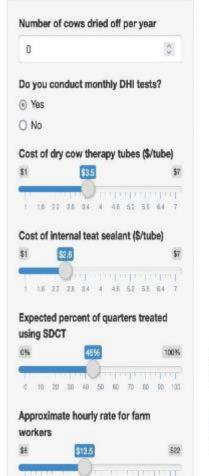
Relative frequency graph showing 50,000 iterations for the herd net economic impact of **algorithm-guided** SDCT (\$ / cow-dry-off). The **mean herd net economic impact was \$7.85**, indicating that on average, a herd switching from BDCT to algorithm-guided SDCT could expect to save \$7.85 per cow-dry-off. 100% of iterations had a net economic impact of \$0.00 or greater, indicating that algorithm-guided SDCT was a profitable practice in all herd conditions evaluated



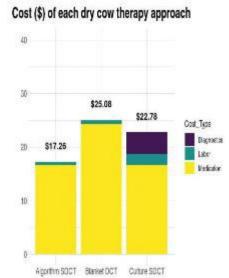
https://dairyknow.umn.edu/research/udderhealth/selective-dry-cow-therapy-cost-calculator/

Selective Dry Cow Therapy Cost Calculator

Enter your information below to compare the cost of dry cow therapy strategies in your herd



4 4.5 11 12.5 14 155 17 18.5 20 21.80



Culture SDCT

Culture-guided selective DCT will cost \$2.30 LESS per dry-off than blanket DCT. The estimated annual cash impact on your farm is +\$0.00

Algorithm SDCT

Algorithm-guided selective DCT will cost \$7.82 LESS per dry-off than blanket DCT. The estimated annual cash impact on your farm is +\$0.00

SDCT: What herds?

- Veterinarian of record involvement
 - Constitutes prescribing
- Bulk tank SCC <250,000
- Limited "contagious pathogens"
 No Strep ag, little Staph aureus
- Good herd records

uality Milk

Production Services

- Ability to implement new management
- Mastitis pathogen surveillance

Selective Dry Cow Therapy:

Points of Discussion for Vet of Record and Herd Management for Success



by Paul Virkler, D.V.M., and Heidi Sharkey-Webb

Dry-off routine should not introduce mastitis

- How are cows sorted and held prior to dry-off?
- Dried-off after last milking of lactation?
 - Ensure units and deck have not accumulated "debris"
- Check IDs and work list; leg bands
- Teat end cleanliness; far to near with alcohol
- Hygienic insertion of Abx and Teat sealant; near to far





Controlling the Dry-Off Procedure on Your Dairies – Getting Involved, Monitoring, and Training for Improvement

Wolfgang Heuwieser, DVM Valeria Gallardo, DVM Michael Zurakowski, DVM Rachel Moody, MS Paul Virkler, DVM Quality Milk Production Services 607-229-5985 (Paul) <u>pdv3@cornell.edu</u>



Cornell University Animal Health Diagnostic Center





Phase 1 Module Design

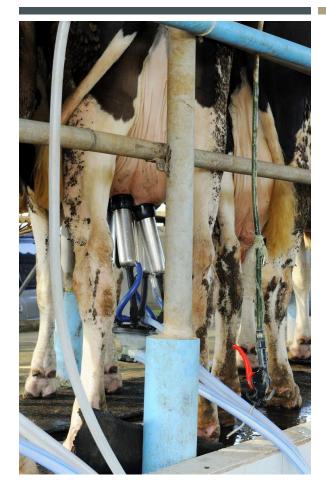
• Access by QR code



Or directly to: <u>https://dairyroutines.jimdo.com/</u>







Supporting The Implementation and Monitoring of Selective Dry Cow Therapy (SDCT) on NY State Dairy Farms

Amber Forrestal, DVM, QMPS, Perry Veterinary Clinic AABP 9/24/2022

- Tracy Potter, DVM, QMPS, Perry Veterinary Clinic
- Daryl Nydam, DVM, PhD, Cornell University

Michael Capel, DVM, Perry Veterinary Clinic





Cow Selection Criteria



All farms algorithm-based (vs. culture, CMT)

DairyComp305 SDCT Algorithm High Risk Cows

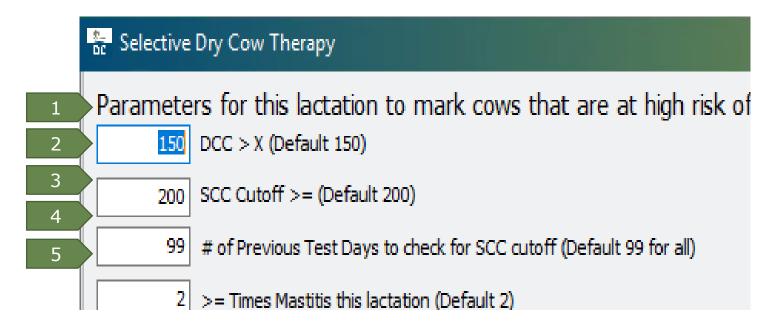
- SCC \geq 200 any test day through lactation
- \geq 2 mastitis events
- If 1 mast event, must be > 30 days before dry off
- Dry off list populated with Y or N

Routine's Custom bST Evtlnv Repro Prod MlkQlty Divide Herd Help				
◙ ▣ ▾ ▣ ▾ A ▾ ≗ ŀ< ⊟ ▣ ▾ ?				
= 🔂 Selective Dry Cow Therapy — 🗆 🗙 =				
Parameters for this lactation to mark cows that are at high risk of infection.				
200 SCC Cutoff >= (Default 200) 5 # of Previous Test Days to check for SCC cutoff (Default 99 for all)				
2 >= Times Mastitis this lactation (Default 2)				
30 If only 1 Mastiitis Event, treat if it occurred in the last () days (Default 30) OK Cancel				

https://vas.com/blog/2022/01/07/how-to-set-up-selective-dry-cowtherapy-with-dairycomp/

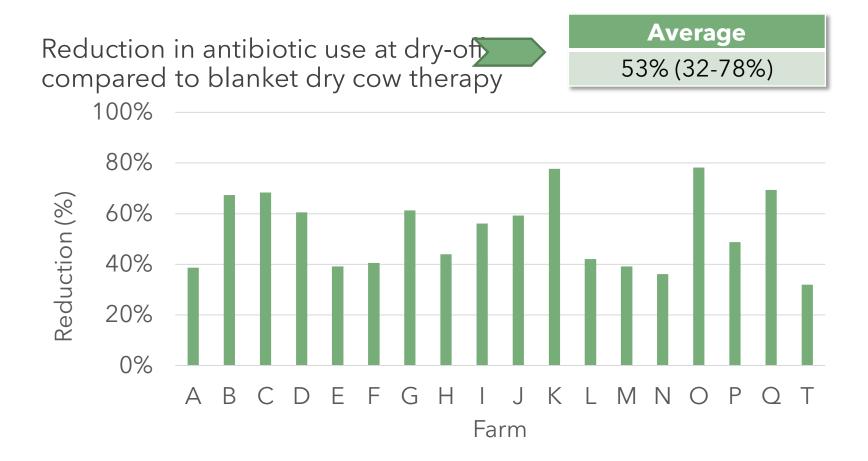
Enable SDCT Option in ECON

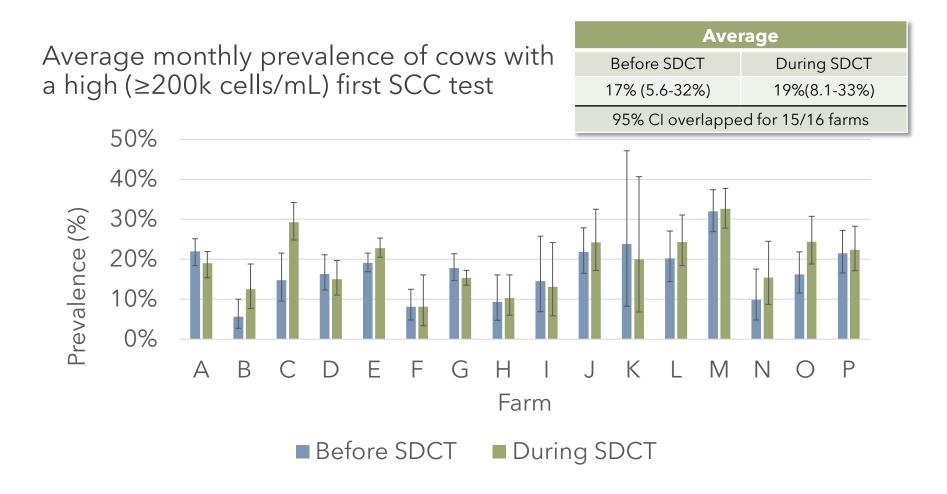
- ECON\SDCT

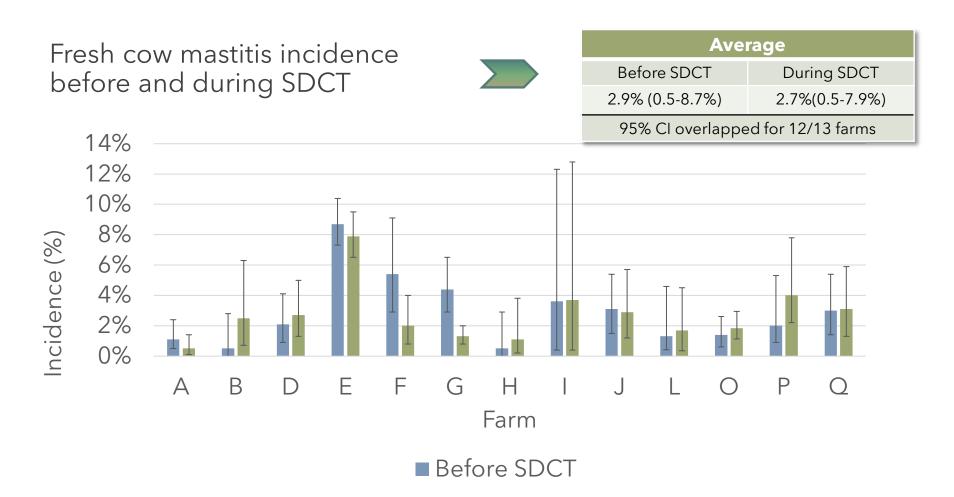


Herd Demographics: 24 farms enrolled

- Herd size range: 65 3,774 mature cows (avg. 985)
- Robot dairies: 4 farms
- Tie stall dairies: 2 farms
- DHI testing: 18 farms
- DairyComp 305: 21 farms
- DairyComp305 SDCT Algorithm: 14 farms
- All using teat sealant at dry off





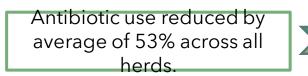


Summary

- SDCT was implemented in various farms of different sizes across NY state, and an algorithm was used to determine high risk and low risk cows.
- Results show that SDCT be implemented **in the right herd** without decreasing herd health.



- Excellent hygiene during the dry-off procedure
- Appropriate use of teat sealants (internal > external > nothing)



- 4,851 cows not treated with antibiotics
 - = 19,404 dry cow tubes
 - ~\$60,000 not spent on dry cow tubes



J. Dairy Sci. 105:7161–7189 https://doi.org/10.3168/jds.2021-21455

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Invited review: Selective use of antimicrobials in dairy cattle at drying-off

Kayley D. McCubbin,^{1,2} Ellen de Jong,^{1,2} Theo J. G. M. Lam,³ David F. Kelton,⁴ John R. Middleton,⁵ Kott McDougall,^{6,7} Sarne De Vliegher,⁸ Sandra Godden,⁹ Päivi J. Rajala-Schultz,¹⁰ Sam Rowe,¹¹ David C. Speksnijder,^{12,13} John P. Kastelic,¹ and Herman W. Barkema^{1,2}

CONCLUSIONS

Although described selection protocols and results differed, common themes emerged that present a positive argument in favor of SDCT. Producers should be provided with SDCT protocol options that reflect their access to data as the basis of antimicrobial treatment decision-making, as well as their motivation to choose one method over another. Further, sufficient evidence supports that TSL should be included as an integral part of an SDCT protocol (Winder et al., 2019b; Kabera et al., 2021). If SDCT recommendations are practical and based on producer situations, uptake will likely increase. Furthermore, ongoing producer and veterinary education is essential to increase antimicrobial stewardship in the dairy industry (Farrell et al., 2021) and increased personal responsibility in AMR mitigation is required to promote the required behavior change (Fishbein and Cappella, 2006). In addition, proper evaluation mechanisms should be in place to evaluate impacts of introduced SDCT protocols. In summary, SDCT protocols can be enacted in countries with developed dairy industries without negative udder health and production impacts and will substantially reduce DCT-associated AMU, potentially reducing the ant on AMD

"... SDCT protocols can be enacted in countries wit developed dairy industries without negative udder health and production impacts..."

What did the 2 cows do when they met?

They gave each other a milk shake!



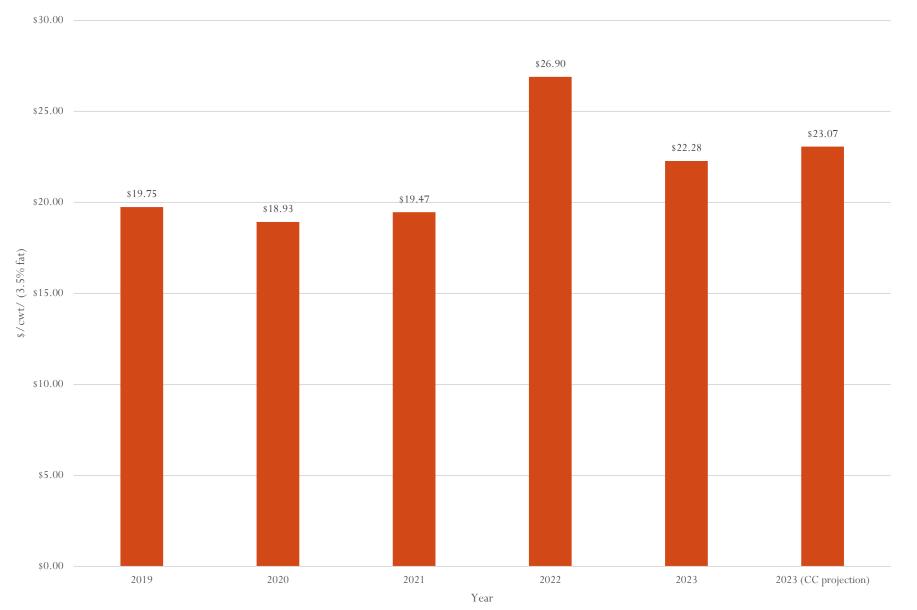
DAIRY MARKET OUTLOOK SOUTHEAST STATES

Georgia Milk Producers Association January 15 , 2024 Calvin Covington ccovington5@cs.com

OUTLINE

- 1. Milk prices.
- 2. Southeast- demand and supply.
- Federal Orders recent final decision and on-going hearing.

SOUTHEAST FMMO ANNUAL BLEND PRICES - Base Zone



SKIM MILK - DECLINE

	2022	2023	Change
Skim (\$/cwt.)	\$16.16	\$12.28	(\$3.88)
Butterfat (\$/lb.)	\$3.2256	\$2.9806 (second highest)	(\$0.245/lb.) (\$0.86/cwt.)
Average BF %	3.96 %	<u>4.01 %</u>	
3.5% BF (\$/cwt.)	\$26.90	\$22.28	(\$4.62)
Average BF % (\$/cwt.)	\$28.29	\$23.74	(\$4.56)
Average – 3.5 (\$/cwt.)	\$1.39	\$1.46	

DAIRY PRODUCT PRICES

	2022	2023	Change	
	(\$/lb.)			
Butter*	\$2.87	\$2.62	(\$0.25)	
Cheese (block)*	\$2.10	\$1.86	(\$0.24)	
Cheese (barrel)*	\$2.09	\$1.71	(\$0.38)	
<u>Nonfat Dry Milk*</u>	\$1.69	\$1.19	<u>(\$0.50)</u>	
Dry Whey*	\$0.61	\$0.36	(\$0.25)	
World Butter**	\$2.63	\$2.21	<u>(\$0.42)</u>	
World Skim Powder**	\$1.75	\$1.21	<u>(\$0.54)</u>	
World Cheese ***	\$2.47	\$1.99	<u>(\$0.48)</u>	
* DPSR	** Oceania	*** Western Europe		

MILK SUPPLY "More Solids in Milk)

	2021	2022	2023		
Milk production (billion lbs.)	226.3	226.5	226.5 (p)		
<u>Annual Change</u>	<u>1.4%</u>	<u>0.1%</u>	<u>0.0%</u>		
Cows – December (1,000's)	9,373	9,396	9,350 (p)		
Milk Solids %	13.35%	13.49%	13.56% (p)		
Milk Solids (billion lbs.)	30.2	30.6	30.7 (p)		
<u>Annual Change</u>	<u>2.2%</u>	<u>1.1%</u>	<u>0.5%</u>		
Predicted Cheddar Cheese Yield (lbs. per cwt.)					
<u>2010</u>	<u>2021</u>	<u>2022</u>	<u>2023</u>		
<u>10.06</u>	<u>10.78</u>	<u>10.98</u>	<u>11.08</u>		

DAIRY PRODUCT INVENTORY

Product	November 2021	November 2022	November 2023	Change
		(million lbs.)		(%)
Butter	210	200	215	7.8 %
Nonfat Dry Milk Powder	227	252	209	(16.9 %)
American Cheese	835	816	826	1.2 %
Dry Whey	60	73	71	(2.7 %)

DEMAND* -Domestic versus Export

<u>Year</u>	Domestic %	<u>Export %</u>
2000	96.1%	3.9%
2010	87.9%	12.1%
2015	86.6%	13.4%
2020	84.3%	15.7%
2021	83.2%	16.7%
2022	82.4%	17.6%
<u>2023 (January-October)</u>	<u>83.8%</u>	<u>16.2%</u>
*total solids		

ANNUAL DEMAND* CHANGE

Year	Domestic	Export	Total	
	(percent)			
2018	1.2%	10.1%	2.5%	
2019	2.1%	-7.3%	0.7%	
2020	-0.2%	12.8%	1.7%	
2021	1.6%	9.5%	2.9%	
2022	0.1%	5.9%	1.1%	
5 yr. Average	1.0%	6.7%	1.8%	
<u>2023 (Jan-Oct)</u>	<u>3.0%</u>	<u>-7.0%</u>	<u>1.3%</u>	
*total solids				

DAIRY EXPORTS

Product	2021-2022 % U.S. Production Exported	2023 vs. 2022 (JanOct.) % Change in Export
Nonfat and Skim Milk Powder	69.8%	(2.5%)
Dry Whey	53.5%	(19.5%)
Butter	5.5%	(50.0%)
Cheese	8.4%	(0.7%)

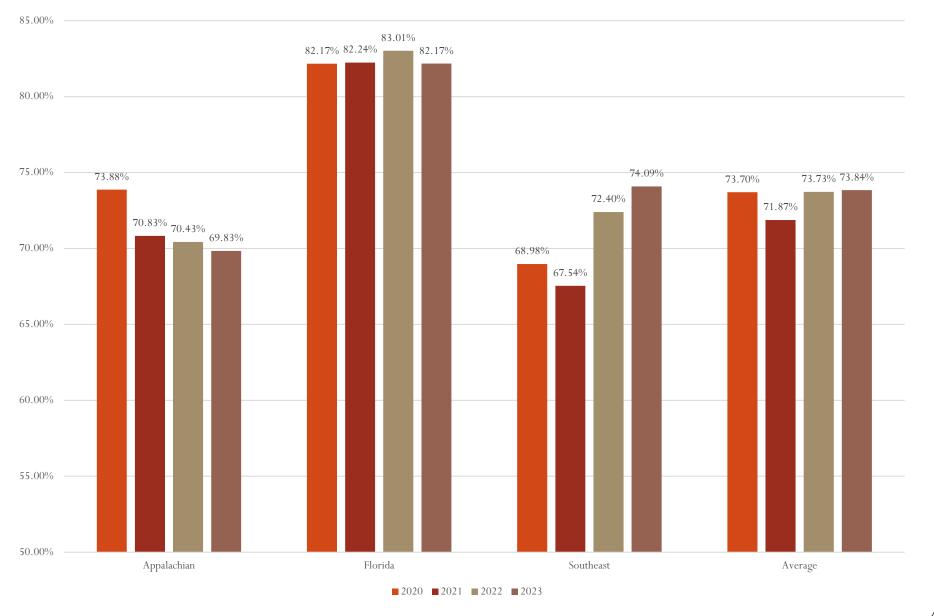
WHY DROP in MILK PRICES ?

- Decline in U.S. dairy exports.
- Decline in Global dairy prices lowered domestic dairy prices.
- Increased milk solids more product from same volume of milk.

2024 PROJECTIONS FO BLEND PRICES – Base Zone

	Appalachian	Florida	Southeast
<u>2023</u>			
\$/cwt. 3.5% fat	\$21.68	\$23.76	\$22.28
Butterfat \$ / lb.	\$2.9864	\$3.0090	\$2.9806
2024			
\$/cwt. 3.5% fat	\$21.55	\$23.50	\$22.06
Butterfat \$ / lb.	\$2.9655	\$2.9654	\$2.9681
Difference \$/cwt.	(\$0.13)	(\$0.26)	(\$0.22)

CLASS I UTILIZATION



Avg. Loads Class | Producer Milk/ Day

Year	Appalachian	Florida	Southeast	Total
2000	240	139	269	<u>648</u>
2010	229	139	259	<u>627</u>
2015	214	128	216	<u>559</u>
2020	217	114	179	<u>510</u>
2021	207	111	171	490
2022	211	114	157	482
2023	210	114	145	<u>469</u>
2023 vs. 2022	(1)	0	(12)	(13)

MILK MARKETS POOL DISTRIBUTING PLANTS

Year End	Appalachian	Florida	Southeast	Total
2000	26	12	32	70
2010	20	12	25	57
2015	17	10	22	49
2020	17	10	19	46
2022	16	8	15	39
2023	16	7	15	38

SOUTHEAST MILK PRODUCTION

State	2021	2022	2023 (p)	% of Total
	Average N			
Georgia	100	112	116	25.9%
Florida	120	107	106	23.8%
Virginia	81	79	78	17.6%
Kentucky	50	51	51	11.4%
N. Carolina	51	50	50	11.1%
Tennessee	28	27	26	5.7%
S. Carolina	9	9	8	1.9%
Louisiana	7	6	6	1.3%
Mississippi	6	5	4	0.9%
Alabama	2	2	2	0.4%
Total	454	449	446	

DISTRIBUTING PLANT DELIVERY CREDIT

	Appalachian	Florida	Southeast
Maximum Assessment on Class I Producer Milk	\$0.60/cwt.	\$0.85/cwt.	\$0.50/cwt.
Percent of Eligible Miles Reimbursed	Range 75-95%	Range 75-95%	Range 75-95%
Mileage Rate Factor (MRF)	Rate paid per cwt. per eligible mile	Change monthly based on diesel fuel price	Estimated January 2024 MRF \$0.00788
Credit paid to handler.			

On-Going National FMMO Hearing

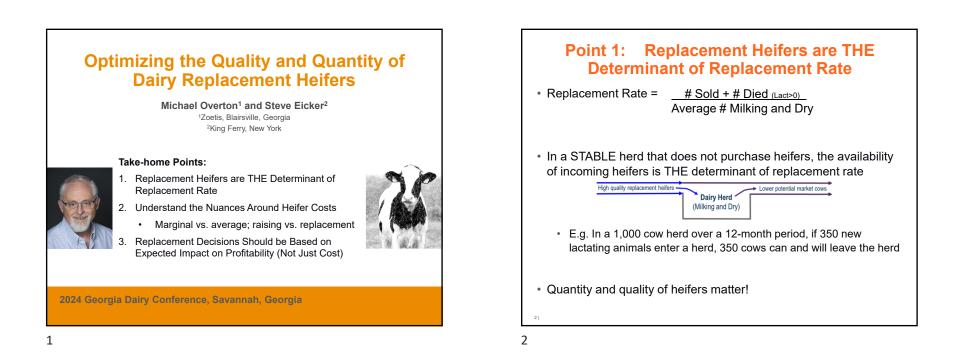
National Milk Producer Proposals	Estimated Impact FMMO's 5, 6 and 7
1. Update milk composition factors.	Increase blend price
2. Eliminate barrel cheese.	Increase blend price.
3. Return to "higher of".	Increase blend price.
4. Update make allowances.	Decrease blend price.
5. Update Class I differentials.	Increase blend price
Order	<u>USDA Estimate October 2022 on Blend Price</u>
Appalachian	+ \$1.68/cwt.
Florida	+ \$1.62/cwt.
Southeast	+ \$1.78/cwt.

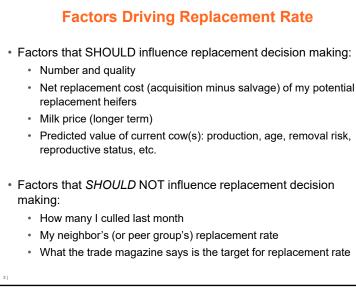
DATA SOURCES

- USDA Agricultural Marketing Service
- USDA National Agricultural Statistics Service
- USDA Economic Research Service
- USDA Farm Service Agency

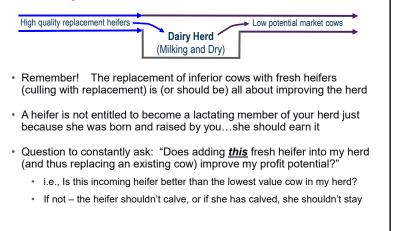
THANK YOU FOR THE OPPORTUNITY

QUESTIONS





The Calving of Heifers <u>ALLOWS</u> for the Replacement of Less Valuable Cows



3

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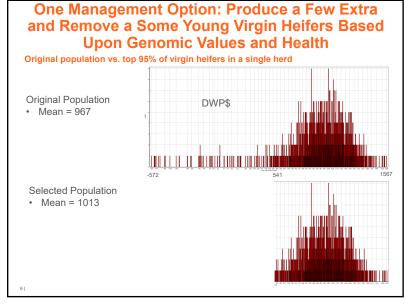
What if a Dairy Produces "More" Heifers than Truly Needed for Replacement Purposes?

- · Possible actions taken:
 - "Pushed" cows out of the herd prematurely \rightarrow NOT optimal
 - Selectively removed inferior heifers prior to calving \rightarrow improved the quality of the replacement pool
 - Genomic testing
 - Health and growth
 - · Sell springers or fresh heifers
 - · Calve "extras" and remove on basis of early lactation performance
- Today, I simply do not see this as most herds have rebalanced heifer production and used high levels of beef semen
- Unfortunately, many herds have overcorrected...
- 5

Same Herd: Results of Other Genomic Values

Predicted results of removing bottom 5% of virgin heifers

	gDWP\$	gNM\$	gMilk	
Original Population (average/heifer)	967	897	1123	
5% Removed (average/heifer)	94	187	-10	
Selected Population (average/heifer)	1013	934	1183	
Improvement	46	37	60	-
Value gained/heifer	\$92	\$59	\$25	(using 2.9 lact, \$0.14 marginal milk)
Difference kept vs. sold	919	747	1193	-
Value difference	\$1838	\$1195	\$485	(using 2.9 lact, \$0.14 marginal milk)
Value difference	\$1838	\$1195	\$485	(using 2.9 lact, \$0.14 marginal milk

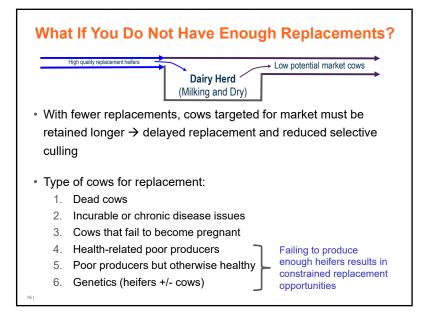


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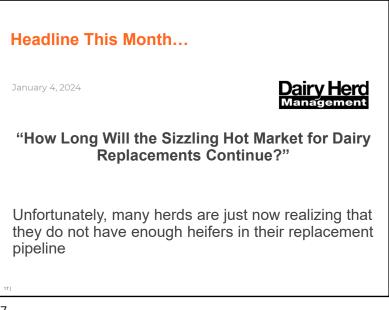
Another Consideration When There are Excess Heifers Above True Replacement Needs

- Calve extra heifers into the herd
- Then, make decisions on keep vs. sell based upon actual, early lactation production
- · Advantages:
 - · Built in "surplus" for times of extra need
 - · Allows selection based on actual performance
 - Provides a bit of insurance
 - National heifer pool → fewer heifers, lower value, rising cost
- More to come on this topic...

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Consequences of Not Having Enough Replacements

- · Scenario to consider:
 - A herd with that historically has run a 38-39% replacement rate "decided" to raise only enough heifers to support a 35% replacement rate
 - I.e., they "decided" to retain cull cows longer (assuming that no significant management changes occurred that truly changed the need for replacements)
- $39\% \rightarrow 35\%$ replacement rate due to insufficient heifers...
 - Now, the average market cow is retained ~ 100 days longer
 - · Under current conditions, miking these less productive cows longer than optimal results in lost opportunity of approximately \$150-200 or more per delayed replacement
- 16

How Many Replacements Should You Produce?

- · We usually work from historical replacement needs and historical youngstock removal risks
- · But what happened in the past may not repeat itself
 - · Trying to "anticipate" future replacement needs but many things can and do change:
 - · Cow health challenges Genetic potential
 - · Heifer quality Heifer cost
 - Milk price
- Market cow value
- · Consequently, we should add in a bit of a buffer for flexibility
 - · Adds cost but provides a bit of insurance

One Approach to Estimate Replacement Needs

	All	L=1	L=2	L>2
Avg # Milking and Dry	1000	313	256	431
# Sold	311	75	59	178
# Died	59	12	9	37
Herd Turnover	37%	28%	27%	50%
Total Replacements Needed – Status quo	370			

19

	All	L=1	L=2	L>2
Avg # Milking and Dry	1000	313	256	431
# Sold	311	75	59	178
# Died	59	12	9	37
Herd Turnover	37%	28%	27%	50%
Total Replacements Needed – Status quo	370			
Year-to-Year Variation (1 std dev of 10-yr RR = 2% of	herd)	20	→ 39	90
Cushion for unanticipated needs (% of the herd)	2%	20	→ 41	10
Net # Heifer Available to Ent	er Lactatio	n =	410	
% of Pregnant Heifers that leave prior to Calving	-4%	-17		
			427	# Heifers that Get Pregnant
% of Breeding Heifers that Conceive	93%			
% of Breeding Heifers that Conceive BREEDING Period	<mark>93%</mark>		459	# Heifers Enter Breeding Period
	93%		459	# Heifers Enter Breeding Period
	93% -5%	-24	459	# Heifers Enter Breeding Period
BREEDING Period		-24		# Heifers Enter Breeding Period # Heifer before Selective Culls
BREEDING Period		-24 -21		<u> </u>
BREEDING Period % Selective removals prior to breeding	-5%			<u> </u>

One Approach to Estimate Replacement Needs

	All	L=1	L=2	L>2				
Avg # Milking and Dry	1000	313	256	431				
# Sold	311	75	59	178				
# Died	59	12	9	37				
Herd Turnover		28%	27%	50%				
Total Replacements Needed – Status quo	370							
Year-to-Year Variation (1 std dev of 10-yr RR = 2% of herd)		20	→ 39	90				
Cushion for unanticipated needs (% of the herd)	2%	20	→ 41	10				
201 (Note: This is NOT an inventory calculation	ı; thus	s, age	e at fir	st cal	ving is	not ne	eeded)

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Point 2: Understand the Nuances Around Heifer Costs

- As a cost center, replacements are typically the 2^{nd} or 3^{rd} largest variable cost of production
- But it is an investment that will be paid back via milk and market cow revenue
- Important topics to understand:
 - Average raising cost vs. marginal raising cost
 - · Raising cost (acquisition cost) vs. net replacement cost
 - Longer time in the herd \rightarrow lower cost/day
 - Greater dilution of cost over more days
 - Longer time in the herd → lower net salvage value
 Salvage value matters!

²²¹ 22

Average vs. Marginal Raising Cost

- Facilities are typically built to raise "X" amount of heifers
- In calculating average raising cost for a dairy, housing and other fixed costs are estimated, then divided over "X" number of heifers
 - Average heifer cost = wet calf value, feed costs, mortality losses, treatment costs, labor, housing, bedding, utilities, etc.
 - E.g. \$2300-2600 for average raising cost
- Any extra heifers produced beyond "X" number of heifers represent "marginal heifers"
 - Raising a few extras are the least expensive to raise (assuming the numbers are not excessive and thus create health/ welfare issues or significant increases in labor needs)
 - Marginal heifer cost = wet calf value, feed costs, mortality losses, treatment costs, etc. but no "fixed costs" and little to no extra labor
 - E.g. \$1750-1900 marginal raising cost
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- 23

Average Net Salvage Value at Slaughter

Net Replacement Cost = Heifer cost – net salvage value

Net salvage value received per new addition depends upon many things:

- market conditions, body condition, weight of market cow \rightarrow price/lb
- · how long the animal stays in the herd (and interest cost)
- how many market cows yield a positive return (i.e., do not die during herd life nor get condemned at slaughter)

Assumptions:

- Mortality risk = 6% per lactation and condemnation risk at slaughter = 7%
- Interest rate = 7%

Net Sal	vage	e Valu	e Marke	t Cow Valu	e (\$/lb live	weight)	
		\$0.75	\$0.85	\$0.95	\$1.05	\$1.15	\$1.25
Rate	32%	\$666	\$755	\$843	\$932	\$1,021	\$1,110
	34%	\$682	\$773	\$864	\$955	\$1,046	\$1,137
Replacement	36%	\$697	\$789	\$882	\$975	\$1,068	\$1,161
olace	38%	\$710	\$805	\$899	\$994	\$1,089	\$1,183
Rep	40%	\$722	\$818	\$915	\$1,011	\$1,107	\$1,204

Raising Cost vs. Replacement Cost

- When discussing replacement rates for herds, we often overly focus on the "acquisition" cost – purchase price, average cost, marginal cost, etc.
- But this is only part of the transaction
- There is also the salvage value of the animal that is being replaced
- Net Replacement Cost = Raising Cost Net Salvage Value
 - Net Salvage Value = average revenue received per incoming replacement
 - · Includes the missing animals that died or were condemned

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Net Replacement Cost

Net Replacement Cost = Heifer cost – net salvage value

Assumptions:

- Mortality risk = 6% per lactation
- Condemnation risk at slaughter = 7%
- Interest rate = 7%
- Replacement rate = 37%

Net Replacement Cost

		Market Cow Value (\$/Ib live weight)								
		\$0.75	\$0.85	\$0.95	\$1.05	\$1.15	\$1.25			
ᆂᆈ	\$2,200	\$1,497	\$1,403	\$1,309	\$1,215	\$1,121	\$1,028			
Replacement Heifer Cost	\$2,300	\$1,597	\$1,503	\$1,409	\$1,315	\$1,221	\$1,128			
acel fer (\$2,400	\$1,697	\$1,603	\$1,509	\$1,415	\$1,321	\$1,228			
tepl Hei	\$2,500	\$1,797	\$1,703	\$1,609	\$1,515	\$1,421	\$1,328			
æ	\$2,600	\$1,897	\$1,803	\$1,709	\$1,615	\$1,521	\$1,428			

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Net Replacement Cost Net Replacement Cost = Heifer cost - net salvage value Assumptions: Mortality risk = 6% per lactation Condemnation risk at slaughter = 7% • Interest rate = 7% Replacement heifer cost = \$2400 **Net Replacement Cost** Market Cow Value (\$/lb live weight) \$0.75 \$0.85 \$0.95 \$1.05 \$1.15 \$1.25 \$1,380 \$1,291 **32%** \$1,734 \$1,646 \$1,557 \$1,468 \$1,446 \$1,355 \$1,264 **34%** \$1,718 \$1,628 \$1,537 Replacement **36%** \$1,704 \$1,611 \$1,518 \$1,425 \$1,333 \$1,240 38% \$1,691 \$1,596 \$1,501 \$1,407 \$1,312 \$1.218 **40%** \$1,678 \$1,582 \$1,486 \$1,390 \$1,293 \$1,197 Notice how the larger factor for Net Replacement Cost is Market Cow Value and NOT Replacement Rate Why??? → Impact of time and mortality on Net Salvage Value

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Point 3: Focus on Profit and Not Simply Cost

Don't over pursue current cashflow at the expense of future profitability (if possible)

- Many in our industry focus heavily on the large *explicit* cost of raising heifers and conclude that there are two goals:
 - 1) Lower the replacement rate (herd turnover) as much as possible
 - 2) Bring in heifers as cheaply as possible
- Overdoing points 1 and 2 above can result in significant lost opportunity costs
 - Milking poorer quality animals (poorly grown, chronic health issues)
 - Lower replacement rates due to insufficient heifers forces lousy cows to stay in the milking herd too long

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Net Replacement Cost/Day of Adult Life

Net Replacement Cost/d= (Heifer cost - net salvage value)/projected number of days

Assumptions:

- Mortality risk = 6% per lactation
- Condemnation risk at slaughter = 7%
- Interest rate = 7%
- Replacement heifer cost = \$2400

Net Replacement Cost/d of Adult Life

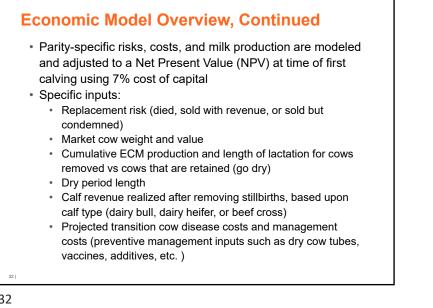
	Market Cow Value (\$/Ib live weight)											
		\$0.75	\$0.85	\$0.95	\$1.05	\$1.15	\$1.25					
Rate	32%	\$1.75	\$1.66	\$1.57	\$1.48	\$1.39	\$1.30					
ent R	34%	\$1.83	\$1.73	\$1.63	\$1.54	\$1.44	\$1.34					
eme	36%	\$1.91	\$1.80	\$1.70	\$1.60	\$1.49	\$1.39					
olacem	38%	\$1.99	\$1.88	\$1.77	\$1.65	\$1.54	\$1.43					
Repl	40%	\$2.07	\$1.95	\$1.83	\$1.71	\$1.59	\$1.48					

Again, notice how the larger factor for Net Replacement Cost is Market Cow Value and NOT Replacement Rate

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Background → Brief Overview of A New Economic Model Used Throughout this Presentation

- A spreadsheet-based economic model was built to mimic the major variable costs and revenue streams associated with milking and dry cows from first calving until removal from the herd (up to 10 lactations)
- · Imagine building a hypothetical herd:
 - Year 1:
 - Original group (A) of heifers calve for first time and enter lactation (Lact=1)
 - Some get culled but most survive to the next lactation
 - Year 2:
 - Survivors of the original group now becomes Lact=2
 - New group (B) calves for the first time and enter lactation
 - Year 3:
 - Survivors of original group A now become Lact =3
 - Survivors of group B become Lact=2
 - New group (C) calves for first time and enter lactation
 - Process continues



Model Outcome (and Economic Concept Used in this Presentation): Income over Cost* (IOC)

- · Similar to IOFC (income over feed cost) but IOC goes a bit further:
 - (Milk + Wet Calf Revenue + Market Cow Revenue) (Feed + Dry Cow + Transition + Replacement Cost)
 - · IOC is first tabulated as a Lifetime Value
 - · Lifetime production (and costs) are adjusted back to a net present value as of the day of calving
 - Then, IOC is converted to an Annualized Value

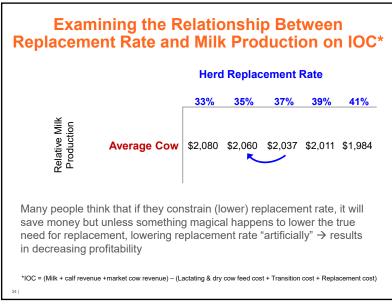
Income Over Cost* (IOC) =

(Milk revenue + calf revenue +market cow revenue) minus (Lactating & dry cow feed cost + Transition cost + Replacement cost)

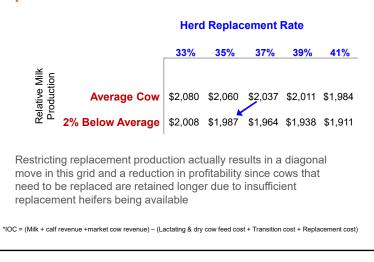
*Note: IOC is not profit as it excludes fixed costs and some other less significant variable costs

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Examining the Relationship Between Replacement Rate and Milk Production on IOC*



Examining the Relationship Between Replacement Rate and Milk Production on IOC*

Herd Replacement Rate

		32%	34%	36%	38%	40%
a ik	2% Above Average	\$2,152	\$2,132	\$2,106	\$2,084	\$2,057
rct je	Average Cow					
Relativ Produ	2% Below Average	\$2,008	\$1,987	\$1,964	\$1,938	\$1,911

- Careful and appropriate *selective* replacement can increase profitability if it results in an increase in production
- A higher replacement rate is costly IF production does not change but it can be more profitable if replacement yields a higher level of production

*IOC = (Milk + calf revenue +market cow revenue) - (Lactating & dry cow feed cost + Transition cost + Replacement cost)

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But, But, But... She Hasn't Paid for Herself!

 The decision to replace a cow should never consider when she has paid for herself, but rather what is most profitable for the slot

Average Cow	Calving to Dry (d)	Total Milk (lb)	Avg/day	Milk + Calf Income	Feed	Dry Cow &Transition	Housing & Other Costs	Net/day
Lact 1	340	24,533	72	\$6,203	-\$2,475	-\$399	-\$2,499	
Lact 2	227	19,076	84	\$5,010	-\$1,809		-\$1,668	
Total	567	43,609		\$11,214	-\$4,284	-\$399	-\$4,167	
Average/day			77	\$19.78	-\$7.55		-\$7.35	\$4.17
							Total Net	\$2,364
Lower Quartile Cow (bottom 25%)	Calving to Dry (d)	Total Milk (lb)	Avg/day	Milk + Calf Income	Feed	Dry Cow &Transition	Housing & Other Costs	Net/day
Lact 1	340	20,853	61	\$5,273	-\$2,260	-\$399	-\$2,499	
Lact 2	330	22,247	67	\$5,812	-\$2,311	-\$426	-\$2,426	
Lact 3	330	22,333	68	\$5,834	-\$2,316	-\$451	-\$2,426	
Lact 4	300	20,040	67	\$5,254	-\$2,090		-\$2,205	
Total	1300	85,472		\$22,173	-\$8,977	-\$1276	-\$9,555	
Average/day			66	\$17.06	-\$6.91		-\$7.35	\$1.82
							Total Net	\$2,364

The lower producing cow takes more than twice as long to reach the same economic endpoint

• When you have low producing cows, do you *REALLY* want to keep them long enough for them to pay for themselves???



"You should not cull many first lactation cows because they have not yet paid for themselves..."

- This logic is flawed and often is referred to as "chasing sunk costs"
 - The Sunk Cost Fallacy describes our tendency to follow through on an endeavor if we have already invested time, effort and money whether or not the current costs outweigh the benefits¹
- Holding on to low producing cows longer lowers the explicit or direct cost of replacement but also lowers *future* revenue (and profit)

¹ https://thedecisionlab.com/biases/the-sunk-cost-fallacy last accessed 5/27/2022

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Keeping Inferior Cows Around Longer is Focusing on Cost Reduction vs. Profit Maximization

- We should make replacement decisions earlier vs. "waiting to see what happens"
- To illustrate...

We¹ modeled the expected cost vs. value of replacing 5% of the first lactation cows at 75 DIM based on projected 305d ECM production at that time

 i.e., replace half of the lowest 10% of first lactation animals based on early lactation production estimates

¹Overton, M. and S. Eicker. 2022. Use of an NPV model to estimate the value of additional selective replacement of dairy cattle during first lactation. J. Dairy Sci. Vol. 105, Suppl. 1:140.

Methods

- 15 Holstein herds that used Dairy Comp 305[®] herd management software was selected
- 1000 cows were randomly selected from each herd that calved for the first time during either 2014 or 2015.
- <u>At the herd level</u>, cows were stratified into two groups based upon projected 70 DIM 305d ECM production (D70_305M)
 - Upper 90% (U90) vs. Lower 10% (L10)
- All relevant performance data through 5 potential lactations were entered into my NPV economic model

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F	Res	ults Upper	r 90 Cov	ws	Lowe	r 10 Cov	ws		Cumi Avg E0	ulative CM (lb)
	Lact #	Replacement Rate	# Starting	Avg # at Risk	Replacement Rate	# Starting	Avg # at Risk		Upper 90	Lower 10
	1	21%	400	359	54%	44	32		25680	15690
-	2	34%	318	263	42%	20	16		27350	23990
Actual	3	41%	208	165	45%	12	9		27310	25270
A	4	53%	122	90	45%	6	5		25580	25790
	5	62%	58	40	49%	4	3		23950	22840
	6	85%	22	13	85%	2	1		20220	19530
eq	7	88%	3	2	88%	0	0		17300	16680
Modeled	8	88%	0	0	88%	0	0		16940	16340
ž	9	94%	0	0	94%	0	0		13950	13440
	10	100%	0	0	100%	0	0		8070	7730
	ALL	35%		931	50%		66		26220	19990
	-	Total herd	size = 🤅	931 (U9	00) + 66 (L1	10) = 99	97 (milki	ng) and dry	()

Methods, Continued

- Half of the L10 cows (5% of total herd) were "removed and replaced" with average replacement heifers for the data set
- The annualized values per slot were tabulated and compared based on the changes in marginal milk and calves (revenue) and marginal costs (feed, transition management, replacement, etc.)
 - Original herd = U90 + L10 = 997 Cows
 - "New" herd = U90 + half of L10 + Average Replacements = 997 Cows
 - Additional revenue = market value from half of the L10 cows that were removed
 - Additional costs = cost of the extra replacements (purchase price or marginal raising cost)
- All revenue, costs, and final values are on a "per slot" basis (997 cows)

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Results

Projected Lifetime Info	Upper 90	Lower 10	Difference
Lifetime ECM/DIM (lb, lactating)	87	77	10
Lifetime ECM/d (lb, milking and dry)	77	69	8
Avg Productive Life (d)	958	580	378
Lifetime IOFC/DIM (lactating)	\$8.30	\$7.00	\$1.30
Net Replacement Cost/d	\$1.18	\$1.89	-0.71
IOC*/year	\$2,121	\$1,476	\$646
IOC*/d	\$5.81	\$4.04	\$1.77

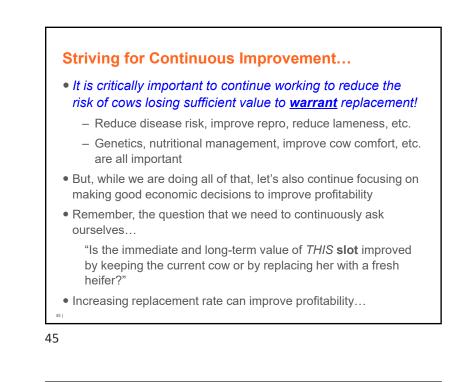
*IOC = (Milk + Calf Revenue) - (Lactating Feed + Dry Cow Feed + Transition Management + Transition Disease Costs + Replacement Costs)

43 |

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100 44	90%	931		
44		501	\$2,121	Improvement/slot \$20
	10%	66	\$1,476	Cull Revenue/slot \$2
144		997	\$2,079	Cost of New Animals -\$3
	\$22,440	→ \$	22/cow slot	Final Net/Cow Slot/Yr \$12
ting Ict	% of Herd	Avg # in Herd	юс	 Selective replacement EARL was a net gain ~\$12,000/year
400	92%	931	\$2,121	· Keeping these low producing
22	5%	33	\$1,476	animals in the herd is costly
15	3%	33	\$2,079	Replacement of these low
437		997	\$2,099	producers is only possible
-\$30,	,000 →	→ -\$30/co	w slot	there are sufficient replacement heifers
	Milk + Ca			
	ing ct 400 22 15 437 -\$30,	= \$22,440 ing % of Herd 400 92% 22 5% 15 3% 437 -\$30,000 →	$\begin{array}{c ccccccccccccccccccccccccccccccccccc$	= \$22,440 → \$22/cow slot ing % of Avg # IOC ct Herd in Herd $400 92\% 931 $2,121$ $22 5\% 33 $1,476$ $15 3\% 33 $2,079$ $437 997 $2,099$







Comparison of Two Investment Options:

- Option A:
 - Invest \$10,000 today
 - In 5 years, you get back \$20.000

• Option B:

- Rate of return = 15%
- Lifetime profit = \$10,000
- Avg profit per year = \$2000
- Invest \$10,000 today
- In 3 years, you get back \$17.716
- Rate of return = 21%
- Lifetime profit = \$7,716
- Avg profit per year = \$2572

Assuming both options are available for renewal, which option do you want?

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_	_	_	_	
Comparison	of	Two	Programs	

Average ECM/DIM (ALL) Total Projected Days (Milk + Dry) Projected lifetime milk (Ib ECM) Average IOC/Lifetime Net Replacement Cost/Day	Option A 75 1147 75,306 \$4,994 \$0.72	Option B 81 842 60,780 \$3,738 \$1.76
• Which would you say	is the winning	option?

Now, A Comparison of Two Hypothetical **Options for Replacements**

• Option A:

- A group of 1,000 heifers Cost of \$1500 each
- Option B: A group of 1,000 heifers
 - Cost of \$2200 each
- Average heifer at 1st calving: Average heifer at 1st calving:
 - 1350 lb @ 710 d
 - GPTAM of 475
- Lact=1 305 M: 20,000 lb

1275 lb @ 760 d
GPTAM of 25

- I act=1 305 M: 23,500 lb

_	Lact=	Τ.	305	IVI:	,

10	30%	25283		40%	27629
10	100%	8486	9 10	100%	7826
9	49 % 60%	29759	8 9	80% 99%	31511
8	49%	28084	8	86%	29738
7	48%	29377	7	83%	31106
6	44%	28697	6	76%	30386
5	41%	28861	5	72%	30560
4	38%	28484	4	66%	30161
3	34%	27102	3	48%	29787
2	26%	26330	2	35%	29783
1	20%	21297	1	30%	25089
Lact	Replacement Risk	Actual Milk/Lact (PREG & Ret)	Lact	Replacement Risk	Actual Milk/Lact (PREG & Ret)

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Comparison of Two Programs

	Option A	Option B
Average ECM/DIM (ALL)	75	81
Total Projected Days (Milk + Dry)	1147	842
Projected lifetime milk (lb ECM)	75,306	60,780
Average IOC/Lifetime	\$4,994	\$3,738
Net Replacement Cost/Day	\$0.72	\$1.76
Avg Projected Lifetime IOFC/DIM	\$6.28	\$7.37
Avg IOC/Day	\$4.35	\$4.44
Annualized Average IOC	\$1,589	\$1,619

• Now, which would you say is the winning option?

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

			"Artificially" Reduced Replacement Rate	"Just Enough"	Small Excess	Mod
ige Herd Size		1000	35%	37%	39%	
I Replacement Rate ge # Removals/Year (Replace			350	37%	39% 390	
Economic assumpt	: ions: \$0.20/lb	Total M	ixed Ration	\$0.14/lb dry	matter	
· · · ·				\$0.14/lb dry \$18	matter	
Milk price	\$0.20/lb	Conver	ntional Semen		matter	

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

		Reduced Replacement Rate	"Just Enough"	Small Excess	Moderate Excess
Average Herd Size	1000				
Actual Replacement Rate		35%	37%	39%	41%
Average # Removals/Year (Replacements Needed/Year)		350	370	390	410
Heifer Completion Risk	80%				
Heifer Calves Born Alive		436	460	485	510
Holstein Bull Calves Born Alive		59	63	66	70
Beef Cross Calves Born Alive		576	539	509	477
Total Calf Value/Year		\$306,250	\$295,602	\$288,146	\$279,427
Breeding Costs/Year		-\$59,035	-\$60,078	-\$62,138	-\$64,089
Total Calf Value minus Breeding Cost/Year		\$247,215	\$235,524	\$226,009	\$215,337
Calf Value minus Breeding Cost/Year (per cow slot)		\$247	\$236	\$226	\$215
54)					

Comparing the Predicted Economic Impact of Four Different Replacement Rates

		"Artificially" Reduced Replacement Rate	Status Quo: "Just Enough"	Small Excess	Moderate Excess
Average Herd Size	1000				
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Comparing the Predicted Economic Impact of Four Different Replacement Rates

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Average Herd Size	1000				
Actual Replacement Rate		35%	37%	39%	41%
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Total Calf Value minus Breeding Cost/Year		\$247,215	\$235,524	\$226,009	\$215,337
Calf Value minus Breeding Cost/Year (per cow slot)		\$247	\$236	\$226	\$215
Replacements Produced/Year		350	370	390	410
Replacement Rate Supported		35%	37%	39%	41%
Potential Deficit or Surplus Heifers		-20	0	20	40
Average Heifer Raising Cost (not including calf value):	<mark>-\$2,087</mark>	-\$2,108	-\$2,087	-\$2,048	-\$2,032
Average Marginal Heifer Raising Cost:	<mark>-\$1,707</mark>				
Average Heifer Raising Cost (per cow slot)		-\$738	-\$773	-\$799	-\$833

55

Comparing the Predicted Economic Impact of Four Different Replacement Rates

		"Artificially" Reduced Replacement Rate	Status Quo: "Just Enough"	Small Excess	Moderate Excess
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Average Marginal Heifer Raising Cost:	-\$1,707				
Average Heifer Raising Cost (per cow slot)		-\$738	-\$773	-\$799	-\$833
Net of Calf Value and Raising Cost/Cow Slot/Year		-\$491	-\$537	-\$573	-\$618
56					

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

	"Artificially" Status Quo: Reduced "Just Enough" Small Excess Excess Replacement Rate	
Total Calf Value minus Breeding Cost/Cow Slot/Year	\$247 \$236 \$226 \$2 ⁻	15
Replacements Produced/Year Replacement Rate <i>Supported</i> Potential Deficit or Surplus Heifers	35% 37% 39% 41	10 % 40
Average Heifer Raising Cost (minus calf value):	-\$2,108 -\$2,087 -\$2,048 -\$2,03	32
58		

Comparing the Predicted Economic Impact of Four Different Replacement Rates

		"Artificially" Reduced Replacement Rate	Status Quo: "Just Enough"	Small Excess	Moderate Excess
Average Herd Size	1000				
Actual Replacement Rate		35%	37%	39%	41%
Average # Removals/Year (Replacements Needed/Year)		350	370	390	410
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Replacements Produced/Year		350	370	390	410
Replacement Rate Supported		35%	37%	39%	41%
Potential Deficit or Surplus Heifers		-20	0	20	40
Average Heifer Raising Cost (not including calf value)	-\$2.087	-\$2 108	-\$2,087	-\$2.048	-\$2,032

Net of Calf Value and Raising Cost/Cow Slot/Year

-\$491 -\$537 -\$573 -\$618

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

	"Artificially" Status Quo: Moderate Reduced "Just Enough" Small Excess Excess Replacement Rate
Total Calf Value minus Breeding Cost/Cow Slot/Year	\$247 \$236 \$226 \$215
Replacements Produced/Year Replacement Rate Supported Potential Deficit or Surplus Heifers	350 370 390 410 35% 37% 39% 41% -20 0 20 40
Average Heifer Raising Cost (minus calf value):	-\$2,108 -\$2,087 -\$2,048 -\$2,032
Average Annual Mortality Risk, Condemnation Risk (cows)	6.2%, 6.2% 6.0%, 6.0% 5.7%, 5.8% 5.5%, 5.6%
Projected Net Salvage Value/cow (NPV)	\$864 \$881 \$898 \$912
Net Replacement Cost (Cost - Projected NPV Salvage)	-\$1,244 -\$1,206 -\$1,150 -\$1,120
Net Replacement Cost/Cow Slot/Year	-\$436 -\$446 -\$449 -\$459

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

	"Artificially" Reduced Replacement Rate	Status Quo: "Just Enough"	Small Excess	Moderate Excess
Total Calf Value minus Breeding Cost/Cow Slot/Year	\$247	\$236	\$226	\$215
Replacements Produced/Year Replacement Rate <i>Supported</i> Potential Deficit or Surplus Heifers	350 35% -20	370 37% 0	390 39% 20	410 41% 40
Average Heifer Raising Cost (minus calf value): Average Annual Mortality Risk, Condemnation Risk (cows)	-\$2,108 6.2%, 6.2%	-\$2,087 6.0%, 6.0%	-\$2,048 5.7%, 5.8%	-\$2,032 5.5%, 5.6%
Projected NPV Net Salvage Value/cow	\$864	\$881	\$898	\$912
Net Replacement Cost (Cost - Projected NPV Salvage) Net Replacement Cost/Cow Slot/Year	-\$1,244 - \$436	-\$1,206 - \$446	-\$1,150 - \$449	-\$1,120 - \$459
NPV Annualized Milk Impact/Cow Slot/Year (selective replacement)	-\$19	\$0	\$14	\$11
60				

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Comparing the Predicted Economic Impact of Four Different Replacement Rates

		"Artificially Reduced Replacement	í,	Status Quo: "Just Enough"	Small Excess	Moderate Excess
Total Calf Value minus Breeding Cost/Cow Slot/Year		\$24	47	\$236	\$226	\$215
Replacements Produced/Year			50	370	390	410
Replacement Rate Supported		35		37%	39%	41%
Potential Deficit or Surplus Heifers		-	20	0	20	40
Average Heifer Raising Cost (minus calf value):		-\$2,10	08	-\$2,087	-\$2,048	-\$2,032
Average Annual Mortality Risk, Condemnation Risk (cows)		6.2%, 6.	.2%	6.0%, 6.0%	5.7%, 5.8%	5.5%, 5.6%
Projected NPV Net Salvage Value/cow		\$86	64	\$881	\$898	\$912
Net Replacement Cost (Cost - Projected NPV Salvage)		-\$1,24	44	-\$1,206	-\$1,150	-\$1,120
Net Replacement Cost/Cow Slot/Year		-\$43	36	-\$446	-\$449	-\$459
NPV Annualized Milk Impact/Cow Slot/Year (selective replacement)		-\$1	19	\$0	\$14	\$11
Delayed Culling Opportunity Cost/d	-\$1.60	-\$31,1	52	\$0	\$0	\$0
Market Value for Fresh Lact=1 Sold	\$1,500				\$30,000	\$60,000
Delayed Culling and Extra Heifer Market Value Net/Cow Slot		-\$3	31	\$0	\$30	\$60
Total Average Cost/Cow Slot/Year		-\$23	39	-\$211	-\$179	-\$173
62						

Comparing the Predicted Economic Impact of Four Different Replacement Rates

		"Artificially" Reduced Replacement Rate	Status Quo: "Just Enough"	Small Excess	Moderate Excess
Total Calf Value minus Breeding Cost/Cow Slot/Year		\$247	\$236	\$226	\$215
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Net Replacement Cost/Cow Slot/Year		-\$436	-\$446	-\$449	-\$459
NPV Annualized Milk Impact/Cow Slot/Year (selective replacement)		-\$19	\$0	\$14	\$11
Delayed Culling Opportunity Cost/d	-\$1.60	-\$31,152	\$0	\$0	\$0
Market Value for Fresh Lact=1 Sold Delayed Culling and Extra Heifer Market Value Net/Cow Slot	\$1,500	-\$31	\$0	\$30,000 \$30	\$60,000 \$60
611					
61					

61

Take Home Points from This Demo

- Not producing enough replacements enhances cash flow but will hurt total profitability
- Producing a few extra heifers creates options/ flexibility
 - Option to selectively remove young heifers early in life
 - Option to selectively replace existing, less profitable cows
- Focusing on cost reduction without regard to the impact on future revenue can be a very costly mistake

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Summary

- The replacement of cows with fresh heifers is all about improving the herd
- The quality and availability of replacement heifers is THE determinant of replacement rate
- Replacing cows is expensive but failing to replace cows that should be replaced is also costly
 - Cost of replacements is just one variable to consider when making replacement decisions
- Prioritize the value obtained from the slot and not on a specific cow's productive life...more lifetime days is not always more profitable

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Futureproofing Your Farm Communications



How did farmers communicate 40 years ago?



How do farmers communicate today?



What have I seen farmers communicating with?

- Text messaging
- Slack / MS Teams
- Asana
- Groupme
- WhatApp
- What are your favorites?

groupme

How did checkoff reach consumers then?

We're such good friends, if I got invited to a big Hollywood party, I'd call you the minute I got home. Or if you had stuff on your face, I'd tell you, sooner or later.

MII

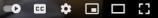
What a surprise!

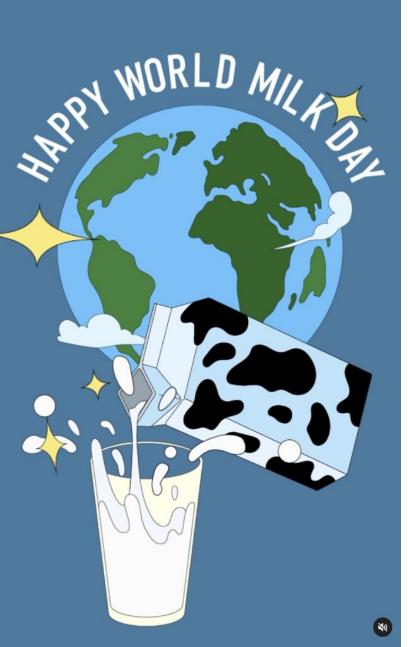
Right, like now, sort of. But this is to tell more women to drink skim milk. It has all the calcium without all the fat. Well, isn't that what friends are for?

> For More Information 1-800-WHY-MILK











How does checkoff reach

consumers

now?

I Made a \$50,000 Player Building Competition!

33M views + 2 years ago

🔯 MrBeast Gaming 🥏

Thank you to America's **Dairy** Farmers for sponsoring this video! We hosted a 100-player building challenge for \$50000.

SELTZER & CHEESE PAIRINGS



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Sustainable Dairy Farming Practices | Midwest Dairy

We Help Farmers Spread Awareness of the Benefits of Dairy - Check out our Resource Guides

What do consumers expect from the creators of the food they eat?



What does checkoff talk about with consumers? • Recipes

- ICED Immunity, Calm, Energy, Digestive Health
- Animal Care
- Sustainability
- Milk Safety

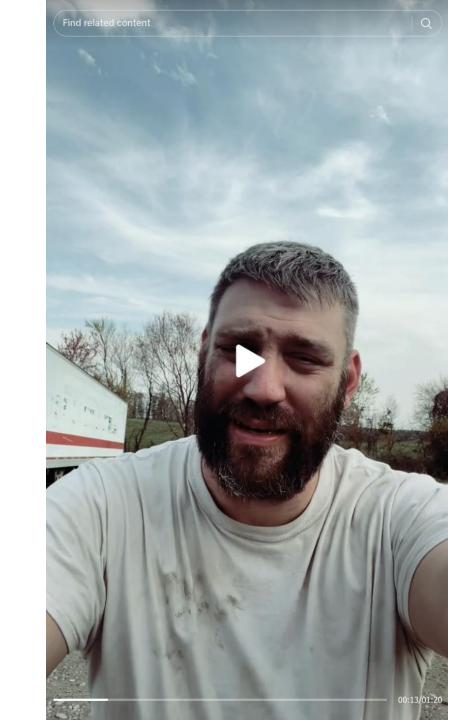


What do consumers expect from the farmers of the food they eat?



What should farmers talk about with consumers?

- Animal Care
- Environmental
 Practices
- How milk gets from cow to store
- Everyday life on the farm



The basics of farm communications to consumers





About Sustainability Animal Welfare Products Blog Careers f 🧿

RESPONSIBLE FARMING

It all started with a farm.

Twenty years ago, we started farming Threemile Canyon Farms with the intent to make it a special place that demonstrates our respect for our people, community, and natural resources. We're proud to be the 2020 U.S. Dairy Sustainability Awards recipient for Outstanding Dairy Sustainability. Thank you. We will continue to work hard to safely and sustainably produce food for future generations.

Since we took ownership of Threemile Canyon Farms in 1999, we've challenged ourselves to question longstanding agricultural practices. "Business as usual" really has no meaning at Threemile, because we know that as the population grows and the world changes, we must continuously adopt new and better technologies and operational practices to remain relevant and successful.

A safe and rewarding work environment means a happy, satisfied workforce that shares ownership in our philosophy and pride in carrying it forward every day, both at work and in our local communities.

A farm website

- Squarespace
- Wix
- Wordpress

What should be on the website?

- Where to find your products
- Animal Care
- Environmental
 Practices
- History of the farm
- Contact Us
- Careers in Ag



First-Class Cow Care

At MVP Dairy, we strive to create the perfect environment for our cows to keep them healthy and happy. Our 4,500 Holstein cows live in six tunnel-ventilated freestall barns that are furnished with sand bedding, misters and fans to keep them cool and even cow brushes to scratch their backs.

We work with experts in animal health and nutrition to ensure our cows have everything they need from balanced and nutritious diets to veterinarian care.

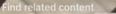


Animal Welfare Standards

We look to Validus and the FARM program to audit our animal welfare practices to not only verify our care, but to also help us continuously improve.



MVP Dairy, LLC and its four sister farms are the first and only dairies to receive all four certifications from Validus: Animal Welfare Worker Care Environmental Responsibility On-Farm Security



How to give a cow a pill:

Social Media

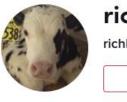
- Facebook
- Instagram
- YouTube



IowaDairyFarmer

Social Media

- **Easily share your** messages via video and text – get instant feedback
- More than 80% of US pop has a presence
- **Build an audience that** can defend you



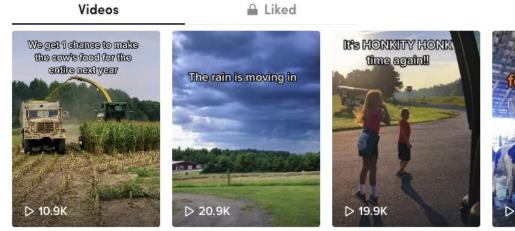
richlandsdairy richlandsdairyfarm

2 Messages

1538 Following 358.1K Followers 18.6M Likes

Family owned Virginia Dairy Farm and Creamery specializing in milk and ice cream

𝔄 richlandscreamery.com/



we better do a good job! ...

At least the kids got extr...

#busstop ...

#itsbeenawhile







\$...



Im away from the farm to ...

Reply to @asack

Reply to @blantontiger N... Reply to ...

Tell a Friend

	ד	alkwalker 🗚	lerts CREATE	MANAGE IMPORT	∎ don.	schindler@gm	ail.com 👻	
M	ana	age Alerts	Delete				CRE	EATE Alerts
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	٣	News, Blogs, Discussions	All languages	All countries	As it happens	Best	11/07/22	Edit
	Q	"dairy manage	ment inc."					
	۳	Everything	English	All countries	Once a day	Best	11/08/22	Edit
	Q	dairy social m	edia					
	۳	News, Blogs, Discussions	All languages	All countries	Once a day	Best	11/08/22	Edit
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	Q	"don schindler	.11					
	2	News, Blogs,	All languages	All countries	As it happens	All	02/17/21	Edit

Alerts Whenever your farm or names are mentioned on the web Not for

SOCIAL **MEDIA**

Discussions

Can farmers be social media influencers?





Potential Revenue

- Farm Merchandise
- Video Streaming Ads
- Public Speaking



GOOD DA

TO RUMINATE.

In-Stream Ads

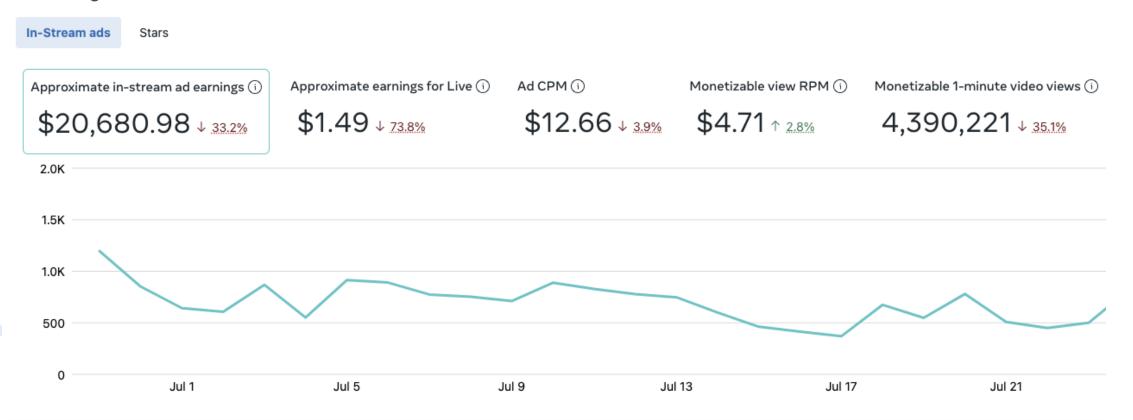
Earning period Last 7 days: Jul 20, 2023 - Jul 26, 2023

Approximate in-stream ad earnings 0

\$5.609.65 + 47%

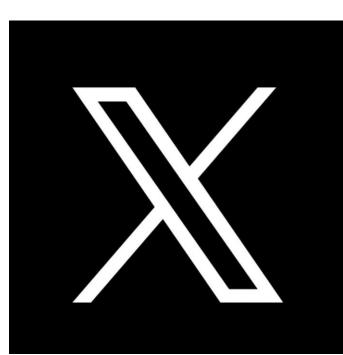
Can this be a revenue stream for you?

Video earnings



New platforms:

- Tik Tok
- Threads
- X



12:30

2

•11 5G 85

0

<u>cabotcreamery</u>

We're so excited for a weekend filled with live music, loads of fun, and all the good vibes. Tickets to the Thursday (The Backseat Lovers with Bendigo Fletcher) and Friday (Gregory Alan Isakov with Josh Ritter) Cabot Waterfront Concert shows are still available! The Cabot Cruiser Cheese Truck will be there serving up cheesy bites, see you at the Burlington waterfront



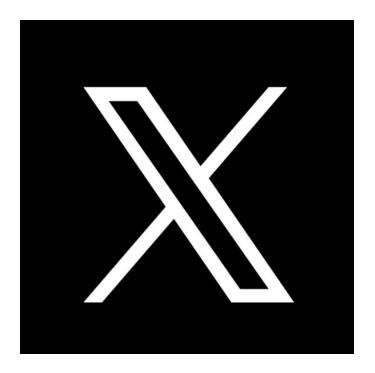
Reply to Joanie Cahill758's comment a soo cows and cattle are eating there own crap, mmm, thank god I'm vegan yanno I'm not judgin' ya, but I'm just sayin'

Find related conten

Where is communication going?



Twitter to X transformation







Twitter was acquired by X Corp both to ensure freedom of speech and as an accelerant for X, the everything app. This is not simply a company renaming itself, but doing the same thing.

The Twitter name made sense when it was just 140 character messages going back and forth – like birds tweeting – but now you can post almost anything, including several hours of video.

In the months to come, we will add comprehensive communications and the ability to conduct your entire financial world. The Twitter name does not make sense in that context, so we must bid adieu to the bird.

9:52 PM · Jul 24, 2023 · 1.7M Views





Facebook to Meta transformation



Generative Artificial Intelligence



How are dairy cows treated on the farm?



As of my last knowledge update in September 2021, I can provide information on how dairy cows are typically treated on farms. However, please note that farming practices can vary depending on the region, farm size, and specific management practices. Improvements or changes in practices might have occurred after my last update.

Dairy cows on farms are generally taken care of to ensure their health, well-being, and productivity. Some common aspects of their treatment include:

- Housing: Dairy cows are usually provided with shelter to protect them from harsh weather conditions, such as extreme heat, cold, or rain. They are often kept in barns or free-stall systems where they have space to move around and lie down comfortably.
- Nutrition: Proper nutrition is essential for dairy cows to maintain good health and produce milk. Farmers work with nutritionists to design balanced diets that meet the cows' energy and nutrient requirements. Diets typically include a combination of forages (such as hay or silage) and grains or other concentrates.
- 3. Healthcare: Dairy cows receive regular veterinary care to monitor their health and address any medical issues. Vaccinations, deworming, and preventive measures against common



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Statif V DAIRY CHEGICOFF bury Kongrement Inc

Augmented / Virtual reality dairy farm tours

Dairy

GHS



Crisis and Issues

- Available through The Dairy Alliance
- Develop a plan for your team
- Protect your investment and your family

YOU CAN'T IMAGINE THE HORRORS OF DAIRY CALF TRANSPORT!



• Update every year

How do you start?





The Dairy Alliance is seeking farmers and industry affiliates to serve as Community Engagers for our new WaveMakers community outreach program. Participants will:

- Speak and engage with consumers in your communities
- Engagers will include farmers, industry specialists, veterinarians, animal science extension staff, etc.
- Receive training and support from our communications team
- Connect with consumers across the Southeast

Want to learn more? Email Farrah Newberry at: fnewberry@thedairyalliance.com

Talk to The Dairy Alliance and get their

resources





Sign up for newsletter

Any questions?

DAIRY

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THE DAIRY ALLIANCE

Geri Berdak, CEO





For Today...

National Dairy Checkoff



that Benefit Dairy



The Dairy Alliance is Capitalizing on these Trends



A DAIRY DAIRY Dairy Management Inc.



National Dairy Checkoff



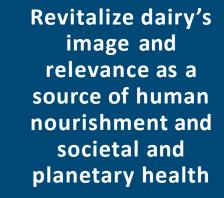


Sustainability

Demonstrate that dairy is an environmental solution –backed by science and proof – and economically additive for farmers, markets and society

Innovation





Develop technologypowered breakthrough science and innovations that advance U.S. dairy's wellness and product leadership

<u>R</u>eputation



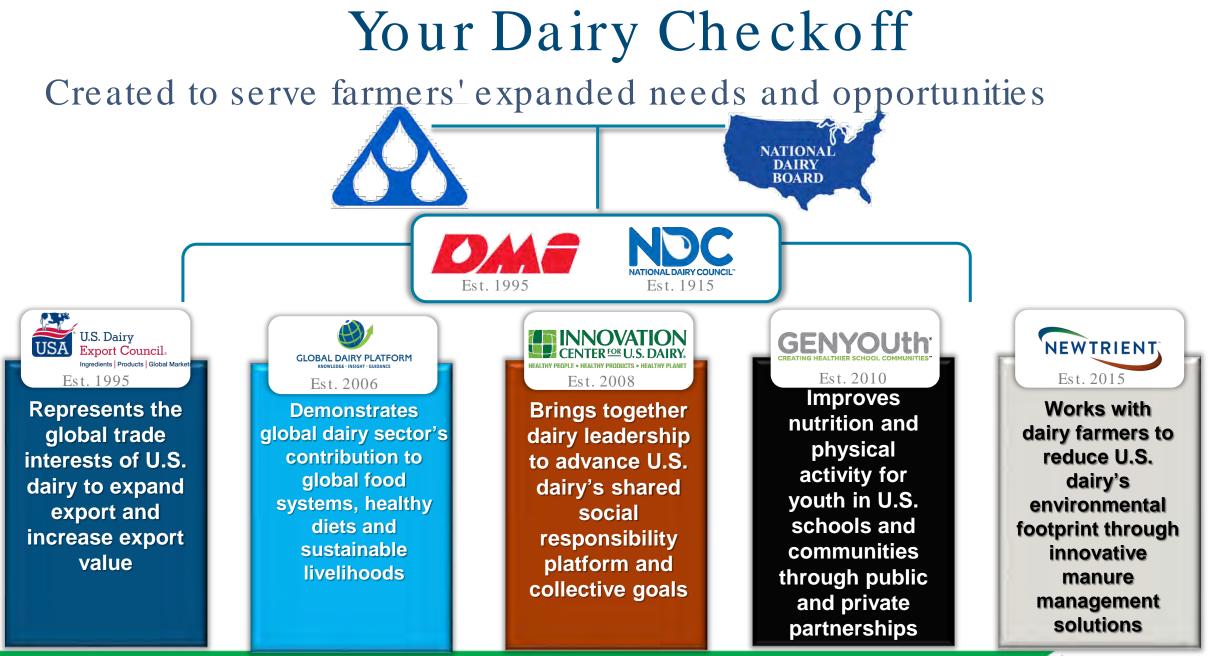
Ensure U.S. dairy is a growing, consistent, and preferred supplier in key markets

globally



<u>Exports</u>







Quiz Question: **The National Dairy Checkoff Strategy is:** A) EMPIRE B) ASPRIN C) ASPIRE



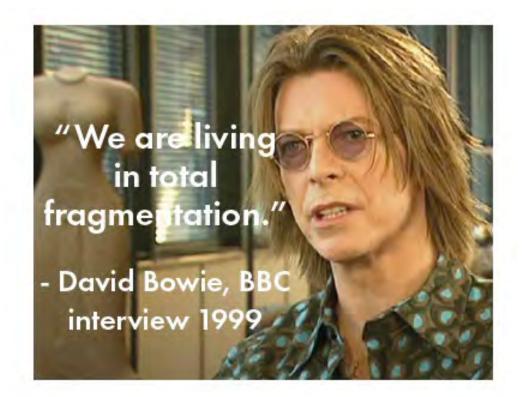
Trends That Benefit Dairy...



Fragmentation of Consumers' Beliefs about Food and Health



The biggest drivers of change for last 15 years: Consumers turning to Dr. Internet for health and nutrition advice

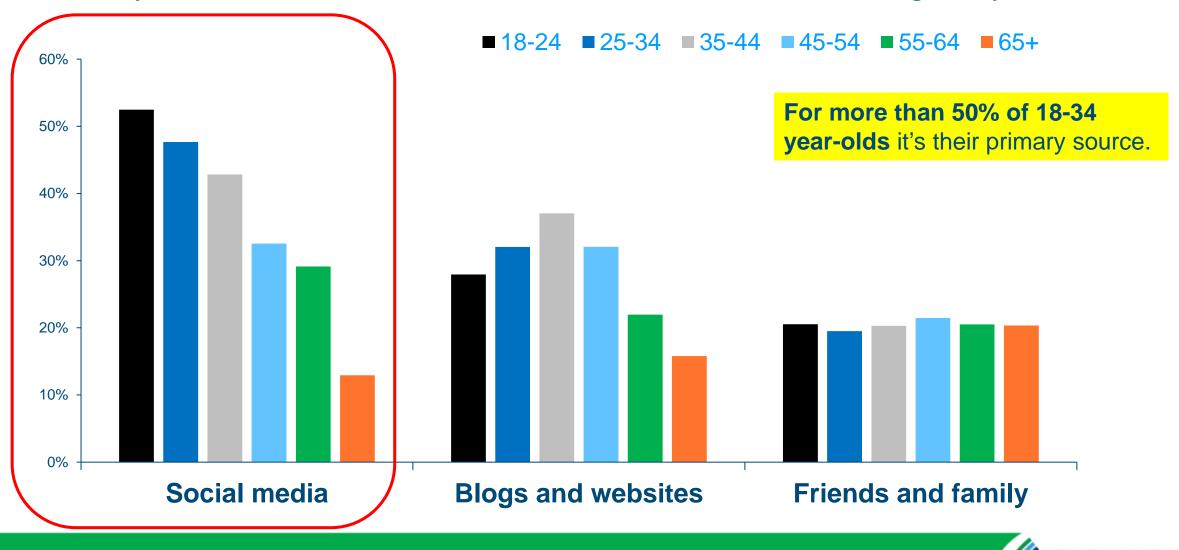


Mega-trend was forecast by David Bowie back in 1999



For the Young, Social Media is Mainstream Media

When you want to know more about food and health, which of the following have you used?



SUSTAINABILITY = Permission to Enjoy

What the consumer wants is reassurance that they can stop thinking about sustainability and enjoy their favorite foods with a clear conscience.

GOOD THINGS COME IN RENEWABLE & RECYCLED MATERIALS!



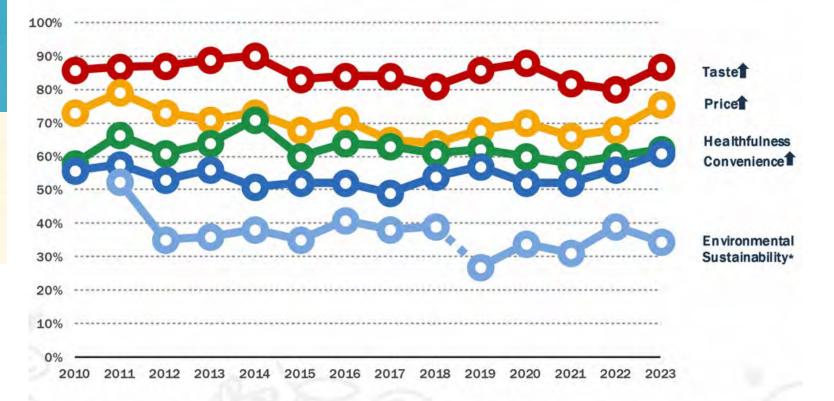
Clover was the first dairy in the U.S. to switch to a 100% plant based, renewable carton. And now we're the first milk brand in the U.S. to launch a post-consumer recycled (PCR) gallon milk jug, made with 30% recycled household plastic!

OUR COMMITMENT TO HEALTH STARTS IN THE SOIL

Powering trucks with poop



Purchase Drivers Over Time (% 4–5 Impact out of 5)





Digestive Wellness – A Driver of Innovation

Wide Appeal

3

Around 1/3 of us are experiencing digestive discomfort. Digestion is a powerful trend that is shaping markets

Trend has created and is driving new categories – plant-based alternatives and lactose free milk. Milk products are an innovation opportunity

...particularly in the kids market.

3 DRIVERS:

Science - the idea that the gut can influence body & mind is growing

Media attention - especially social media

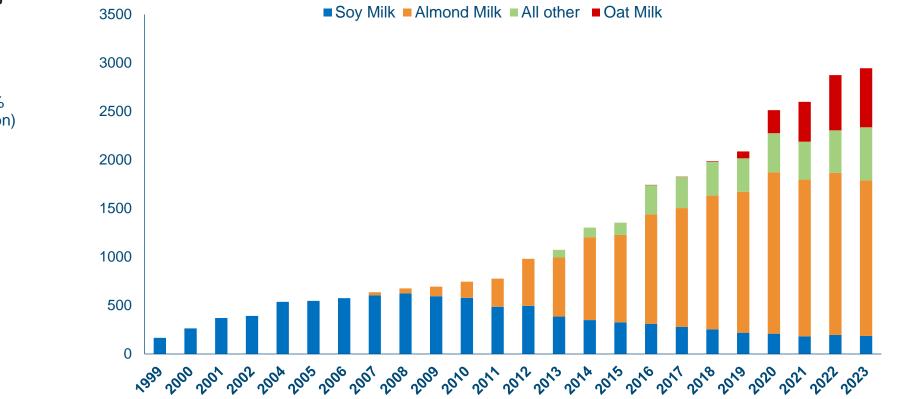
NPD is familiarizing consumers with the digestive wellness concept

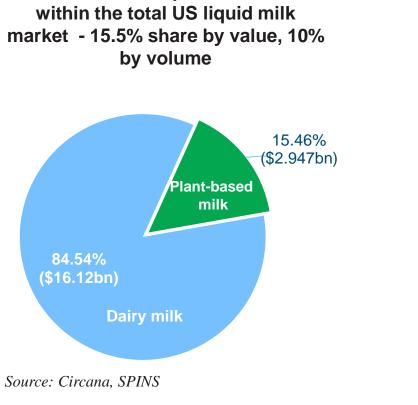


Plant-based milk Alternatives are Heading to Maturity

Evolution of US plant-based alternative category, 1999 to November 2023 (\$m)

The market stalled in 2023 for the first time in its history. Plant alternative volume is down 8% compared to 2022. Even oat volume growth was minimal in 2023 compared to 2022

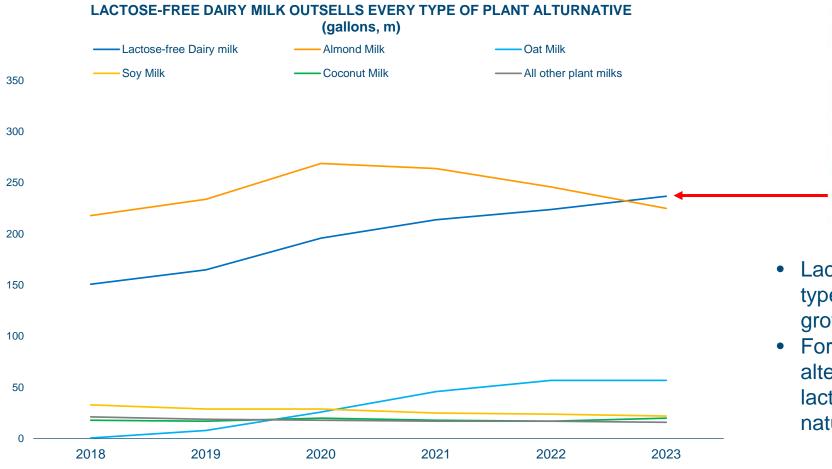




Plant-based is a premium niche

Source: Circana, SPINS

Lactose-free is a Bigger Success than any One Type of Plant Alternative



Source: Circana, SPINS

- Fairlife Barlife Barli
- Lactose-free dairy milk outsells any one type of plant milk in the US and is growing faster
- For the mainstream consumer, plant alternatives are akin to margarine and lactose-free dairy akin to butter – more natural and with a shorter ingredient list.



4

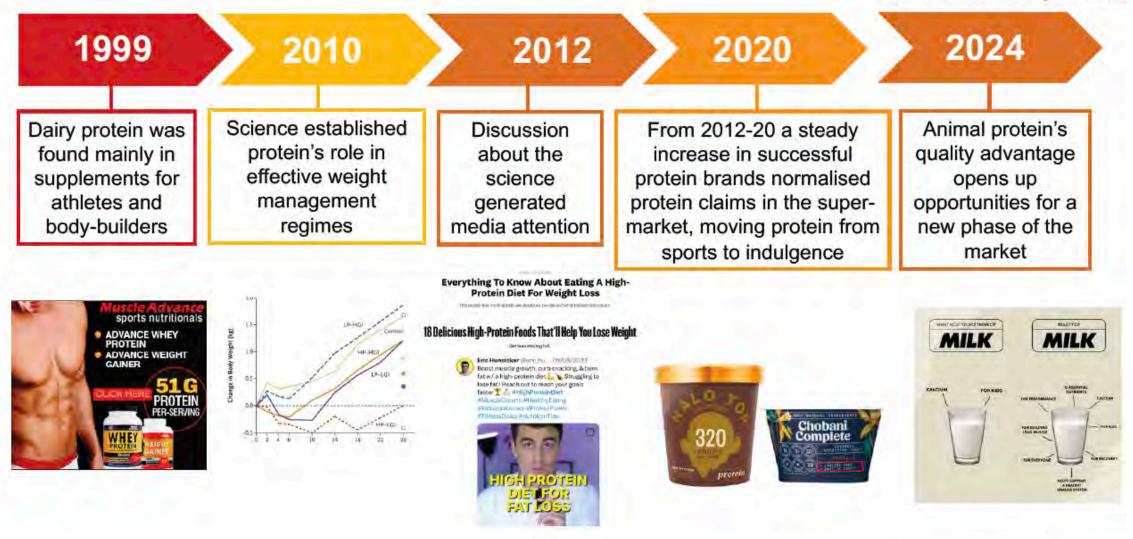
Animal Protein Powers On





Protein has undergone a 23-year evolution

What next for protein?





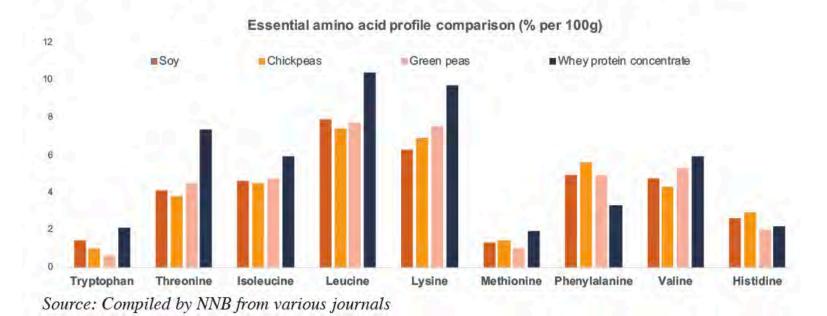
Dairy Protein's Quality Advantage

Animal foods are the **highest quality** protein.

Most plant proteins are incomplete.

Animal proteins are also sources of **important nutrients** which are absent from most plant proteins.

Chart 32: Whey protein has a superior amino acid profile to any plant protein



DIAAS scores of various proteins (%)

Protein source	DIAAS*
Milk protein concentrate	141
Whey protein concentrate	133
Skim milk powder	123
Whey protein isolate	125
Soya flour	105
Soy protein isolate	98
Pea protein isolate	73
Wheat	54

DIAAS=Digestible Indispensable Amino Acid Score Reference: Mathai et al. Br J Nutr. 2017.



Quiz Question: Which three trends were mentioned? A) Digestive Wellness, Animal Protein, Sustainability B) Anxiety, Digestive Wellness and Dr. Internet C) Sleep, Animal Protein and Digestive Wellness



How is The Dairy Alliance Capitalizing on these Trends?





the Southeast

the Southeast

Dairy Loving Consumers Farmers Happy with the Success of Their Checkoff Investment



Grow Dairy Volume

Strategies for 2022 – 2025



Advance content marketing effectiveness and continue to refine SE consumer personas, integrating messages across channels, activating influencers, PR, increasing SEO, improving measurements



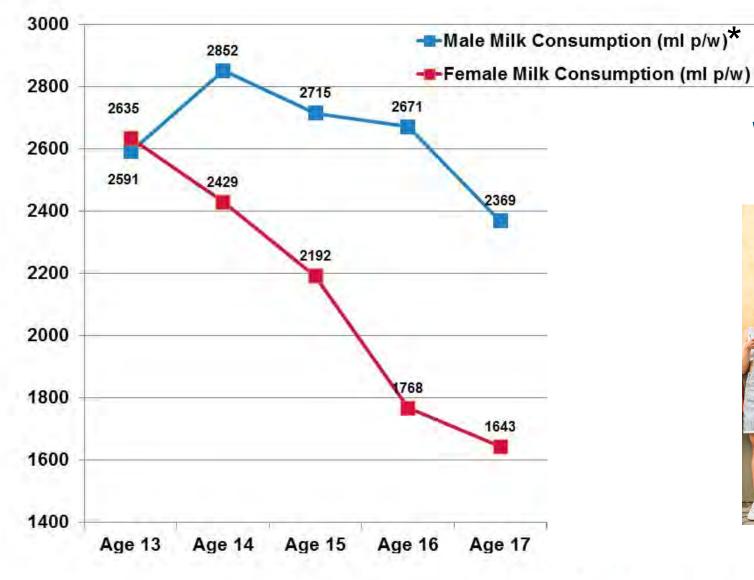
Proactively address consumer barriers to purchase – while promoting the benefits of milk/milk beverages

Ties to: Consumer Fragmentation

Ties to: Sustainability + Benefits of Protein Quality Drive milk volume through targeted channels (schools, ecommerce, foodservice) that reach GenZ and millennial moms

Ties to: Reaching Youth – Gen Z





Why Gen Z?





Milliliters per week

*

Our 2022-2025 Messaging + Channels









Southeast Modern Family

Faith, Family, Sports and Food sums up the Southeast

Millennial Families 25-45, raising Gen Z

Leading active lifestyle defined by both physical and mental strength

<u>Sports</u> is the <u>generational linkage</u> in the SE in driving future milk consumption



Here's a Snapshot of our Sports Influencer Work...



We Know It's Working! In 2023...



-bulk milk dispensers, dairy optimization grants, and trainings



Quiz Question: How many million people did The **Dairy Alliance reach in 2023?** A) 203 Million B) 515 Million C) 724 Million

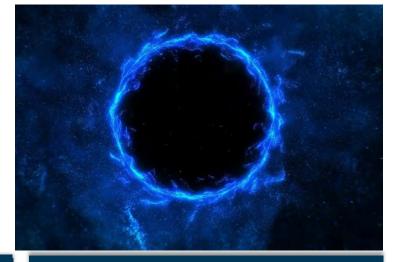


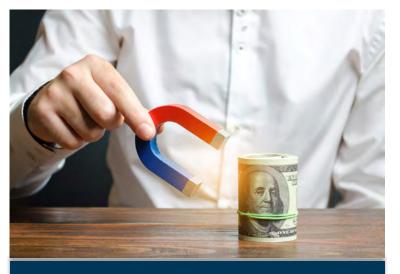
Transform Dairy

Strategies for 2022 – 2025



Sell the Southeast as an opportunity by developing a roadmap to potential volume, processing and innovation growth





Develop a resource portal that guides entrepreneurs, brands & startups to successfully innovate with milk and dairy

Expand and leverage our dairy network, including industry & universities, to continue to attract investment in Southeast dairy

Ties to: Digestive Wellness, Protein Quality and other Health and Wellness Trends



Investment is Possible!

Dairy Herd Management

BUSINESS

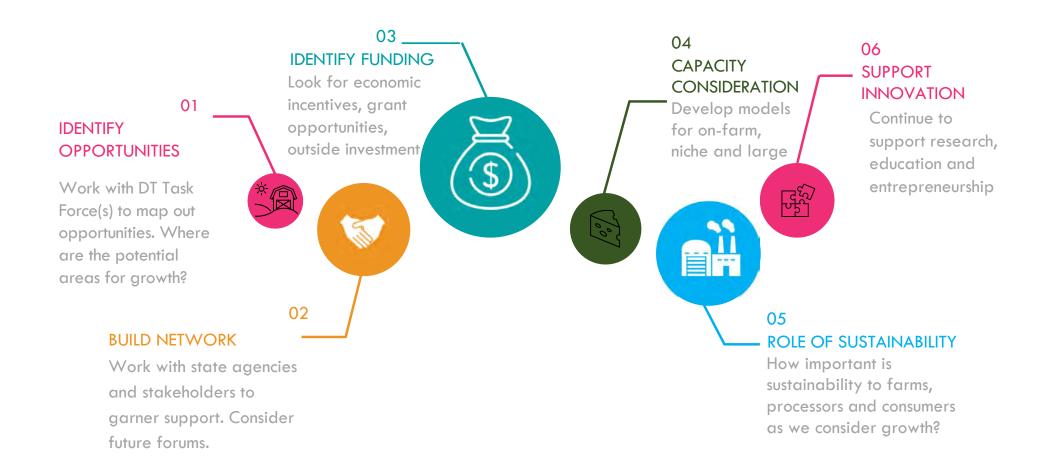
Walmart Announces Plans to Build \$350 Million Milk Processing Plant in Southern Georgia







A Path to Market is Needed





Sustainability Partnerships that Support Farmers is a Big Opportunity for the Southeast





Quiz Question:

To sell the Southeast as an opportunity, The Dairy Alliance will: A) Build a new office B) Knock on doors C) Develop a roadmap to potential volume, processing and innovation growth





THANK YOU!!!



Consistent feed, consistent eating, consistent results!



Georgia Dairy Conference January 16, 2024

Trevor DeVries tdevries@uoguelph.ca



Is there a problem here?





The problem is...

• There is more than one ration found on every farm!





The problem is...

There is more than one ration found on every farm!
There is the one formulated by the nutritionist





The problem is...

- There is more than one ration found on every farm!
 - There is the one formulated by the nutritionist
 - There is the one that is delivered to the cows





Is the feed delivered the same as what was formulated?



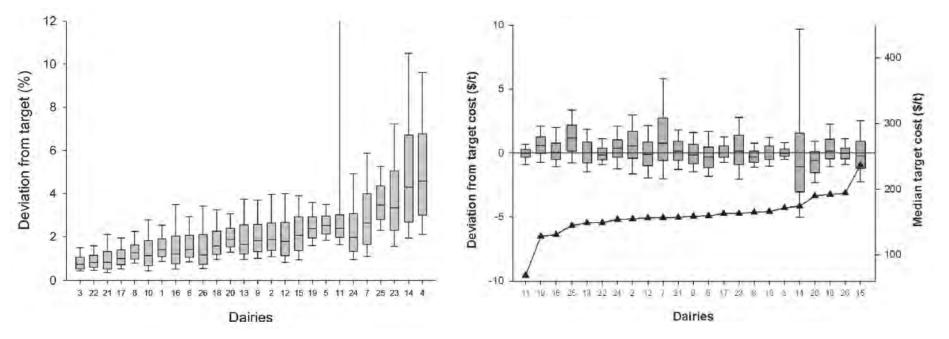


In a study of herds in Canada the average TMR fed...

- Exceeded TMR formulation for
 - NE_L (+0.05 Mcal/kg)
 - NFC (+1.5%)
 - ADF (+0.5%)
 - Ca (+0.1%)
- Underfed TMR formulation for:
 - CP (-0.4%)
 - NDF (-0.7%)
 - Na (-0.2%)



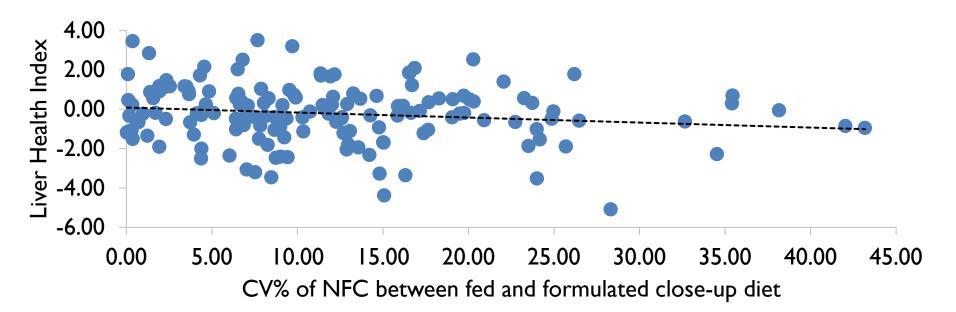
Deviation from the formulated target weight of ingredients loaded into high group TMR on 26 California dairies (1,100 to 6,900 cows)



Same at GUELPH

Trillo et al. 2016. J. Dairy Sci. 99:5866-5878

Higher variability in close-up ration NFC content between formulation and fed diet = poorer liver health in early lactation cows on dairy farms





Gheller et al. in preparation

Ensure that feed delivered matches that which was formulated



- Ensure that feed delivered matches that which was formulated
 - Feed quality
 - Forage management







- Ensure that feed delivered matches that which was formulated
 - Feed amount



- Ensure that feed delivered matches that which was formulated
 - Feed amount
 - How often is feed dry matter (DM) checked?





- Ensure that feed delivered matches that which was formulated
 - Feed amount
 - How often is feed dry matter (DM) checked?
 - How often are feed components analysed and rations reformulated?



- Ensure that feed delivered matches that which was formulated
 - Feed amount
 - How often is feed dry matter (DM) checked?
 - How often are feed components analysed and rations reformulated?
 - Are mixing protocols in place?





- Ensure that feed delivered matches that which was formulated
 - Feed amount
 - How often is feed dry matter (DM) checked?
 - How often are feed components analysed and rations reformulated?
 - Are mixing protocols in place?
 - Are you able to track what is mixed?



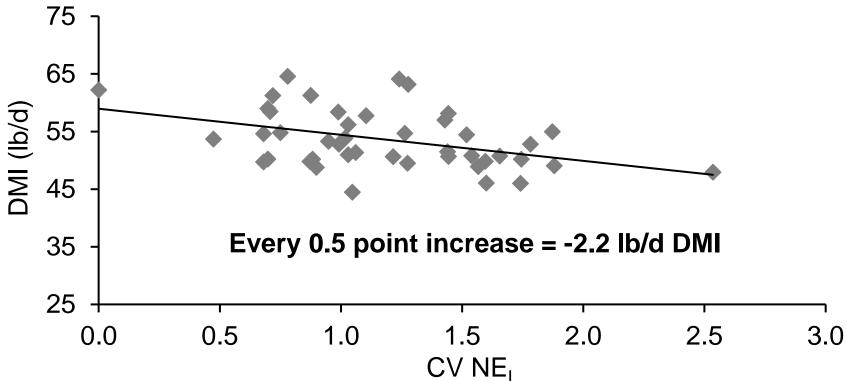


How precisely (consistent) are the rations being delivered?





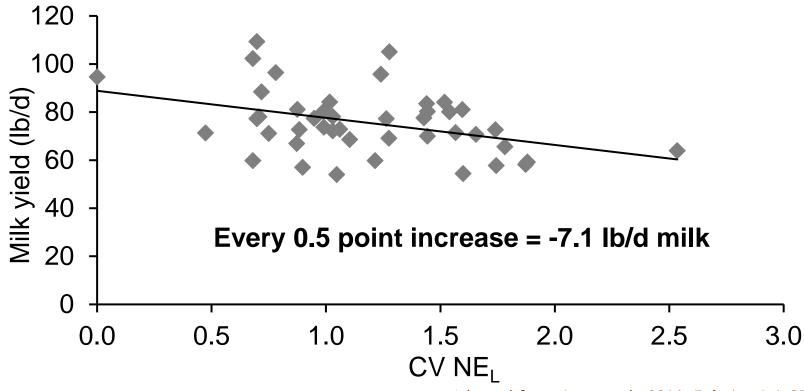
More day-to-day variability in ration energy content = lower DMI





Adapted from Sova et al. 2014. J. Dairy Sci. 97:562-571

More day-to-day variability in ration energy content = lower milk yield





Adapted from Sova et al. 2014. J. Dairy Sci. 97:562-571

Cows love consistency!!!

I'm not one to complain, but this isn't the same meal I had yesterday.



Another step in ensuring cows eat their feed consistently...

 Make sure feed is mixed and delivered the same way each day





Ensure cows are delivered their ration consistently

- Tools?
 - SOPs and training



Ensure cows are delivered their ration consistently

• Tools?

- SOPs and training
- TMR management programs!





Ensure cows are delivered their ration consistently

• Tools?

- SOPs and training
- TMR management programs!
- Automated feeding systems?





The problem is...

- There is more than one ration found on every farm!
 - There is the one formulated by the nutritionist
 - There is the one that is delivered to the cows
 - There is the one that is consumed by the cows

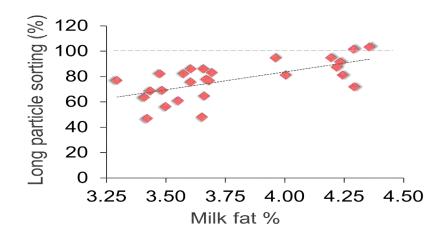


Cows do not always eat what is put in-front of them – leading to inconsistent results



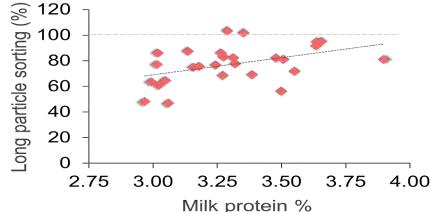


More sorting at a cow level = lower milk components









Miller-Cushon and DeVries. 2017. J. Dairy Sci. 100:2213-2218.

What does this mean from a nutritional management standpoint?



What does this mean from a nutritional management standpoint?

• To promote consistent consumption...diets should be designed to be difficult to sort



What does this mean from a nutritional management standpoint?

- To promote consistent consumption...diets should be designed to be difficult to sort
 - Forage quantity
 - Forage type
 - Forage particle size
 - Moisture content



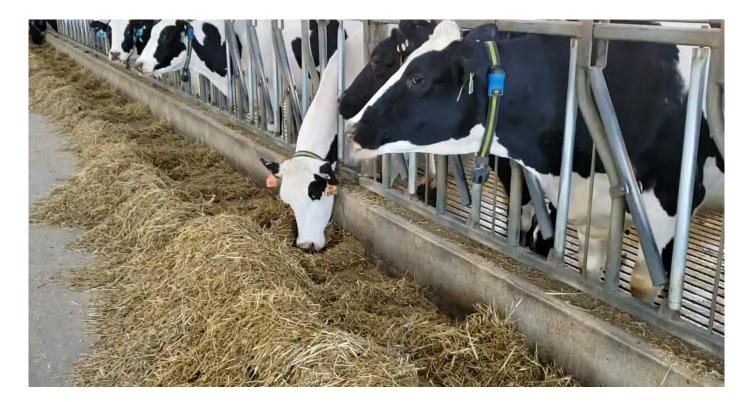
What is the ideal TMR particle distribution?



	Sieve, mm	Current, %	Rationale
Тор	19	<5	Sortable material, too long; increases need for chewing, especially if >10%
Middle	8	50	Still long and functional pef, more so than 4 mm materials, do not exceed 50-60%
Bottom	4	10-20	Remainder of pef, top 3 sieves combined = pef
Pan	-	25-30	40-50% grain in diet results in at least 25-30% in the pan

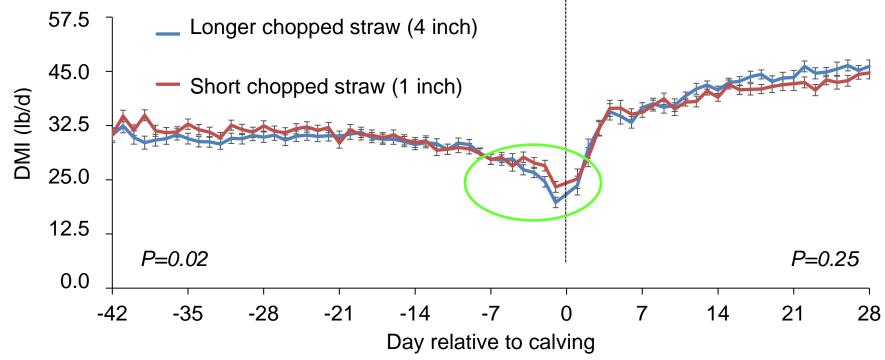


This can be just as problematic with dry cow diets...





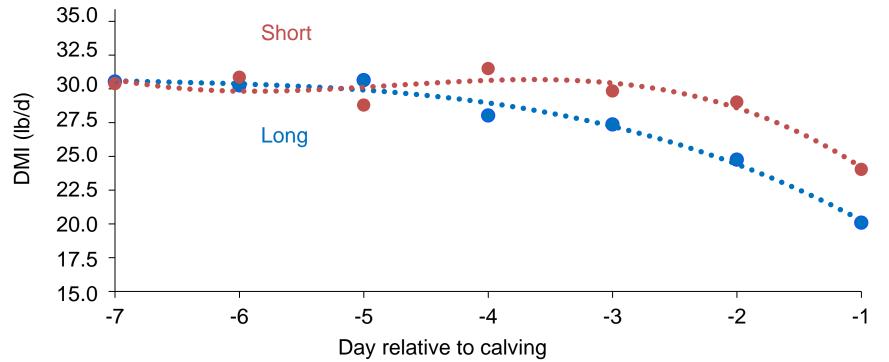
Cows on shorter straw diet ate more during the dry period...





Havekes et al. 2020. J. Dairy Sci. 103:254-271

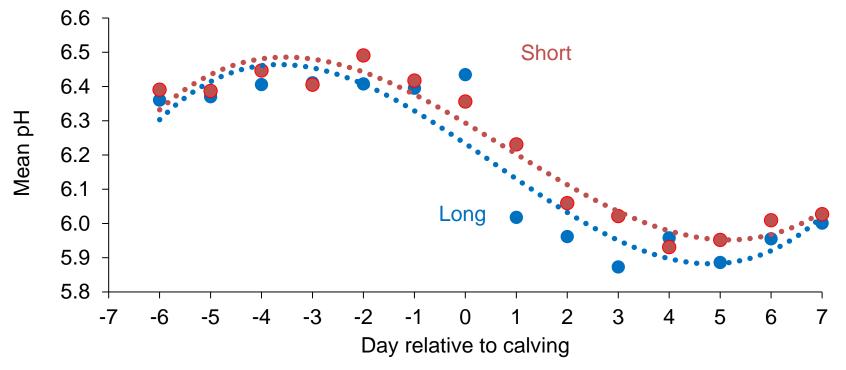
Cows on shorter straw diet had a lesser drop in DMI leading up to calving...





Havekes et al. 2020. J. Dairy Sci. 103:254-271

Cows on shorter straw diet had a lesser drop in reticulorumen pH post-calving...





Havekes et al. 2020. J. Dairy Sci. 103:254-271

The problem is...

- There is more than one ration found on every farm!
 - There is the one formulated by the nutritionist
 - There is the one that is delivered to the cows
 - There is the one that is consumed by the cows
 - There is the one that is digested by the cows

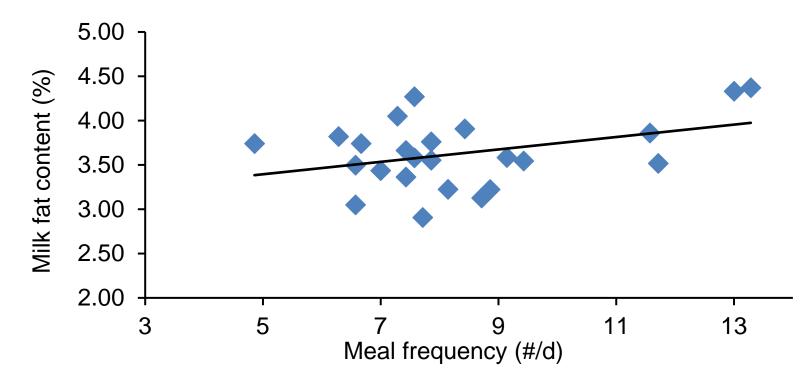


How the cow eats her feed has an impact on how she digests it...





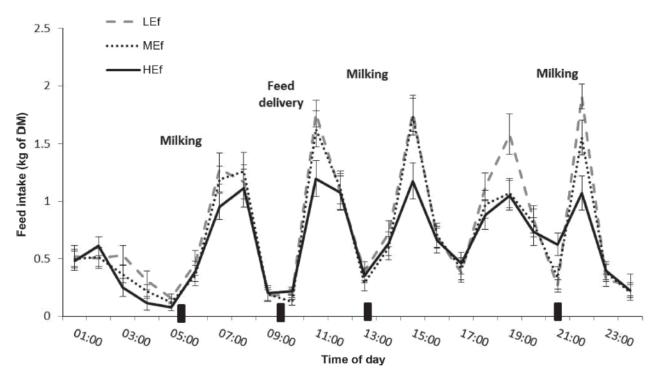
More meals = greater milk fat %





Data from DeVries and Chevaux. 2014. J. Dairy Sci. 97:6499-6510

Highly efficient cows consume smaller meals and eat slower!

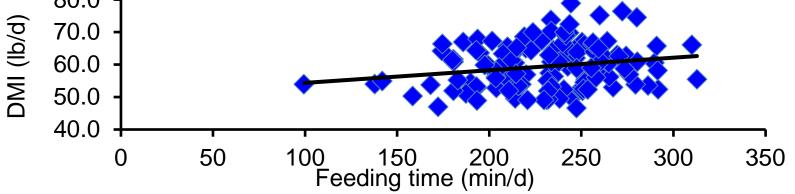




Data from Ben Meir et al. 2018. J. Dairy Sci. 101:10973-10984

More time and meals at the bunk = greater intake!

- DMI was associated with:
 - feeding time (+0.44 lb/10 min) and meal frequency (+0.44 lb/meal)
 80.0





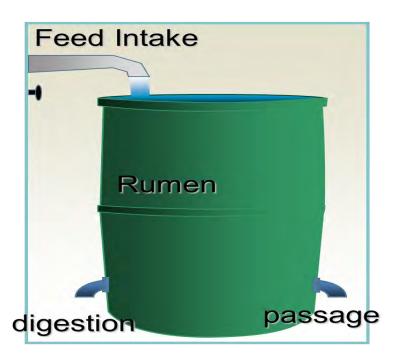
Data from Johnston and DeVries. 2018. J. Dairy Sci. 101:3367-3373

When does a cow go and eat at the feed bunk?



When does a cow go and eat at the feed bunk?

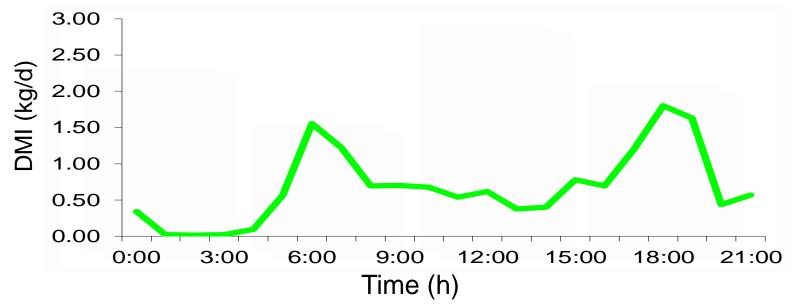
• When she is hungry





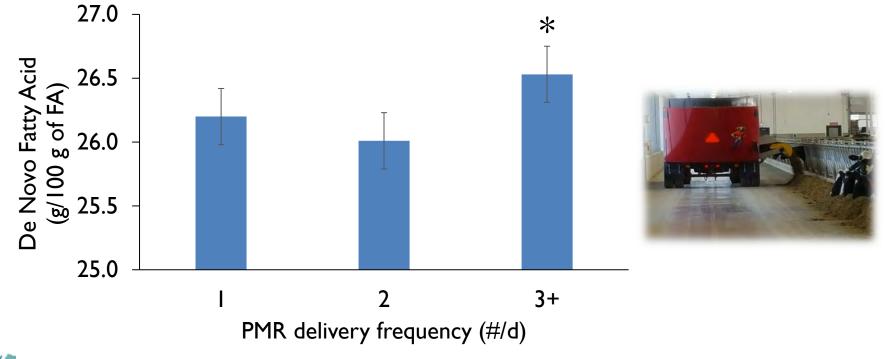
When does a cow go and eat at the feed bunk?

- When she is hungry
- After certain management events





More frequent feed delivery = more consistent consumption = improved rumen health



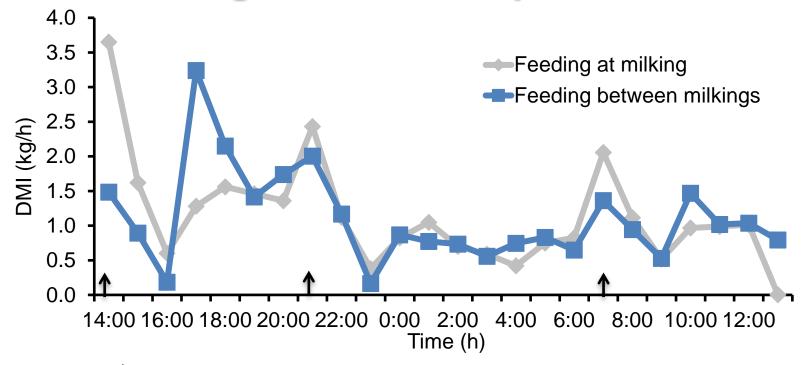


Castro et al. 2022. J. Dairy Sci. 105:5097-5108

Delivering feed multiple times per day may not always be practical...



Manage milking and feed delivery times to encourage consistent bunk visits throughout the day = more meals = greater efficiency



 \uparrow = milking

King et al. 2016. J. Dairy Sci. 99:1471-1482

Need to ensure feed is present when cows go to the bunk!





Need to ensure feed is present when cows go to the bunk!





Ensure cows have access to a consistent ration

- Feed needs to be consistently pushed up and available
 - 33 robot farms in USA Midwest
 - +10.8 lb/d (+4.9 kg/d) of milk for farms with an automated feed pusher vs manual





Ensure cows have access to a consistent ration

- Feed needs to be consistently pushed up and available
 - 197 robot farms across Canada
 - Mean = 12.8 feed pushes/day (SD = 8.3)
 - For every 5 extra feed pushes...
 - +0.77 lb/d (0.35 kg/d) milk yield





Ensure cows have access to a consistent ration

• Feed needs to be consistently pushed up and available





Impact of reduced feed access time increased with overcrowding

- Overcrowding and feed restriction (0100 to 0600 h):
 - Up to 9 h/d greater subacute rumen acidosis (pH < 5.8)
 - Reduces NDF digestion rate by up to 50%





Take home messages:

- Improve consumption and efficiency by ensuring cows receive and consume the right ration!
 - Ensure feed is delivered as formulated and precisely!
 - Ensure feed is consumed as delivered and in a healthy manner



Thanks to our funders:





Agriculture and Agri-Food Canada





FONDS D'EXCELLENCE EN RECHERCHE



OF CANADA

Ontario Agri-Food Innovation Alliance

TM/MC









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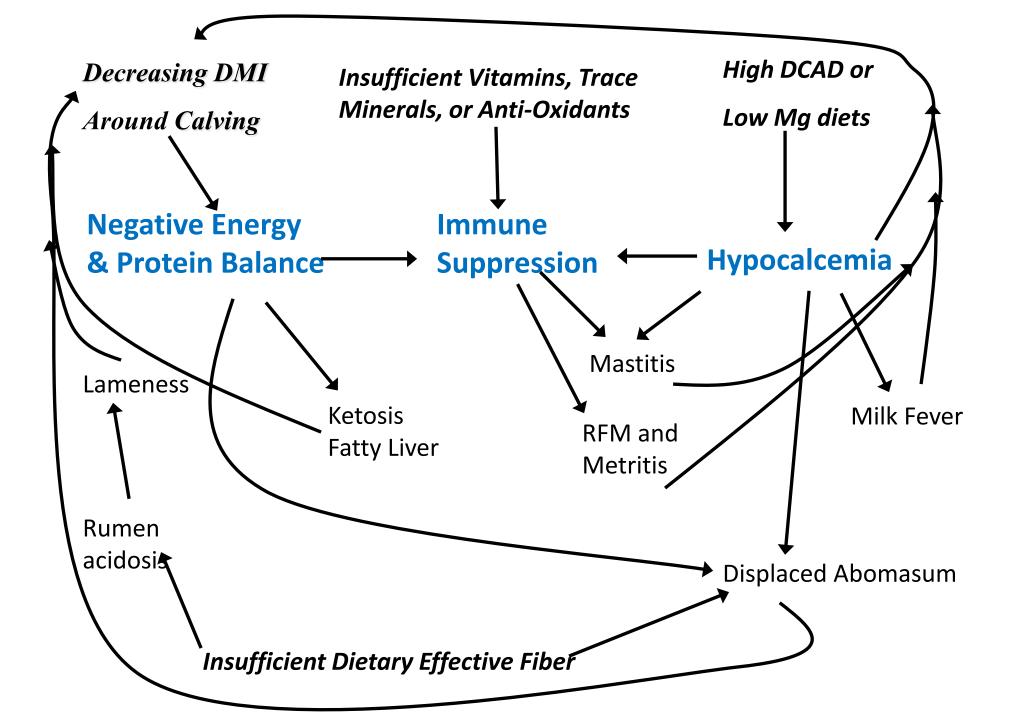


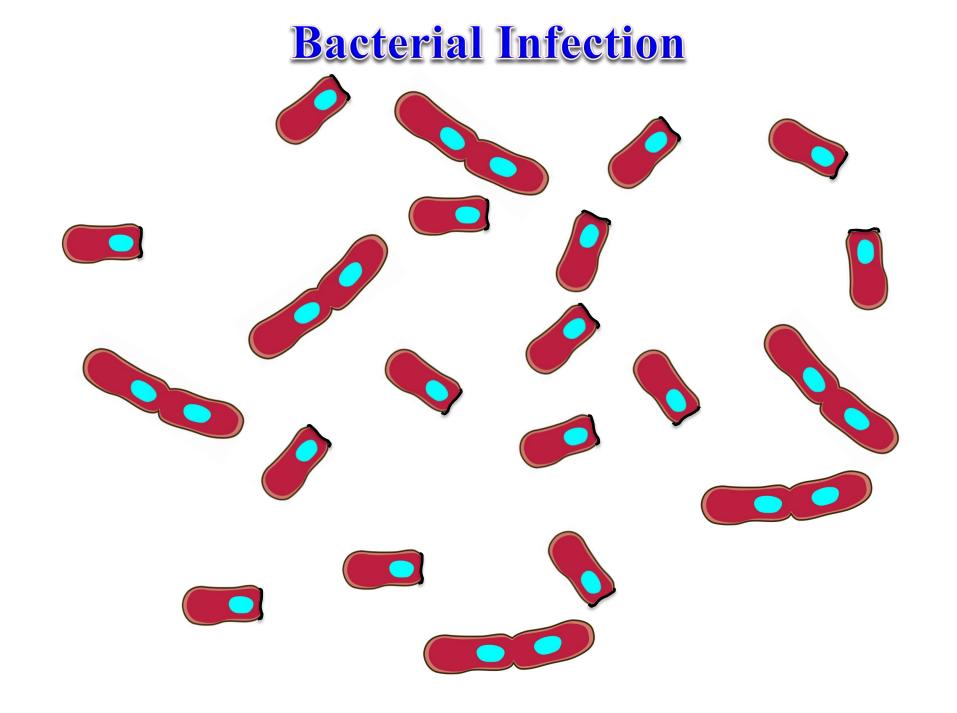


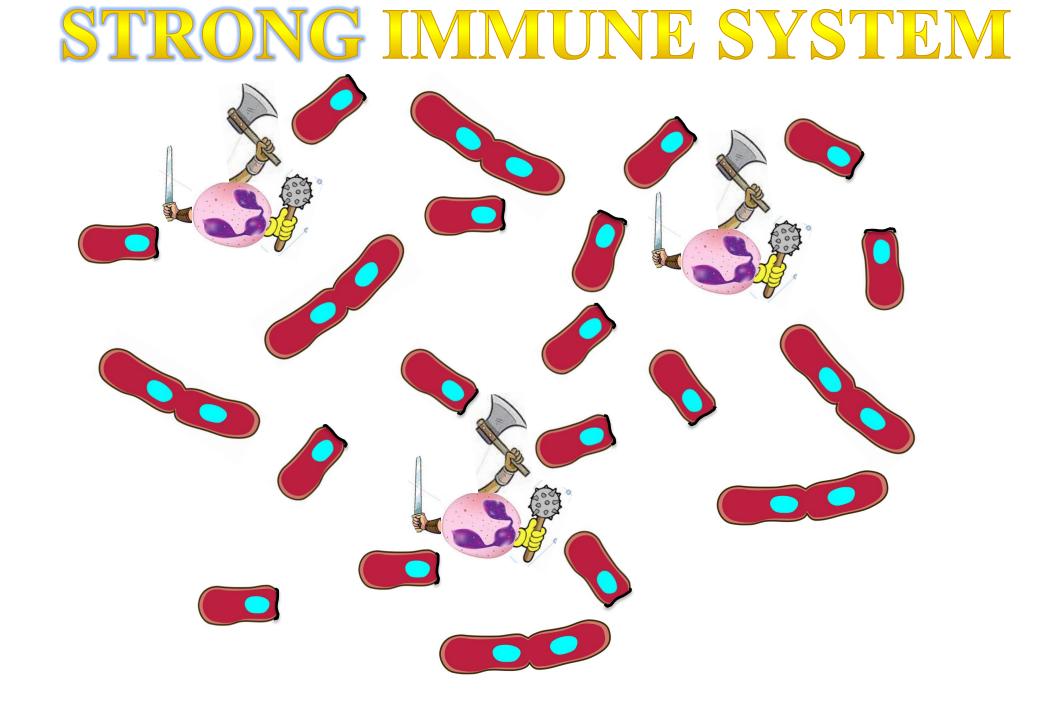
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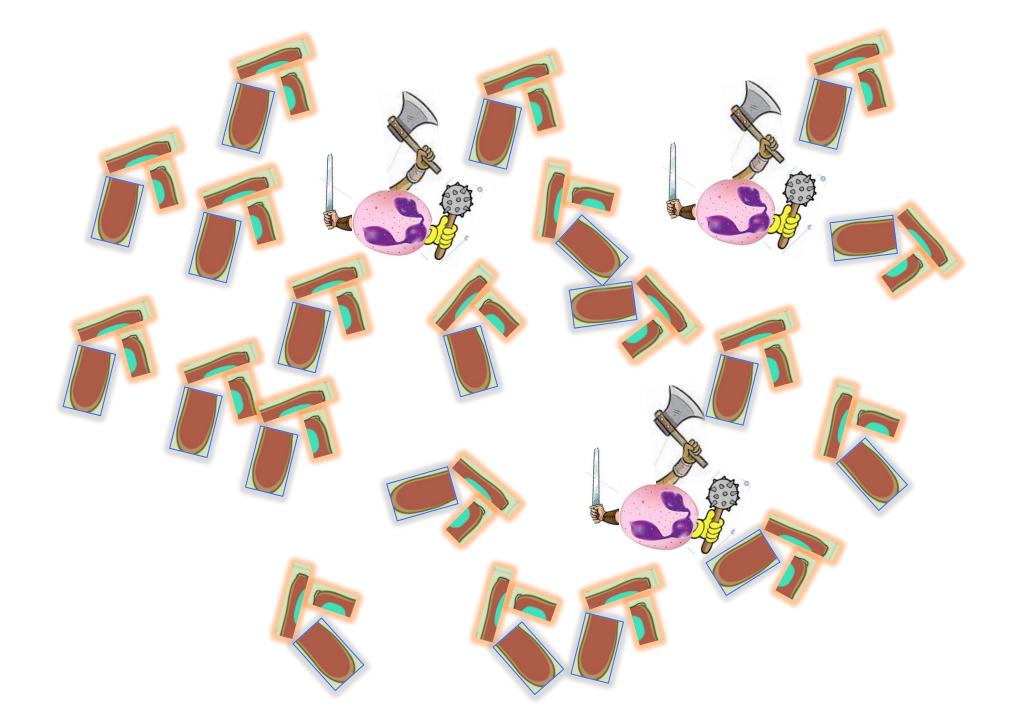
Managing Calcium challenges at the onset of lactation

Jesse Goff Emeritus Professor of Veterinary Medicine Iowa State University Ames, IA 50011 USA

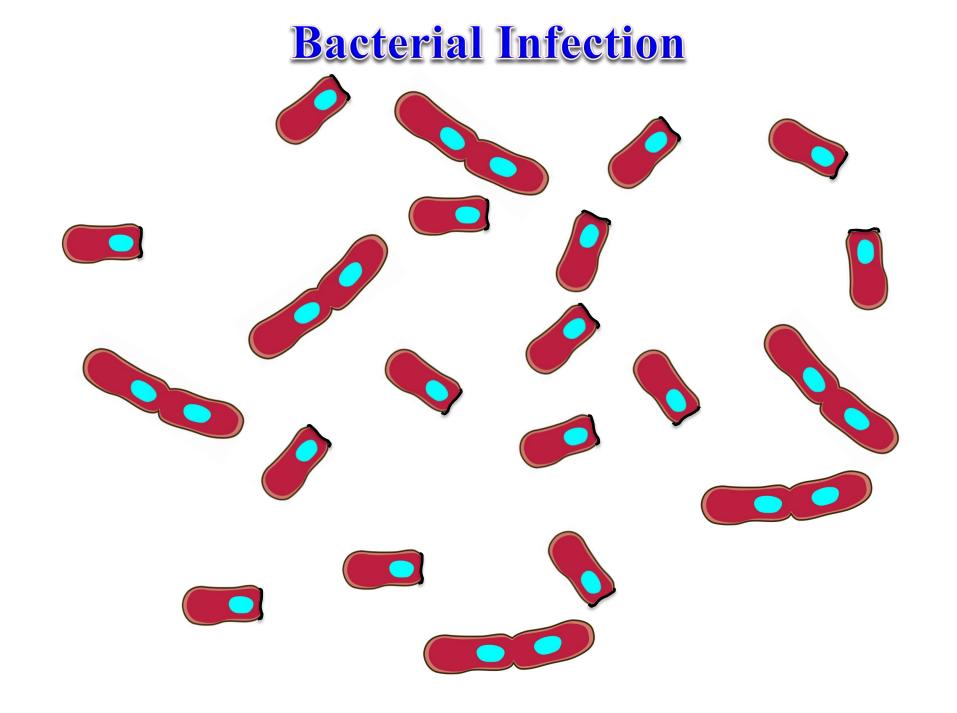


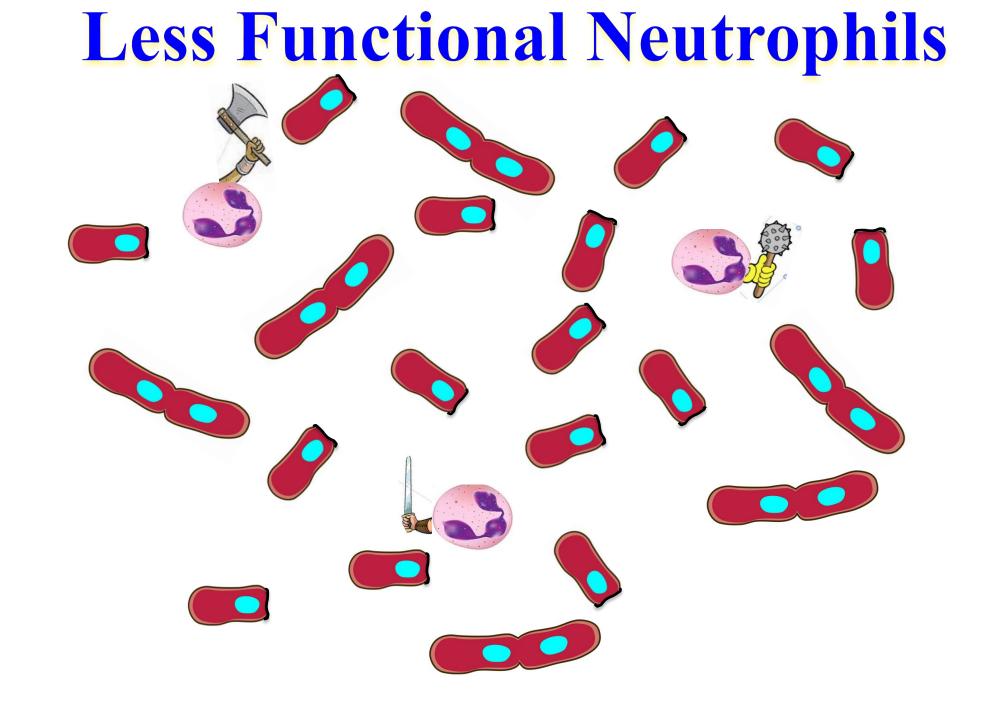




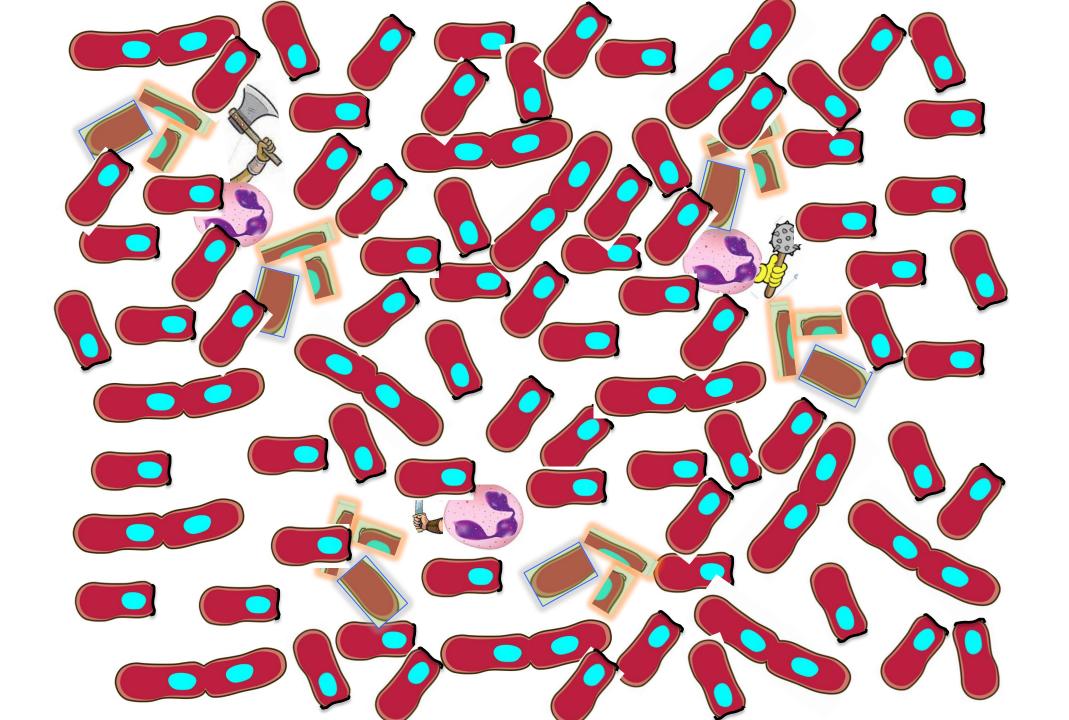


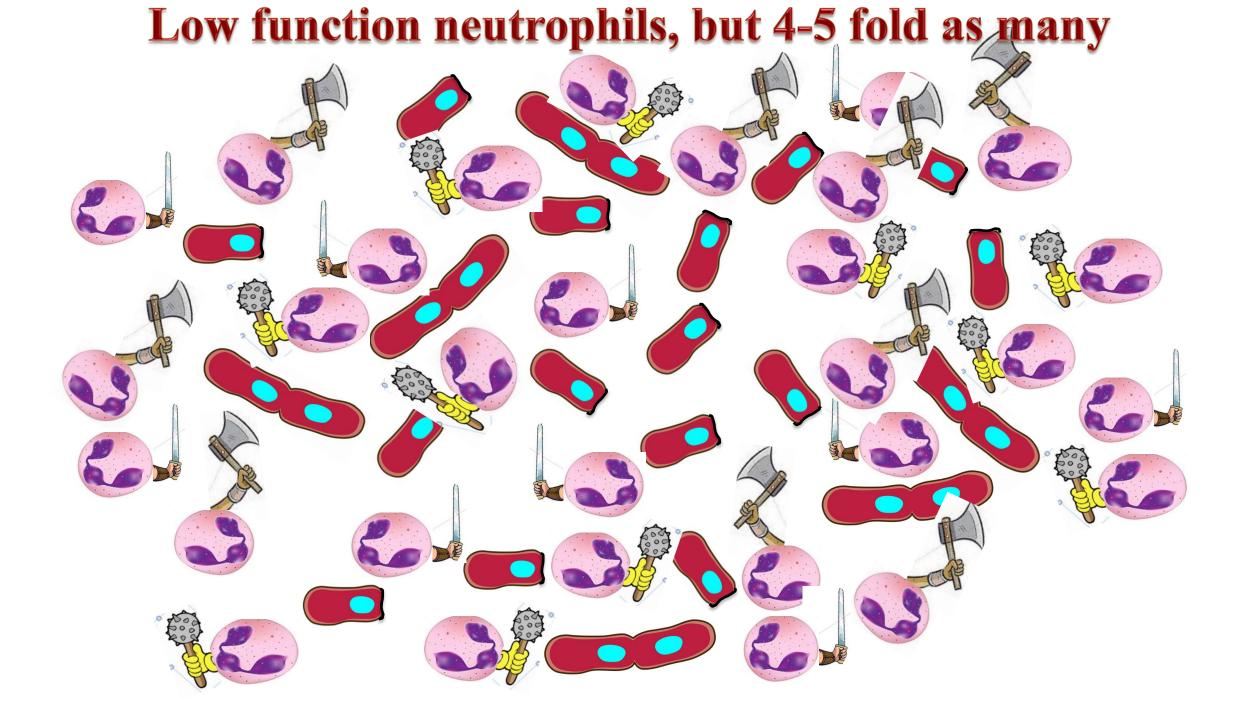


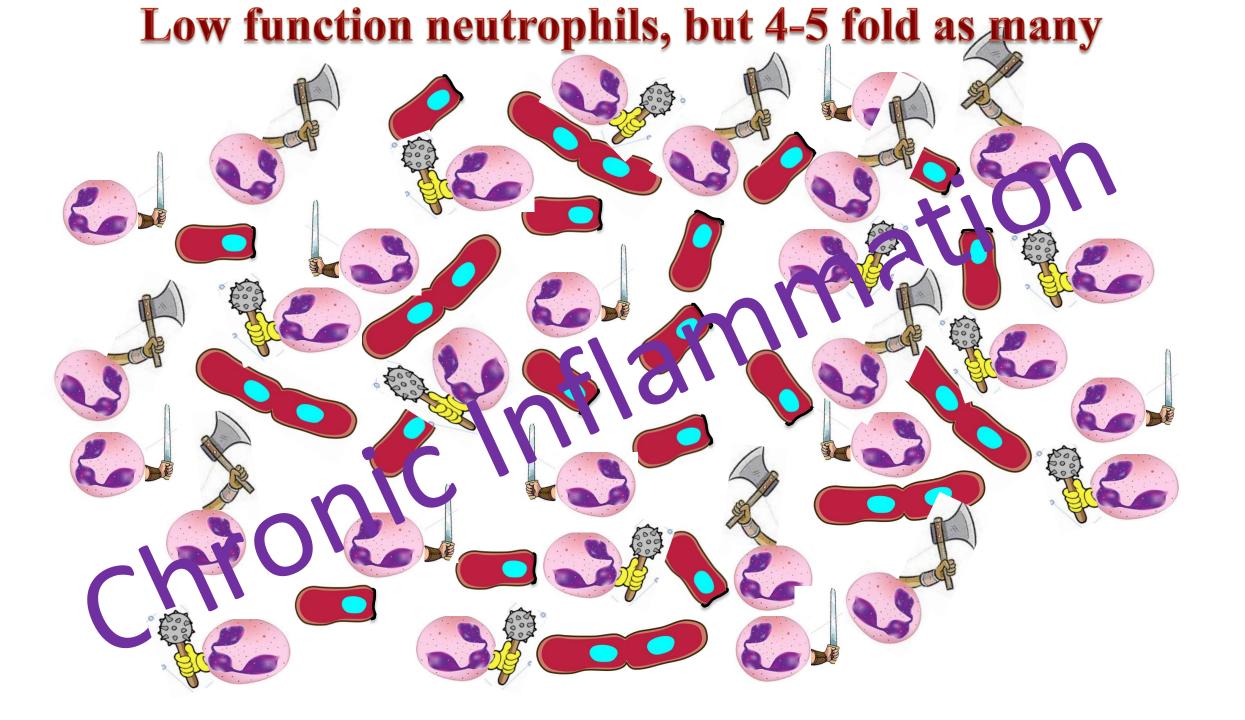


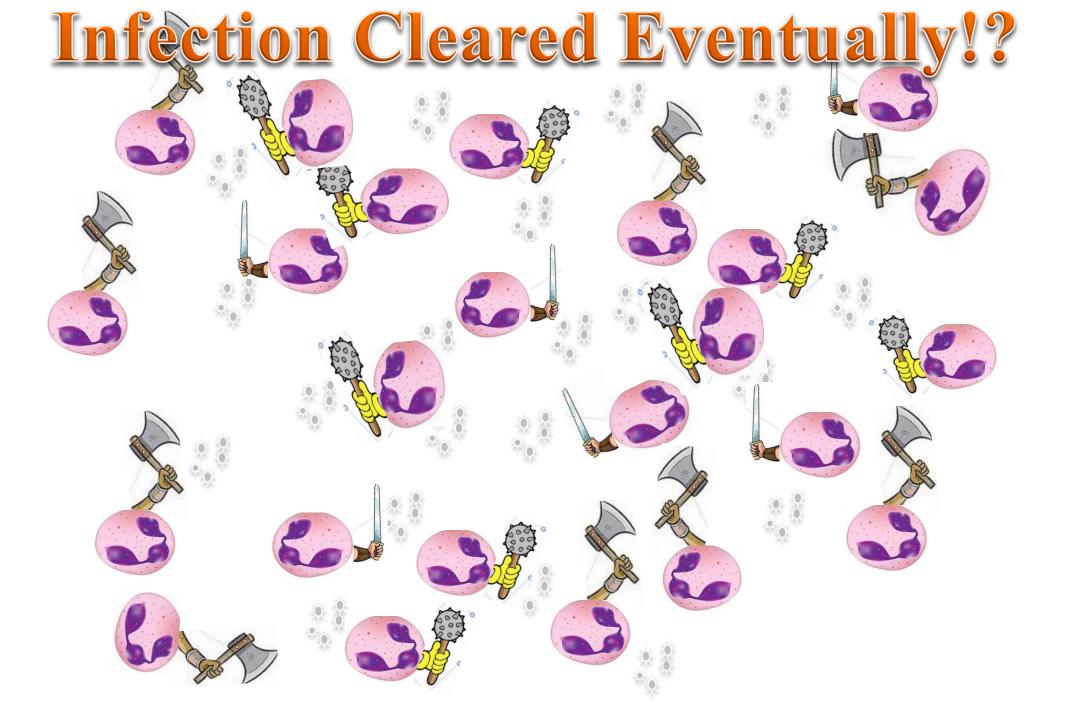










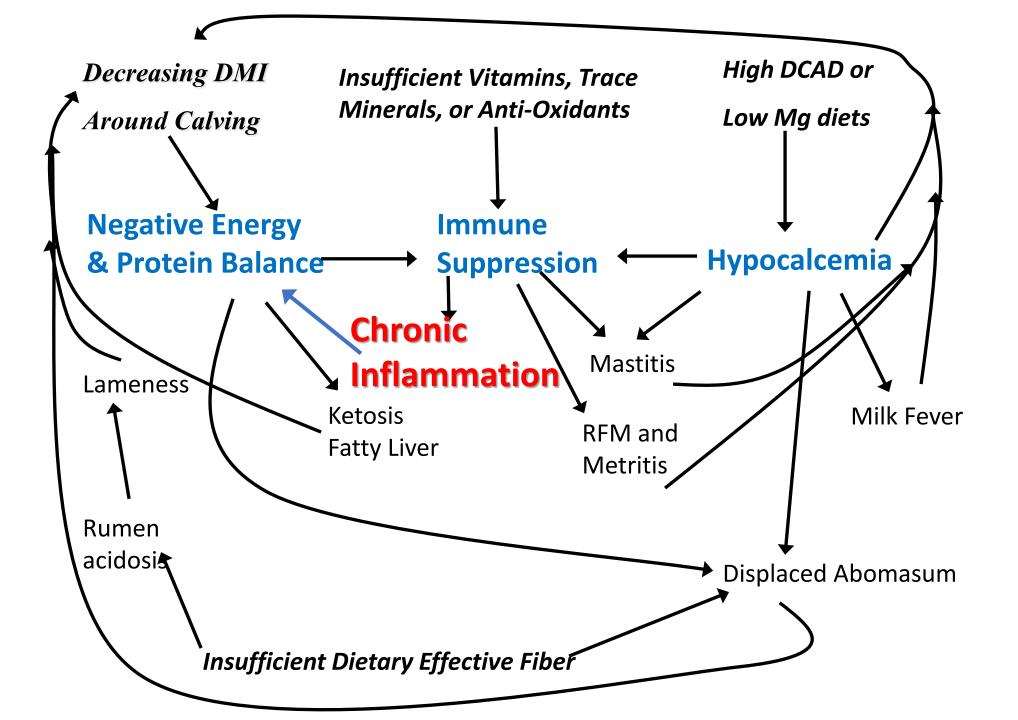


BUT DURING CHRONIC INFLAMMATION THE COW EXPERIENCES DECREASED DMI

- MORE KETOSIS/ FATTY LIVER
- LESS RUMEN FILL= LESS ABOMASAL CONTRACTION
- LESS PROTEIN INTAKE → MORE MUSCLE LOSS

GREATER # BACTERIA TO KILL \rightarrow MORE ENDOTOXINS

- AFFECTS LIVER FUNCTION
- INCREASED FATTY ACIDS RELEASE FROM ADIPOSE
- LOW GRADE HYPOCALCEMIA
- DECREASED INSULIN SENSITIVITY
- REDUCED BLOOD TO HOOF \rightarrow MORE LAMENESS
- **TISSUE DAMAGE BY IMMUNE CELL RESPONSE**
 - GREATER DAYS OPEN
 - LESS MILK PRODUCTION



Normal Blood Calcium concentration = 9-10 mg / dl (2.25-2.5 mM).

Clinical Hypocalcemia = Milk Fever – Blood Ca < 4.5 mg/dl (1.1 mM) (1-5% of cows)

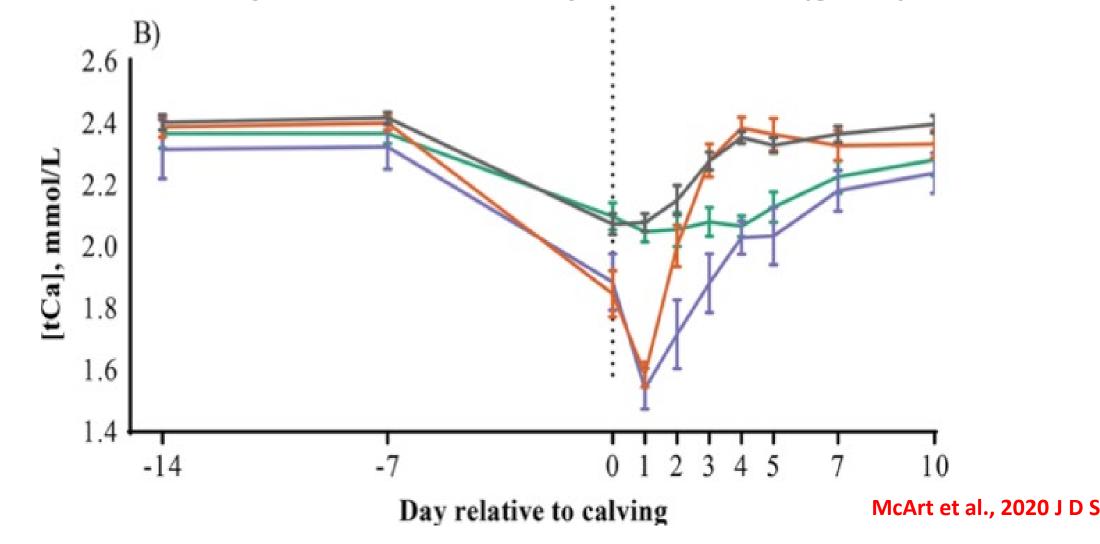
Cow unable to rise to feet, No rumen motility, Severe drop in Dry matter intake. High degree of immune suppression. MUCH LESS MILK & SHORTER LIFESPAN

- more retained placenta, metritis and repro problems
- more ketosis
- more displaced abomasum
- more mastitis

Subclinical – Blood Ca < 8 mg/dl (2.0 mM) in first few days after calving. (25-65% of cows).

Rumen motility and dry matter intake depressed. Immune suppression. Increases risk of secondary disease, but not as much as clinical milk fever. LESS MILK!

Some cows do not develop any hypocalcemia (black). Transient hypocalcemia (red) associated with higher milk production. Persistent hypocalcemia (purple) associated with higher cull rate. A few cows develop hypocalcemia after day 2 of lactation (green).



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TISSUE DAMAGE

- GREATER DAYS OPEN
- LESS MILK PRODUCTION

Hypocalcemia can Contribute to Chronic Inflammation

Cows with hypocalcemia have low Ca++ in neutrophils and reduced neutrophil migration, adhesion, and phagocytosis

Kimura et al., 2006; Zhang et al., 2019

The relative risk of developing metritis decreased by 22% for every 1mg/dL increase in serum Ca.

Martinez et al., 2012

Inflammation Can Cause Hypocalcemia Mastitis and metritis cows often show concurrent hypocalcemia. tCa ~ 6-8 mg/dl. Wenz et al., JAVMA 2001; Waldron et al., 2003.

Acute Infections - endotoxins

Parameters	Healthy cows (8)	Day0 (11)	Day 2 (11)	Day 3 (11)
Hematocrit values (%)	28.7 ± 1.4	32.7 ± 3.9	30.1 ± 4.6	29.4 ± 5.2
Leukocyte counts (/µl)	$13,250 \pm 5,742.8$	$6,136.4 \pm 4,405.9^{a}$	$12,600 \pm 9,948.3$	$15,845.4 \pm 8,856.1^{a}$
Platelet counts ($\times 10^4/\mu l$)	49.3 ± 3.5	39.0 ± 17.7	38.2 ± 16.6	39.9 ± 16.7
Total protein (g/d/)	7.35 ± 0.50	5.63 ± 1.87	5.91 ± 1.39	6.34 ± 1.77
Albumin (g/d/)	3.53 ± 0.13	2.71 ± 0.85	2.82 ± 0.67	2.96 ± 0.84
A/G (%)	0.90 ± 0.18	0.96 ± 0.20	0.94 ± 0.21	0.89 ± 0.17
Blood urea nitrogen (mg/dl)	10.8 ± 4.2^{b}	$17.3 \pm 4.3^{b,c)}$	14.1 ± 5.2	$11.3 \pm 2.1^{\circ}$
Total cholesterol (mg/dl)	212.75 ± 53.72	139.91 ± 57.56	149.72 ± 72.57	151.36 ± 57.05
Total calcium (mmol/l)	2.48 ± 0.34^{d}	1.52 ± 0.55^{d}	1.87 ± 0.68	1.94 ± 0.59
Ionized calcium (mmol/l)	1.1 ± 0.1	0.98 ± 0.22	1.07 ± 0.16	1.07 ± 0.16
Inorganic phosphorus (mg/dl)	5.60 ± 2.05	3.47 ± 1.53	3.83 ± 1.56	4.52 ± 1.40
Magnesium (mg/dl)	2.16 ± 0.37	1.78 ± 0.56	1.71 ± 0.36	1.88 ± 0.56
Number of somatic cells in milk (×103/ml)	$49.3 \pm 3.5^{\rm e,f,g)}$	25,638.1 ± 32,127.2 ^{e)}	$25,\!541.4\pm35,\!022.5^{\rm f)}$	$10,270.3 \pm 18,418.7^{\mathrm{g}}$

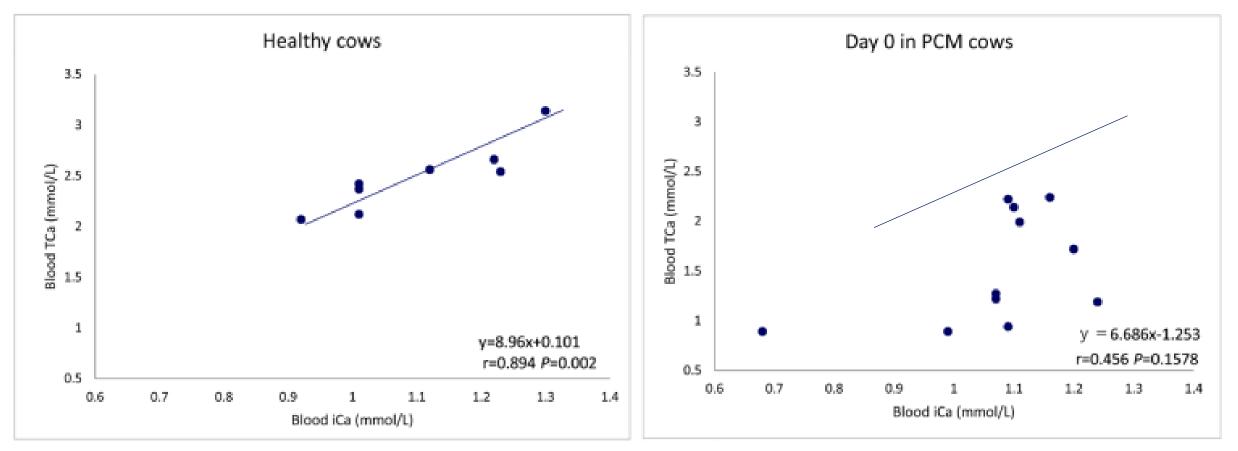
Table 2. Hematological values and number of somatic cells in milk of peracute coliform mastitic cows (day 0 to day 3) and healthy cows

Each value represents the mean \pm SD of the number of experiments (n). Values with the same letters are significantly different (e, f, and g are significant as $P \le 0.01$ and a, b, c, d are at $P \le 0.05$).

39% decrease in total Ca and 23% decrease in albumin

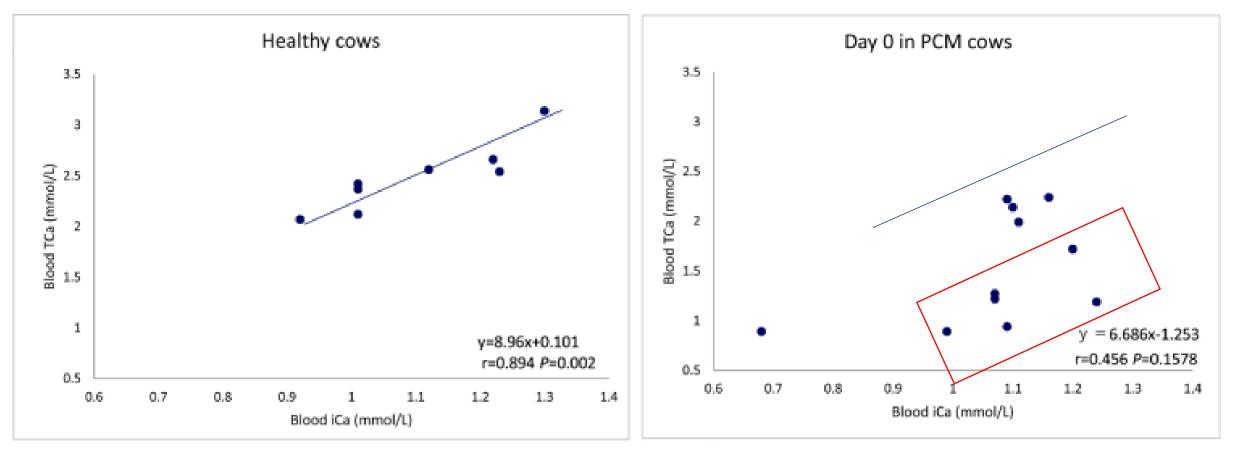
Peracute mastitis causes hypocalcemia and disconnect between iCa and tCa

- disconnect associated with hypothermia, blood coagulation system activation, and dehydration, and low blood albumin



Peracute mastitis causes hypocalcemia and disconnect between iCa and tCa

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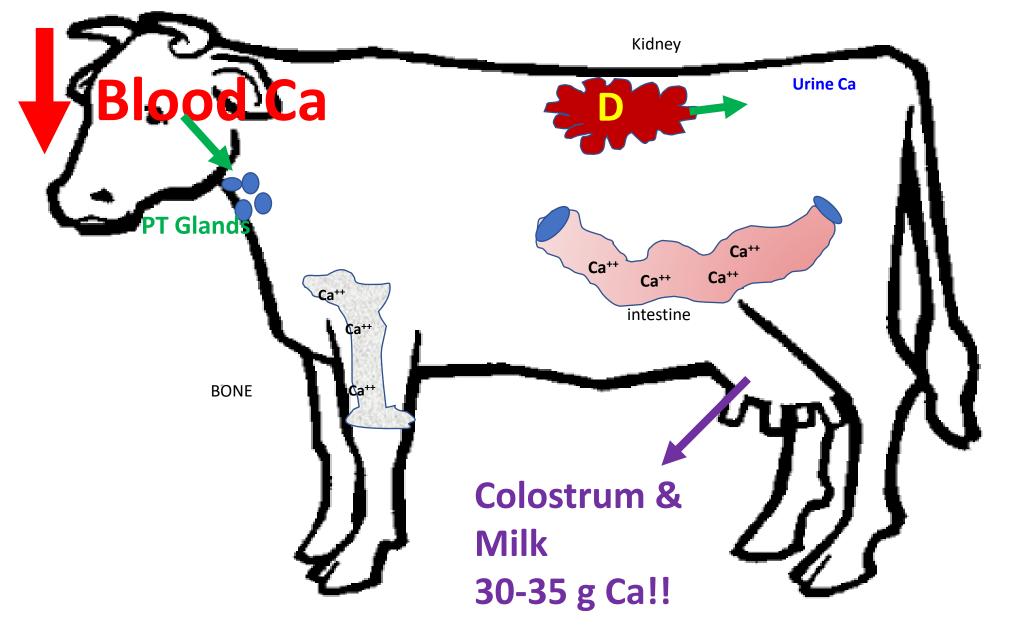
Hisaeda et al., JVMS 2019

Acute Infections – endotoxins

THIS IS NOT MILK FEVER!!

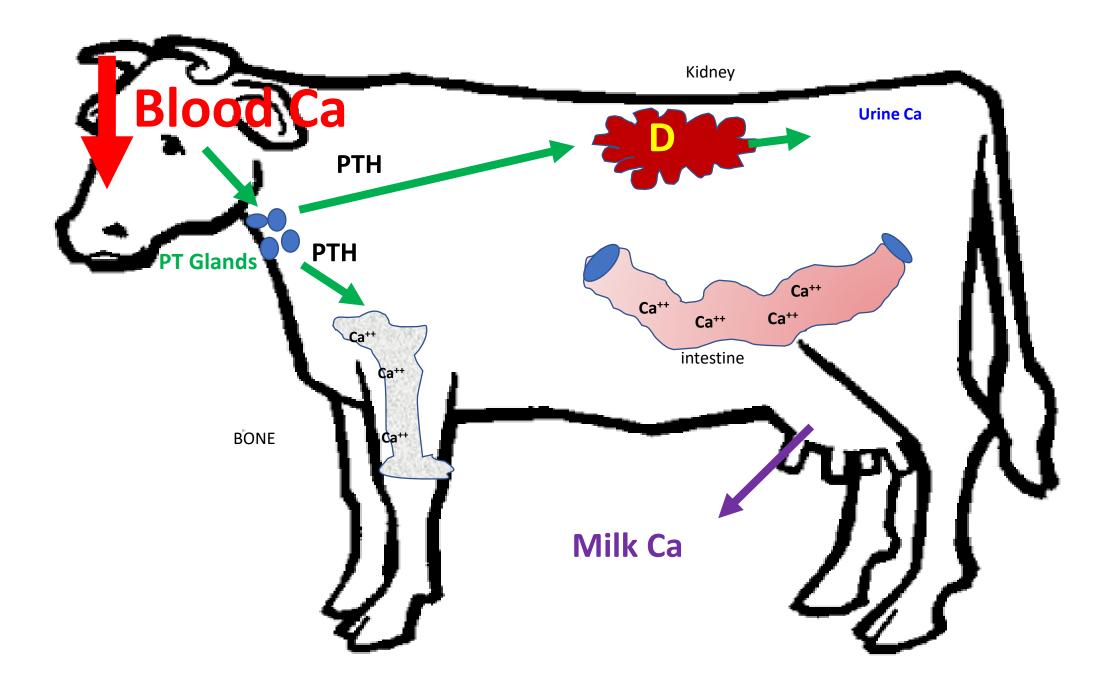
TREATING THESE COWS WITH IV CALCIUM MAKES THINGS WORSE!!!! Cardiac arrest Renal impairment

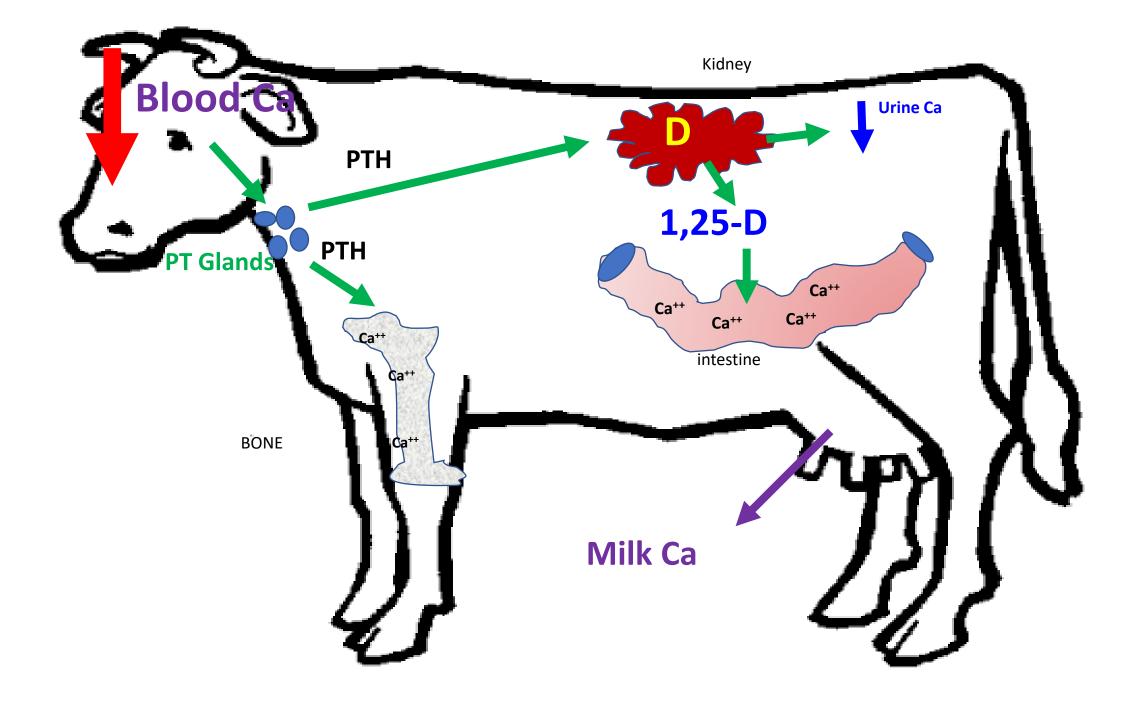
Why does blood Ca fall in almost every cow??

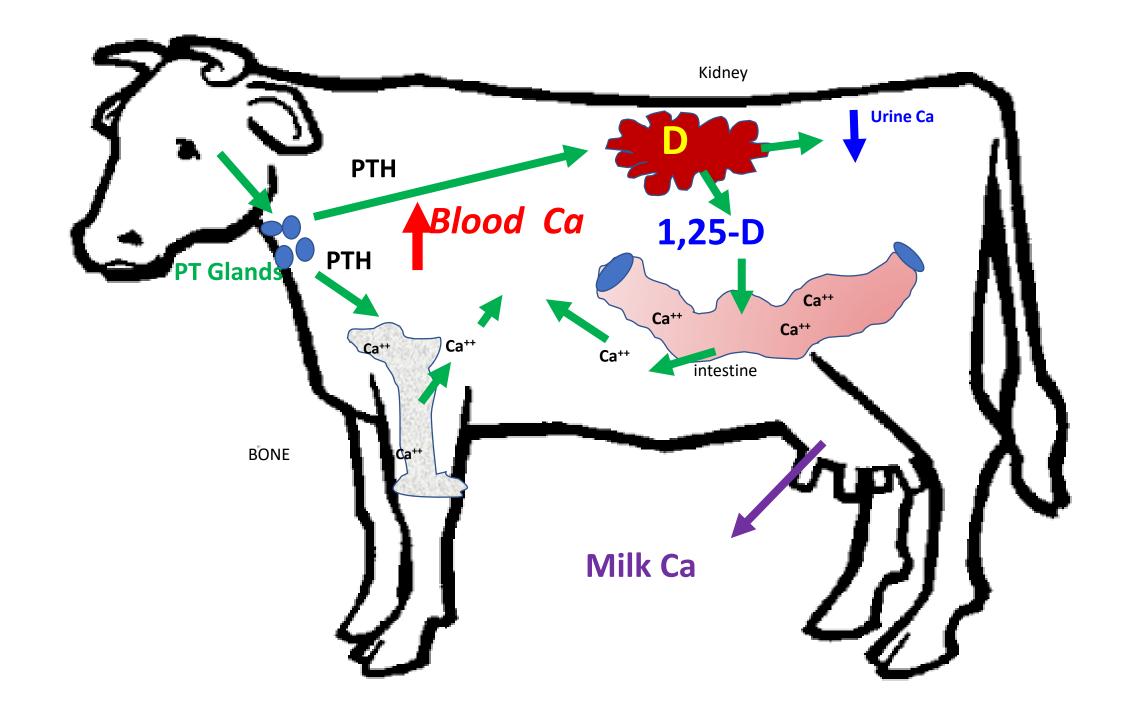


Why don't all cows get milk fever????

Calcium Homeostasis!





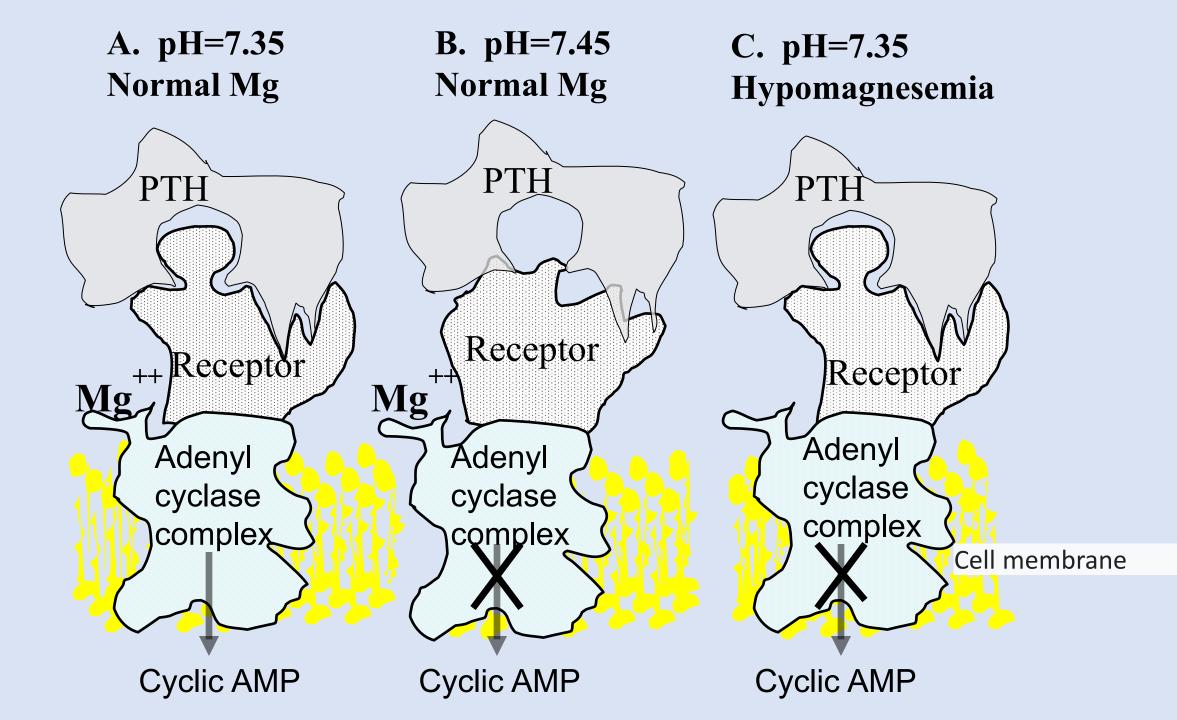


Why doesn't Ca Homeostasis work in all cows???

Aged cows lose vitamin D receptors in intestine

Aged cows have fewer sites of active bone resorption (fewer osteoclasts) capable of responding to PTH rapidly

BLOOD pH AFFECTS BONE AND KIDNEY RESPONSIVENESS TO PTH!



Blood pH is dependent on Diet Cation – Anion Difference

DCAD 1 = $(mEq Na^+ + mEq K^+) - (mEq Cl^- + mEq SO^{-2}_4)$

Cations (+) **absorbed** from forages and diet cause the blood and urine of the cow to become alkaline

Anions (-) **absorbed** from forages and diet cause the blood and urine of the cow to become acidic

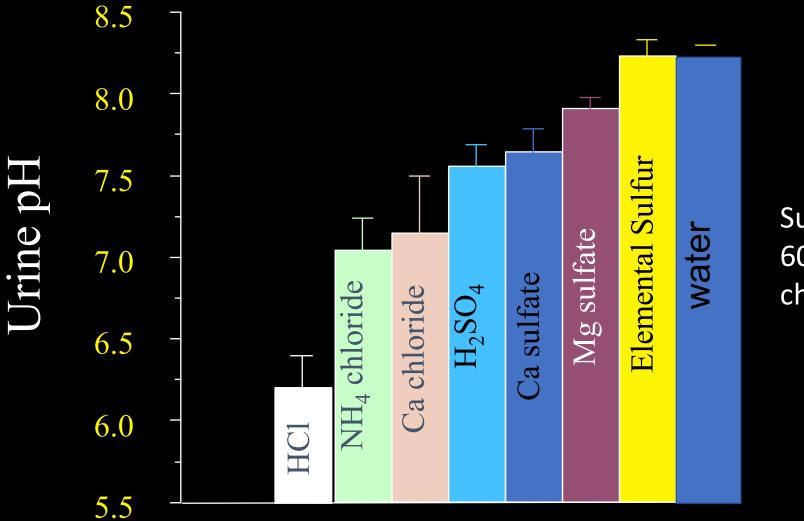
High DCAD diets, where K and Na are in much greater concentration than CI or SO_4 , cause Alkalosis & milk fever

Milk Fever & Hypocalcemia Prevention

- 1. Avoid very high potassium forages for close-up cows; practiced by most dairies in US.
- 2. Add anions (CI or Sulfate) to diet to reduce blood and urine pH and improve tissue ability to respond to PTH!.

Choosing the right anion sources

<u>2 Eq of each anion source fed</u>



Sulfate anion is only 60% as acidifying as chloride anions

DCAD Equations

DCAD 1 = (mEq Na⁺ + mEq K⁺) - (mEq Cl⁻ + mEq SO⁻²₄)

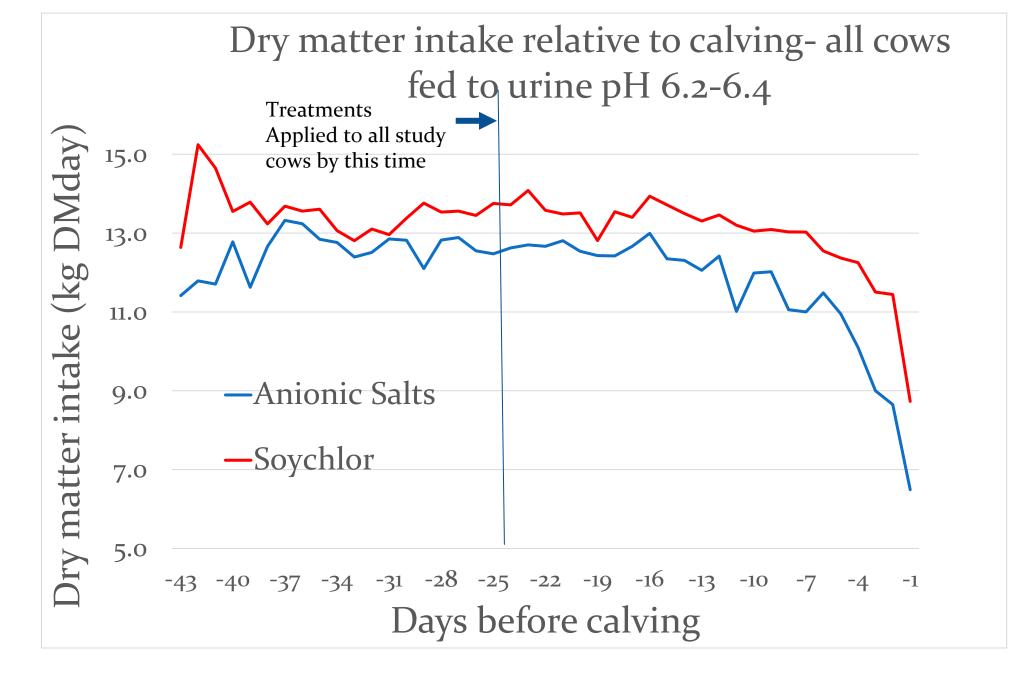
DCAD 2 = (mEq Na⁺ + mEq K⁺) - (mEq Cl⁻ + 0.6 mEq SO⁻²₄)

Milk Fever & Hypocalcemia Prevention

- 1. Avoid very high potassium forages for close-up cows; practiced by most dairies in US.
- 2. Add anions (CI or Sulfate) to diet to reduce blood and urine pH and improve tissue ability to respond to PTH!.

Choosing the right anion sources

Palatability Issues -traditional salts had palatability problems



Strydom & Swiegart, 2016 ADSA

Is Dry Matter Intake Important???

Every 1-kg decrease in average DMI during the last week before calving increased the risk of subclinical ketosis by 2.2 times (Goldhawk et al. 2009).

Cows with a lower DMI prepartum are 3 times more likely to be diagnosed with metritis (Huzzey et al., 2007).

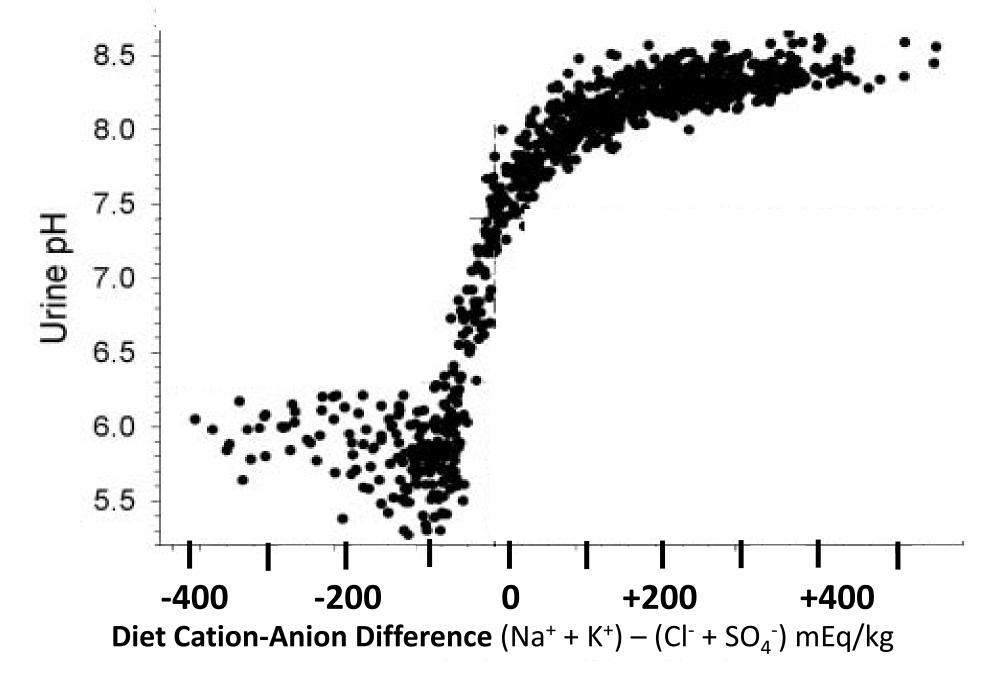
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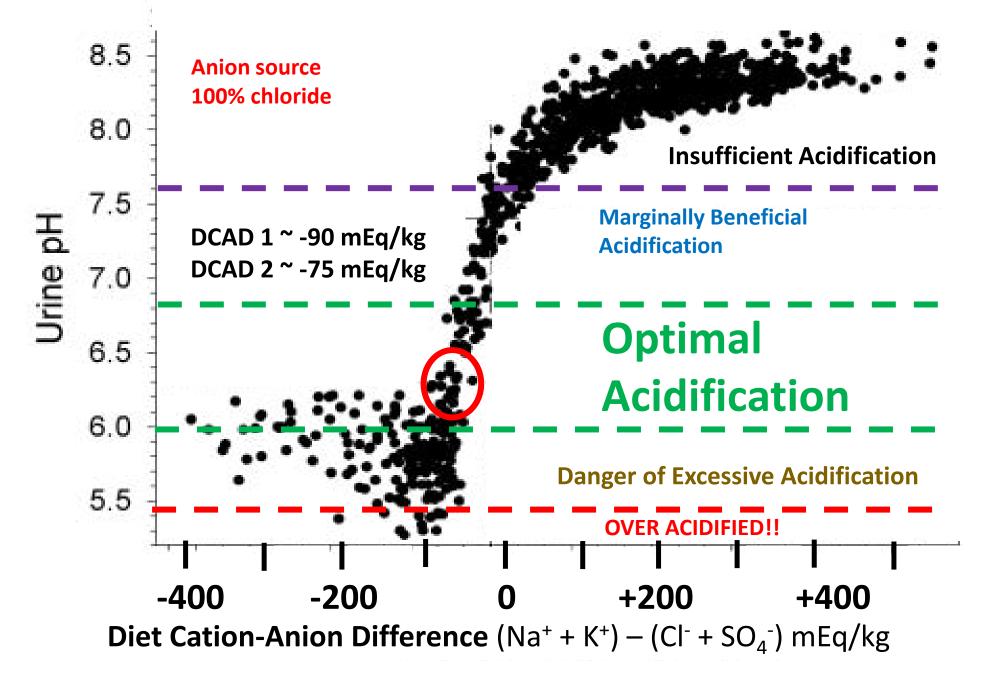
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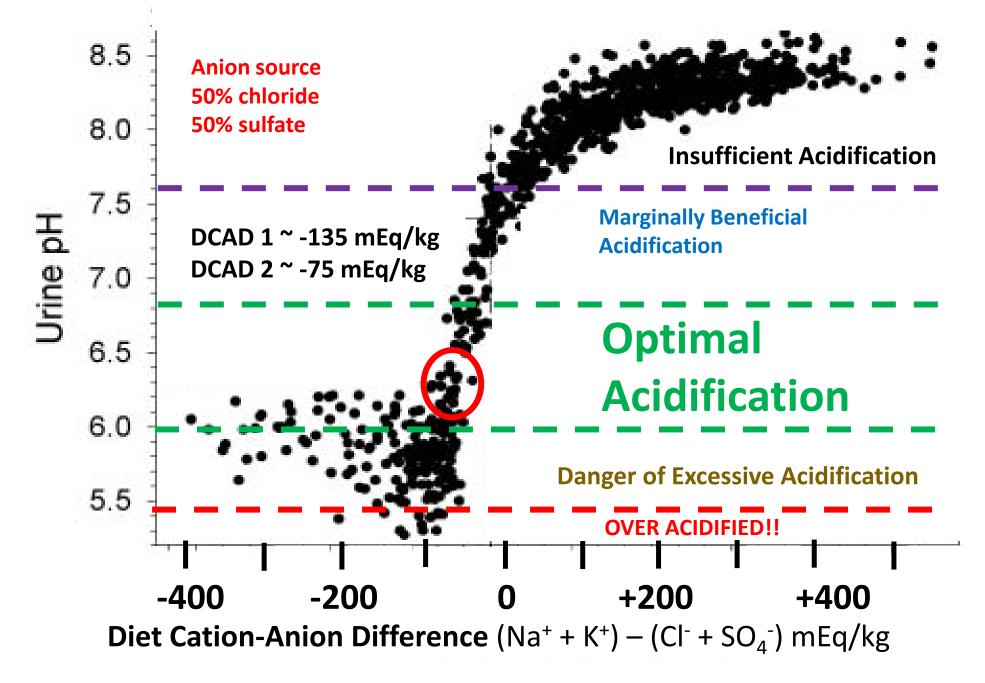
Palatability Issues

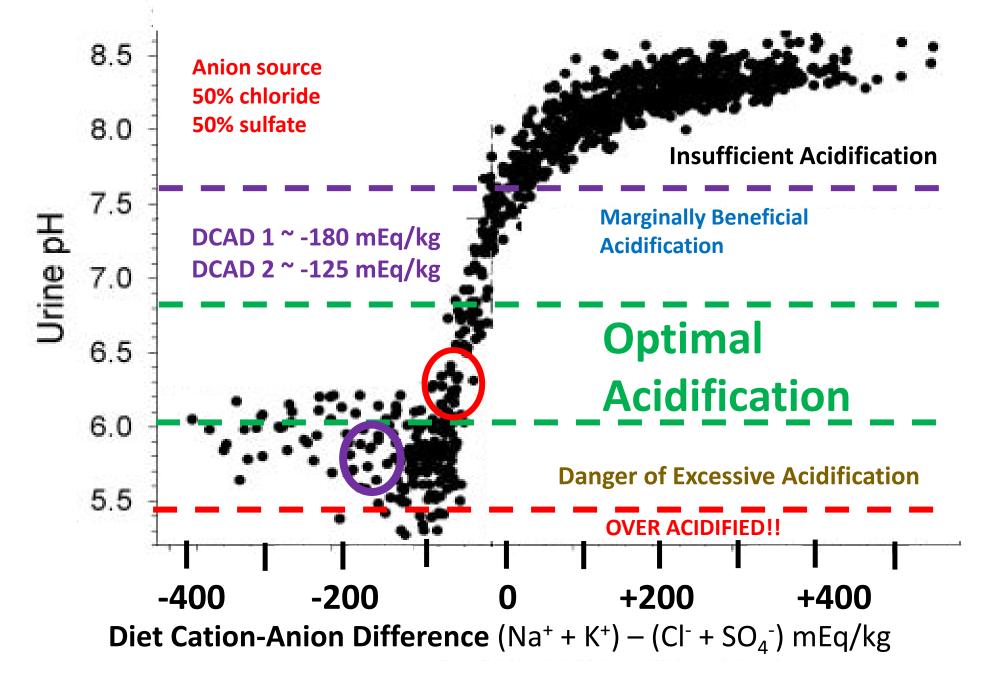
Over and under acidification -blood pH and urine pH decrease when DCAD decreases

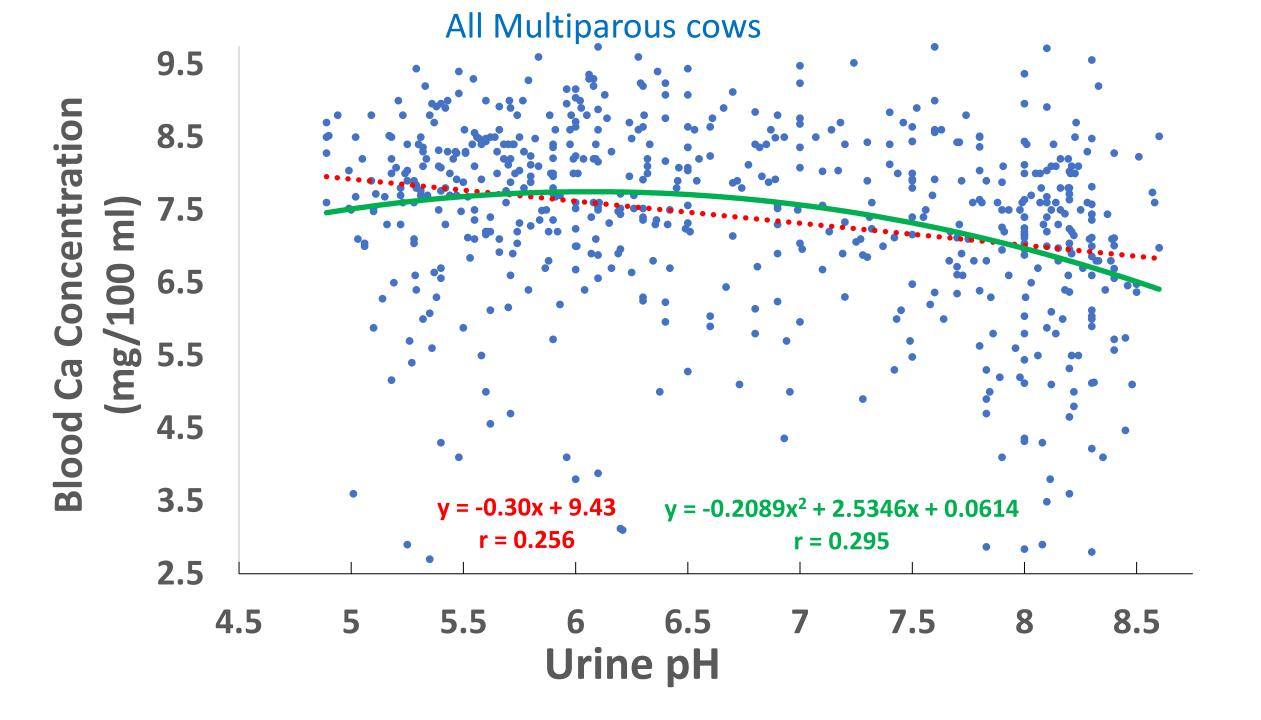


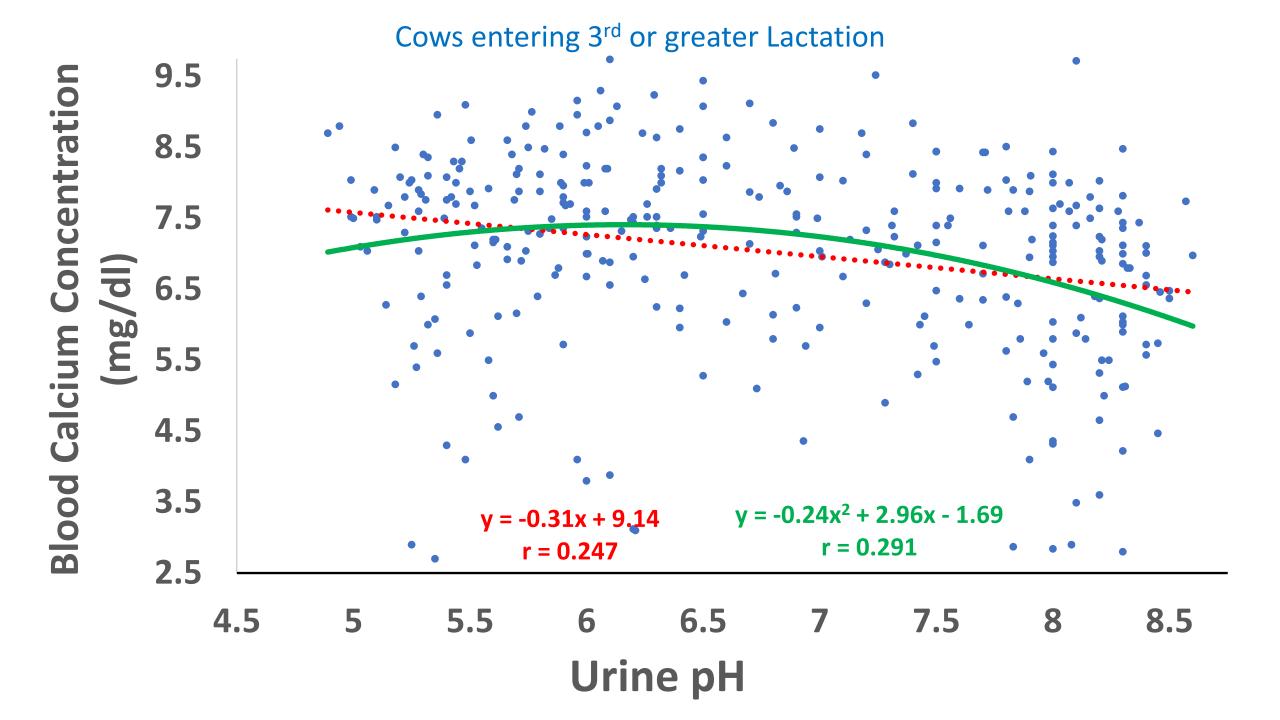
Adapted from Constable et al., 2017; Spanghero, 2004; and Charbonneau et al., 2006

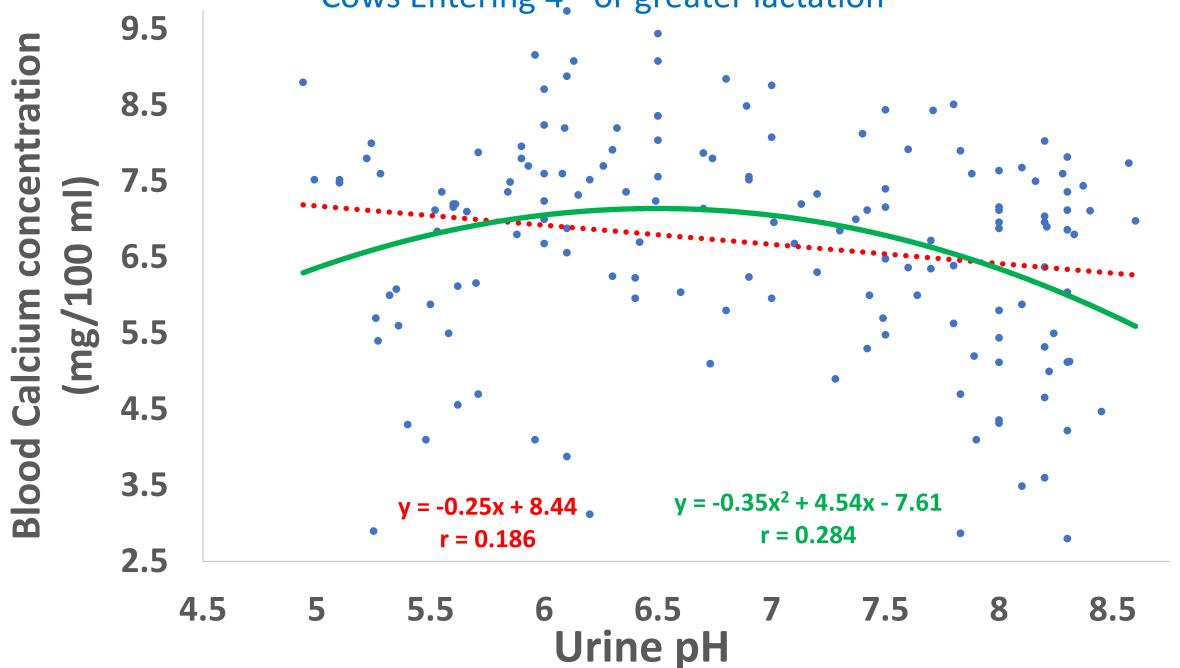






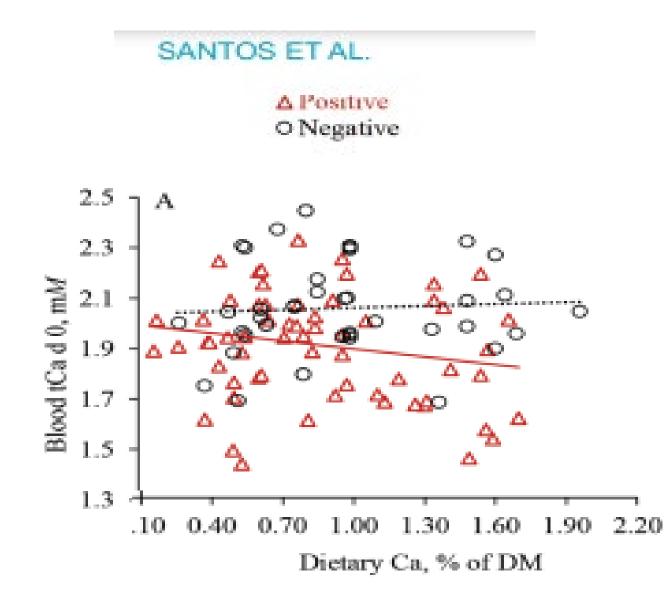






Cows Entering 4th or greater lactation

How much Ca should I feed with a low DCAD diet???



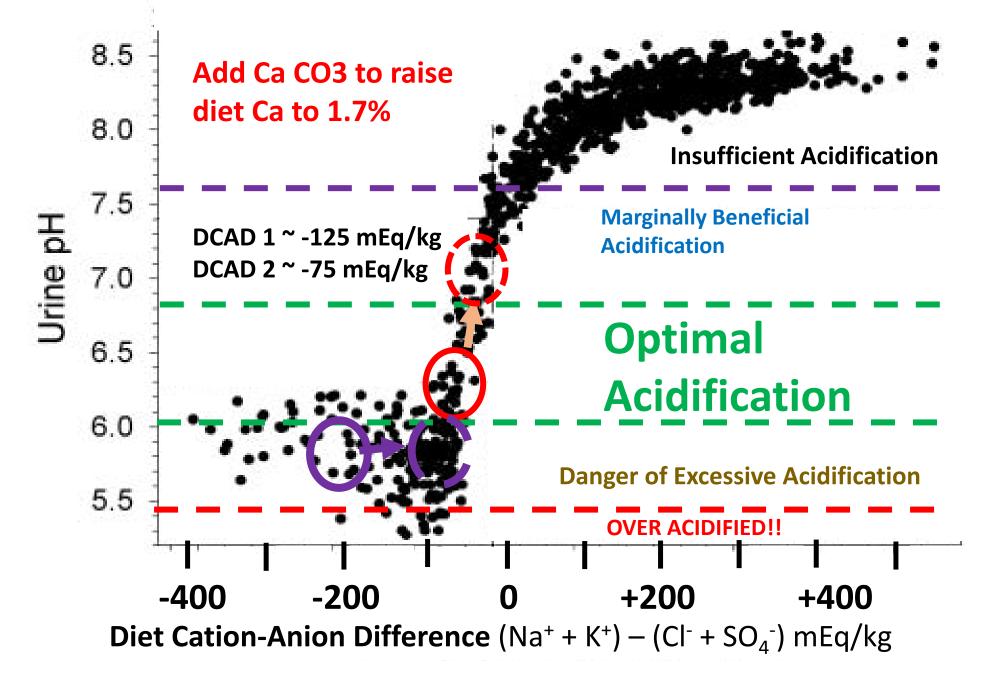
Santos et al., 2019 Meta Analysis

Negative DCAD diet
 No effect of diet Ca on blood Ca in
 cows around calving

I = positive DCAD diet Slight decrease in blood Ca when high diet Ca is fed

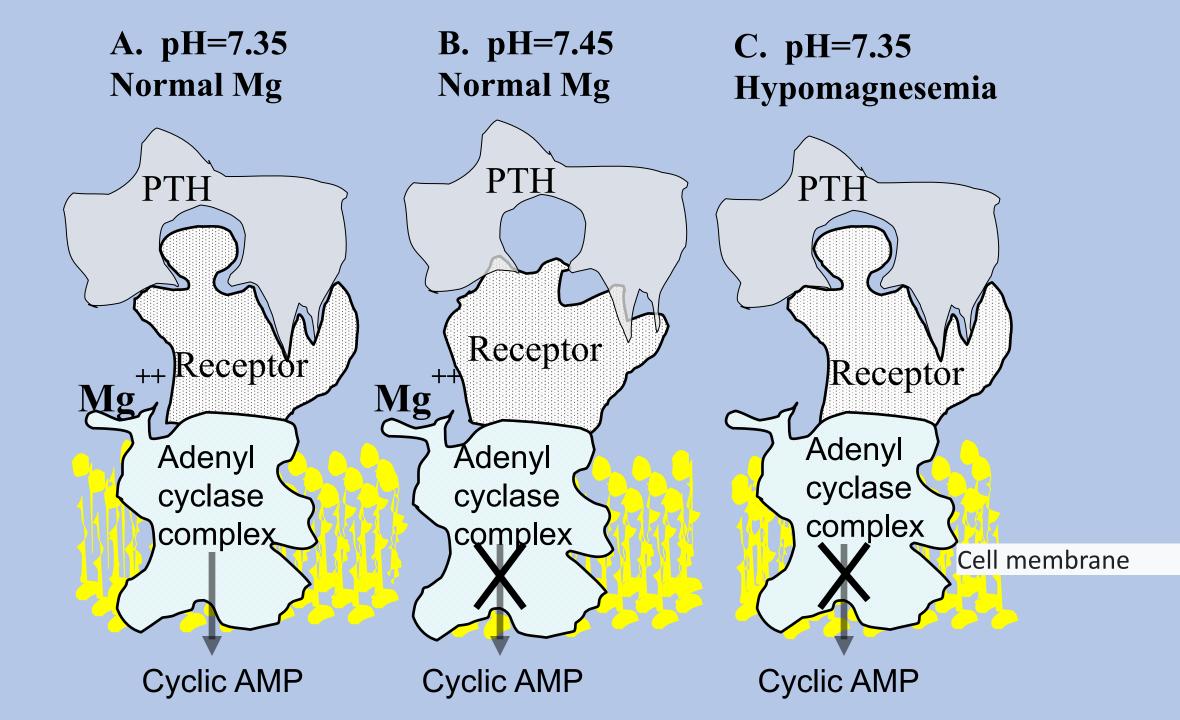
Limestone has an alkalinizing effect!!!

NEED TO FEED MORE ANION TO REACH SAME URINE pH!!



Milk Fever & Hypocalcemia Prevention

- 1. Avoid very high potassium forages for close-up cows; practiced by most dairies in US.
- 2. Add anions (CI or Sulfate) to diet to reduce blood and urine pH; various forms practiced.
- 3. Close-up and Fresh cow Diet Mg ~ 0.4%



Magnesium – ONLY ABSORBED ACROSS RUMEN WALL

Pre-calving

- using MgSO₄ or MgCl₂ as "anions" also supplies readily available, **SOluble** Mg.

-The better anion supplements on the market include Mg in this form to remove Mg worries pre-calving.

Post-calving is the bigger issue!!!!!! Magnesium Oxide – supplies Mg and acts as rumen alkalinizer.

MgO must become soluble to be available for absorption by rumen wall!!!!

Testing Magnesium Oxide Availability

Weigh out 3 g MgO into large vessel.

Add 40 ml of 5% acetic acid (white vinegar) slowly!!

Cap container and shake well and let sit 30 minutes. Check the pH.

Vinegar will be pH 2.6-2.8!

The best MgO will bring the pH up to 8.2.

The worst to just 3.8.

pH is a log scale so this represents >10,000 fold difference in buffering action.

Milk Fever & Hypocalcemia Prevention

- 1. Avoid very high potassium forages for close-up cows; practiced by most dairies in US.
- 2. Add anions (CI or Sulfate) to diet to reduce blood and urine pH; various forms practiced.
- 3. Close-up and Fresh cow Diet Mg ~ 0.4%
- 4. Diet P < 0.35%, better below 0.25%

Excessive Diet Phosphorus Blocks conversion of Vitamin D to the Hormone 1,25-dihydroxyvitamin D

Close-up cow requires diet with 0.22-0.25% phosphorus to be in balance

Above 0.30% Phos begins to impair Ca homeostasis (Wachter et al,2022; Cohrs et al., 2018)

Restricting diet phosphorus below requirements can reduce hypocalcemia (Kichura et al., 1982).

Addition of Na aluminosilicates (zeolites) to diets can bind enough phosphorus to reduce hypocalcemia (Thilsing-Hansen et al., 2002)

Keeping Phosphorus Low

Do not add any source of mineral phosphate such as dicalcium phosphate. Check mineral pack!!

Take care when using canola meal as protein source for closeup cows

- canola meal phos = 1.05 % DM basis
- Soybean meal phos = 0.55% DM basis

Zeolite A (Thilsing-Hansen, et al. 2001)

In a test tube the sodium aluminosilicate can bind 1 g of Ca for every 10 g zeolite.

Creates a Low Ca diet to stimulate PTH release well before calving

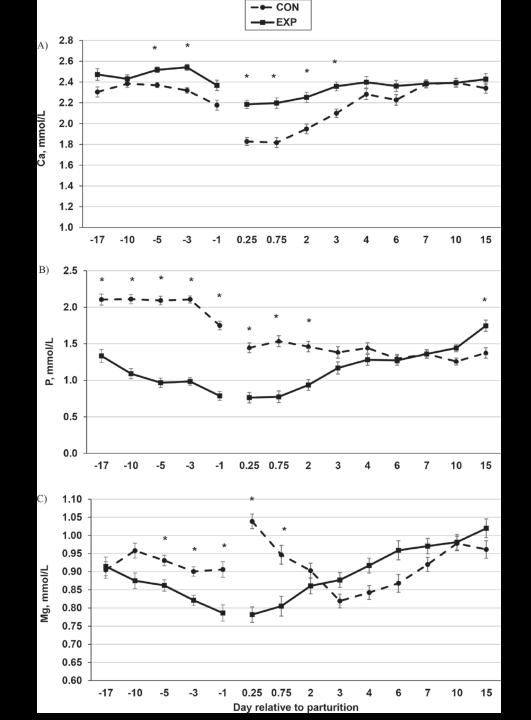
Binds phosphate and magnesium as well. Trace minerals?? Transient reduction in blood Mg and Phos.

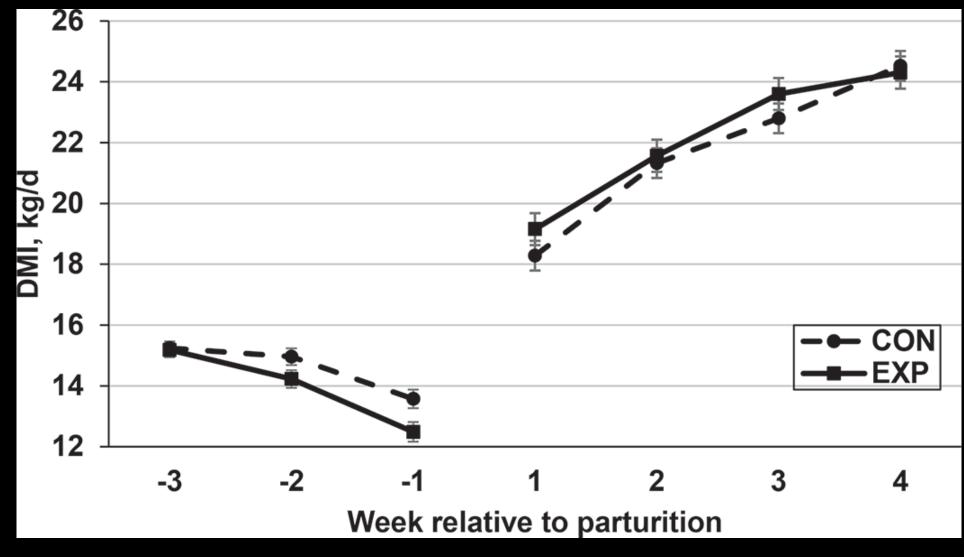
Lower blood phosphate may be an important aspect to its mechanism of action!!!

Kerwin et al., 2019

Added 0.5 kg zeolite to a diet that was :

0.65 % Ca , 0.39% Phos, 0.42% Mg DCAD of + 268 mEq/kg





DMI Treatment X week P= 0.04 Rumination rate significantly decreased with zeolite prepartum. P=0.03

Zeolite

ADVANTAGE

No need to restrict diet Potassium

Urine pH testing not necessary

DISADVANTAGES

Cost

Often reduces Dry Matter intake.

Unlikely to work well should diet Ca rise above 0.7%.

- must take care to restrict Ca found in TM/ Vitamin Packs.

Does binding of Mg and trace minerals have any impact on health?

Impact of Reducing DCAD on health and milk production

Lean et al., 2019. Santos et al., 2019. Meta-analysis indicates significant beneficial effects (P<0.02) on:

Milk Fever, Blood Ca (the day of calving and "postpartum"), Retained Placenta, Metritis, and risk of Multiple Health Events

But not Mastitis (P=0.63) and LDA (P= 0.73)

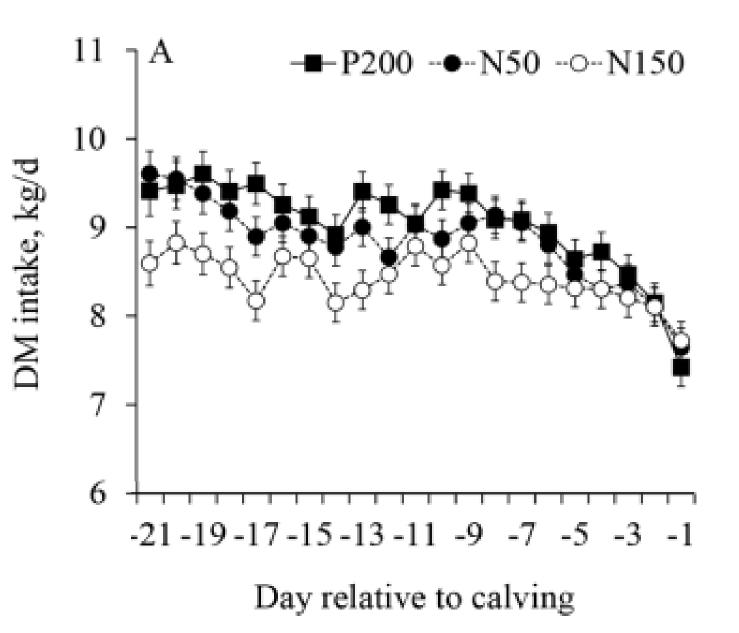
Milk Production – Multiparous \rightarrow + 1.1 to 1.7 kg/day

Nulliparous \rightarrow - 1.28 to - 1.4 kg/day!

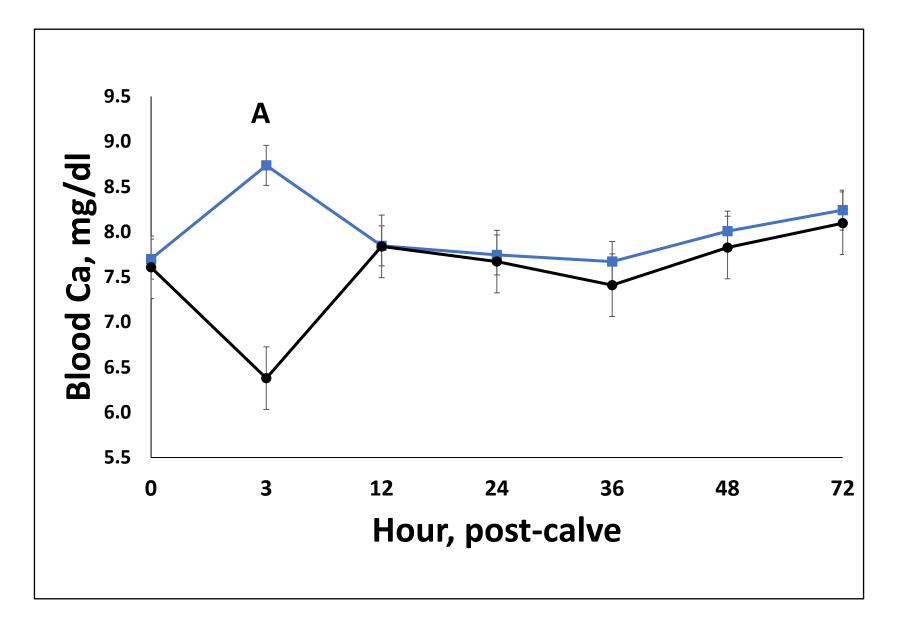
Zimpel et al. 2021 (a,b) - compared to No Anion Controls, negative effects on heifers not observed if "moderately low DCAD" was fed with urine pH 6.67 vs 5.41

Zimpel et al., JDS 2021

Effect of DCAD on dry matter intake before calving in Nulliparous cows. (Na + K) - (Cl + S)



Oral Ca boluses can support blood Ca for about 3-6 hrs and likely need to be repeated



Oral Calcium boluses PLUS anionic diets????

DCAD Adjustment with added anions

To take a diet from +200 mEq/kg to -100 mEq/kg would require the addition of 300 mEq chloride / kg diet DM. And if cows eat 13.5 kg DM/day that amounts to adding 4050 mEq chloride to the diet each day

Bolus containing 40 g Ca as calcium chloride supplies 2000 mEq of chloride.

One calcium bolus adds about ½ a days worth of anion!!! OVERACIDIFICATION POSSIBLE!!!

Fresh Cow Diets – The Next Frontier

What's the matter with the high group TMR??

What changes should be made from the HIGH group TMR diet?

How long should they be fed??

My Opinion -changes to be made from the HIGH group TMR diet?

Energy – starch same as high group, more straw \rightarrow LDA prevention?

Protein – 19-20% CP And amino acid balanced!!

Fat - Don't add any!

Calcium – higher, 1.0-1.2% Ca

Magnesium – higher, 0.45-0.5% and available MgO, MgOH2, MgCO3

Vitamin E – higher, 3000-4000 IU /day

Investing in Your Future – Calf Health

Geof Smith, DVM, PhD Dipl. ACVIM



zoetis

Paradigm Shift – Heifer Raising

Traditional Thinking

- Calves are an expense they won't pay for themselves until somewhere in the 2nd lactation
- I need to raise them as cheaply as possible
- If I run short on heifers I can always buy extra animals
- As long as I keep them alive and get them pregnant – they will "catch up" in the lactating herd eventually



Paradigm Shift – Heifer Raising Reality

- Calves are an investment
- Early growth and disease incidence have a significant impact on future productivity
- Need to manage heifer inventory and focus on nutrition
- Heifer survival rate has been shown to be a key indicator of net farm income and total profitability of dairies (Zoetis Dairy Financial Drivers study)
- The key is not only heifer survival but quality

Current Trends

- 1) Beef on dairy calves have been a blessing and a curse
- 2) Many farms have restricted the "incoming" heifer pipeline by their breeding decisions
- 3) Purchasing dairy replacement heifers has become more difficult
- 4) This has restricted the ability of some dairies to make culling decisions
- 5) Many farms still fail to calve heifers at 85% of mature body weight

Calf Health

- Calf health continues to be a problem on some farms
- Obviously high mortality rates limit the number of heifers available for breeding
- Calves treated for BRD have a 500-1,200 lb decrease in 1st lactation milk
- Multiple studies have shown that scours is a significant risk factor for the development of pneumonia
- Need to focus on weaning big, healthy calves with "good lungs"

Disease Incidence – Dairy Calves

	1991	1996	2002	2007	2014
Pre-weaned calf mortaltiy	8.4%	10.8%	10.5%	7.8%	6.4%
% of deaths caused by diarrhea	52.2%	60.5%	62.1%	56.5%	56.4%
% of deaths caused by pneumonia	21.3%	24.5%	21.3%	22.5%	24.0%
Weaned calf mortality	2.2%	2.4%	2.8%	1.8%	1.9%

Data from USDA NAHMS surveys

Neonatal Calves

- Overall focus should be on management NOT products or interventions
- The vast majority of disease and/or calf health problems stem from improper calf management
- There is no magic bullet to overcome a poor colostrum program or bad housing/hygiene
- Key focus should be in 3 areas: first-day calf care, nutrition and weaning



Day 1 Calf Care: Where Calves Get Their Healthy Start

- ✓Needs to be a focus on dairy farms
- ✓Clean, well-ventilated maternity barn with a separate area for calving
- $\checkmark \text{Dip}$ navel immediately and tag calf
- ✓Harvest colostrum ASAP post-calving in the maternity barn



Colostrum Management

A good colostrum management program – ensuring that all calves get an adequate volume of quality colostrum within the first 2-4 hours - <u>is</u> <u>the single most important aspect of neonatal calf</u> management.

Best Practices

- Test colostrum (Brix) and if not immediately fed need to have plan for <u>rapid</u> cooling and proper storage
- Calves fed 4L of colostrum within 2 hours of birth
- Monitor [total protein] periodically
- Need stable (well trained) maternity barn staff with a plan in place for heavier times of the year



New Standards for Passive Transfer

Category	Serum [IgG] (g/L)	Total Protein (g/dL)	%Brix	% of Calves	2014 NAHMS % of calves
Excellent	<25.0	>6.2	>9.4%	>40	35.5
Good	18.0-24.9	5.8-6.1	8.9-9.3	~30	25.7
Fair	10.0-17.9	5.1-5.7	8.1-8.8	~20	26.8
Poor	<10.0	<5.1	<8.1	<10	12.0

Lombard J et. al. Consensus recommendations on calf- and herd-level passive immunity in dairy calves in the United States J Dairy Sci 2019;103:7611-7624



Post Day 1 Colostrum Use

- Research shows that the continued use of colostrum (or CR) past day 1 can help prevent scours^{1,2} and may help increase growth rates¹
- Colostrum can also be used as a "treatment" to help resolve diarrhea^{3,4}
- More research is needed to define "how much" and "for how long" transition colostrum should be fed

1 Charmorro MF, Cernicchiaro N, Haines MH Evaluation of the effects of colostrum replacer supplementation of the milk replacer ration on the occurrence of disease, antibiotic therapy, and performance of pre-weaned dairy calves J Dairy Sci 2016;100:1378-1387

² Kargar S. et al. Extended colostrum feeding for 2 weeks improves growth performance and reduces the susceptibility to diarrhea and pneumonia in neonatal Holstein dairy calves J Dairy Sci 2020;103:8130-8142

³ Carter HSM, Steele MA, Costa JHC, Renaud DL. Evaluating the effectiveness of colostrum as a therapy for diarrhea in preweaned calves J Dairy Sci 2022;105:9982-9994

⁴ Chung J, Rayburn MC, Chigerwe M, Randomized controlled clinical trial on the effect of oral immunoglobulin supplementation on neonatal dairy calves with diarrhea J Vet Int Med 2019;33:1807-1813

The Benefits of Increased Milk Nutrition

- Nutrition has been shown to be a critical piece of the puzzle in helping to prevent calf disease
- Studies have shown that higher planes of nutrition reduce the incidences of BOTH diarrhea and pneumonia
- Calves should be fed "more" early so they are in good body condition to handle diarrhea if it should happen
- Better nutrition also helps modulate immune function in calves

Nutrition and Disease

- In a challenge model of Cryptosporidiosis in calves those on a higher plane of nutrition got better "faster" than those on conventional nutrition
- On day 5 calves were inoculated with C. parvum (1 X 10⁶ oocysts) with an esophageal feeder
- Health score, fecal score, rectal temp, [TP], PCV, WBC count, body weight, [NEFA]
- A quantitative Crypto oocyst count was done on feces
 from each calf once diarrhea started

Ollivett et al. JAVMA 2012; 241:1514-1520

Nutrition and Disease

- After a pathogen challenge calves on a higher plane of nutrition:
 - maintained hydration
 - had faster resolution of diarrhea
 - grew faster
 - converted feed with greater efficiency

Ollivett et al. JAVMA 2012; 241:1514-1520

Nutrition and Disease

- Another study compared calves on LPN and HPN with a Salmonella Typhimurium challenge model
- Calves on HPN had:
 - Higher % of neutrophils producing an oxidative burst on days
 1-5 post-challenge
 - Greater intensity of oxidative burst post-challenge
 - Some increase in secretion of TNFa from whole blood cultures stimulated with LPS in HPN calves
 - LPN calves had higher [haptoglobin]

Ballou et al. J Dairy Sci 2015; 98:1972-1982





Article

A High Plane of Nutrition Is Associated with a Lower Risk for Neonatal Calf Diarrhea on Bavarian Dairy Farms

Ingrid Lorenz ^{1,*}, Regina Huber ² and Florian M. Trefz ³

- Study took place in Bavaria with 14 veterinarians employed by the Bavarian Animal Health Service making farms visits
 - -Risk factors were compared between herds with "frequent diarrhea" (n = 59) and control herds that had not treated more than 10% of calves for diarrhea in the preceding year (n = 18)

Results

- Farms that fed higher volumes of milk particularly during the first week of life had lower risk of diarrhea
- Both increased frequency of feeding and increased volume of milk/meal were associated with in ↓ diarrhea

Table 4. Variab	les entered into a multiv	ariate regression mode	el with p-values from	univariate regression.
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Variable	<i>p</i> -Value
Calving pen cleaned after every calving	0.14
Newborn calves with dams longer than 3 h	0.08
3 L of colostrum at first feeding	0.08
3 or more liters of colostrum at second feeding	0.01
Ad libitum feeding during first week of life	0.00

Animals 2021; 11:3251

Milk and Future Production

- Several studies now have indicated that increased nutrient intake during the first 8 weeks of life will increase milk yield in first lactation
 - -Increases have ranged from 1,000 to 3,000 lbs
- The increase in milk production seems to be consistent regardless of body weight
- Nutrient intake in the pre-weaning period has a direct impact on mammary gland development

Soberon F, Van Amburgh ME. Lactation Biology Symposium: The effect of nutrient intake from milk or milk replacer of preweaned dairy calves on lactation milk yield as adults: a meta-analysis of current data. *J Anim Sci.* 2013;91:706-712.

LACTATION BIOLOGY SYMPOSIUM: The effect of nutrient intake from milk or milk replacer of preweaned dairy calves on lactation milk yield as adults: A meta-analysis of current data¹

F. Soberon* and M. E. Van Amburgh⁺²

*Shur-Gain USA, Nutreco Canada Inc., Guelph, ON N1G 4T2, Canada; and †Cornell University, Ithaca, NY 14850

Table 1. List of studies comparing preweaning calf nutrition and future milk yield of the same animals
--

Study	N	ADG of control, kg	ADG of treatment, kg	Milk yield of control, kg	Milk response ¹ , kg	Estimated ME, Mcals/d above control calves	Source of nutrient ²
Foldager and Krohn (1994)	30	na ³	na	na	1,405 ^a 3,09	1 na	WM
Bar-Peled et al. (1997)	20	0.56	0.85	9,171	453 ^b 997	0.290	WM/MR
Foldager et al. (1997)	20	0.60	0.90	7,716	519ª 1,142	0.266	WM
Ballard et al. (2005), at 200 DIM ⁴	14	0.44	0.73	6,100	700 ^a 1,54	0.200	MR
Shamay et al. (2005)	20	0.59	0.88	10,784	981 ^a 2,15	9 0.270	WM/MR
Drackley et al. (2007) block 1	10	0.52	0.75	9,245	1,332 ^b 2,93	0.410	MR
Drackley et al. (2007) block 2	14	0.56	0.71	8,796	342 752	0.360	MR
Raeth-Knight et al. (2009)	26	0.56	0.79	12,962	718° 1,58	0.540	MR
Terré et al. (2009)	30	0.80	0.90	9,888	624 ^c 1,373	3 0.100	MR
Morrison et al. (2009)	38	0.34	0.50	6,862	0°	0.160	MR
Moallem et al. (2010)	23	0.73	0.80	9,150	732ª 1,61	0 0.074	WM/MR
Davis-Rincker et al. (2011)	40	0.44	0.64	9,7785	416 ^c 916	0.200	MR
Soberon et al. (2012)	400	0.32	0.70	10,605	552 ^a 1,21	4 0.450	MR

Milk and Future Production

- For every 0.25 lb increase in ADG in the first 8 weeks of life
 milk production increases by ~600 lb in 1st lactation¹⁰
- Minimum goal is to at least double body weight by 8 weeks of age (ADG ~1.6 lbs/day)
- Better goal is ADG of 1.7-1.8 lbs/day
- Ad libitum milk feeding will be 2.0-2.2 lbs/day

Soberon F, Van Amburgh ME. Lactation Biology Symposium: The effect of nutrient intake from milk or milk replacer of preweaned dairy calves on lactation milk yield as adults: a meta-analysis of current data. *J Anim Sci.* 2013;91:706-712.

Feeding – Best Practices

- 1) Consider feeding colostrum and/or transition milk for the first few days if possible
- 2) Good quality milk replacer (minimum 24% protein)
- 3) Invest in a computerized milk mixing system with good weigh cells (weigh powder) and temp monitoring
- 4) Increase milk feeding early (6 liters by 5-7 days of age) not "after" they are done with scours
- 5) Have access to good quality, hot water
- 6) Consistency is critical (meal, TS, feeding times)

Feeding – Best Practices

- 7) Use a Brix refractometer to measure consistency
- 8) Limit the number of cooks in the kitchen
- 9) Proper step-down (2 periods lasting at least 5 days each)
- 10) Weight calves at weaning you need to monitor ADGs in order to evaluate the milk feeding program
- 11) Implement good washing of feeding equipment with regular sanitation audits
- 12) Use chlorine dioxide



Weighing Calves

- Weighing individual calves at birth at weaning is really the only way to evaluate the nutrition program
- Don't have to weigh every calf but at least do it regularly
- Trailer (group) weights really don't offer much information



Calf Wellness Goals

	Great	Good	Problem
Mortality	<3%	<5%	>6%
Number of calves with disease	<10%	<25%	>25%
Brix reading (colostrum)	>25	22-24%	<22%
Colostrum culture	<50,000 CFU/mL	50-100K CFU/mL	>100,000 CFU/mL
Average daily gain (lbs)	>1.75 lbs/day	1.5-1.75 lbs/day	<1.4 lbs/day

Post-Weaning Nutrition

- Need to continue positive plane of energy balance after weaning
- Goal is to calve heifers at 85% of mature body weight
- Smaller heifers won't be as productive
- Study shows beneficial effects of calving heifers at an appropriate body weight lasts multiple lactations (Overton, ADSA, 2023)

THE CANADIAN VETERINARY JOURNAL	LA REVUE VÉTÉRINAIRE CANADIENNE		
Volume 21	September-septembre 1980	No. 9	
The Prevention and Control of Epic Undifferentiated Diarrhea of Beef C	disponibles mais, comme c'est le cas avec la plupart des produits biolo- giques, on ne peut pas déterminer leur impact avant de les avoir utilisés		
O.M. RADOSTITS AND S.D.	ACRES*	durant plusieurs années. On ne doit cependant considérer ces vaccins que comme un des movens de contrôle	

- •Stress defined as reaction by which an animal responds to natural and environmental conditions
- •Recognized stress as one of the key factors responsible for disease in beef calves
- "Because many different conditions can cause stress and because stress is difficult to measure, it has not been possible to identify all of the factors which contribute to the problem"

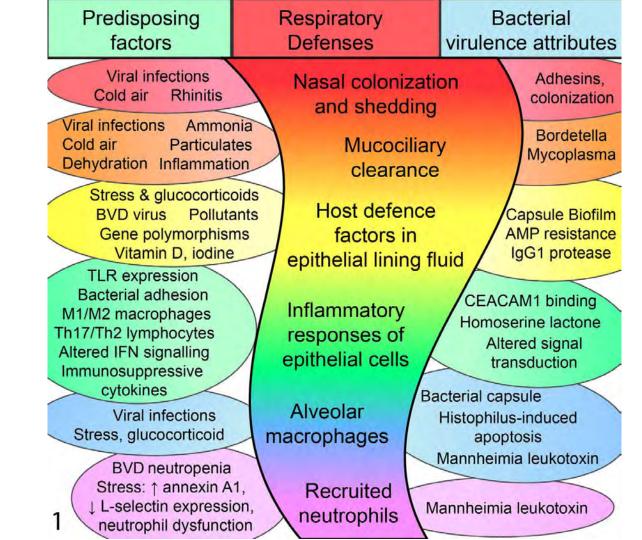
Causes of Stress

- 1) Nutrition
- 2) Weather
- 3) Overcrowding
- 4) Weaning
- 5) Transportation
- 6) Poor ventilation
- 7) Movement (social stress)
- 8) Castration/dehorning (pain)
- 9) Disease



Stress and Pneumonia

Jeff Caswell Vet Pathol 2014;51:393-409



Conventional (CONV)



J Dairy Sci 2019;102:4506-4521

Housing

Moderate (MOD)





Arrival cortisol measurement in veal calves and its association with body weight, protein fractions, animal health and performance



Christien Masmeijer^{a, b, *}, Piet Deprez^a, Katharina van Leenen^a, Lieze De Cremer^a, Eric Cox^c, Bert Devriendt^c, Bart Pardon^a

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- •Male Holstein calves (2-4 weeks of age) across multiple growing cycles were transported (variable distances) to a veal grower
- •Calves were bled on arrival for [cortisol] and [TP]
- •Calves were ultrasounded frequently for lung lesions and clinical signs/ADG were calculated

Results

- •Cortisol concentrations varied widely upon arrival (from 50 to 317 ng/mL)
- •Arrival cortisol, body weight and IgG concentrations were not significantly associated with each other
- For every 10 ng/mL ↑ in cortisol, the odds for lung consolidation at the 2nd US increased significantly

Prev Vet Med 2021;187:105521

Results

- •The presence and severity of lung consolidation with strongly correlated with ADG
- •Interestingly 2 clusters of calves were found in the data:
- A low risk cluster with below average cortisol values, above average body weight, no FPIT and minimal acute phase response during transport
- 2) A high risk cluster with above average cortisol, below average body weight and FPIT

Conclusion

- •Stress is bad there are some things we can do to help minimize the effect
 - Focus on colostrum management
 - Aggressive nutrition program
- •However stress responses seem widely variable within a population of calves
- •We can't always avoid stress but we can somewhat control "how much" stress occurs at a time

Strategies to Prevent Post-Weaning Pneumonia

- 1) Aggressive nutrition (with proper step-down)
- 2) Keeps calves in pens/groups for a period after weaning
- 3) Limit transportation around times of other stress?
- 4) Plan vaccinations before period of stress
- 5) Have a plan to manage heat/cold stress in calves
- 6) Limit group sizes pre and post-weaning
- 7) Maximize ventilation
- 8) Consider genomic testing to improve genetic resistance

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Coccidiosis

- •A common cause of diarrhea in juvenile calves (2-6 months of age)
- •In calves caused by *Eimeria zurneii* and *Eimeria bovis*
- •Eggs are ingested from the environment they first undergo reproduction in the small intestine producing inflammation
- •Then oocysts multiply in the large intestine producing severe damage to the cecum and colon

Bovine (E. bovis) Coccidiosis Life Cycle

1 oocyst = 23,000,000+ yet only 50,000 needed to cause disease!

Clinical Coccidiosis







Coccidiosis – Clinical Signs

Subclinical Infection

- •Often no clinical symptoms seen
- •However calves have decreased weight gain and feed efficiency
- Genetic potential will not be realized
 Coccidiosis will also suppress the immune system and make calves more susceptible to respiratory disease



Immune System Effects

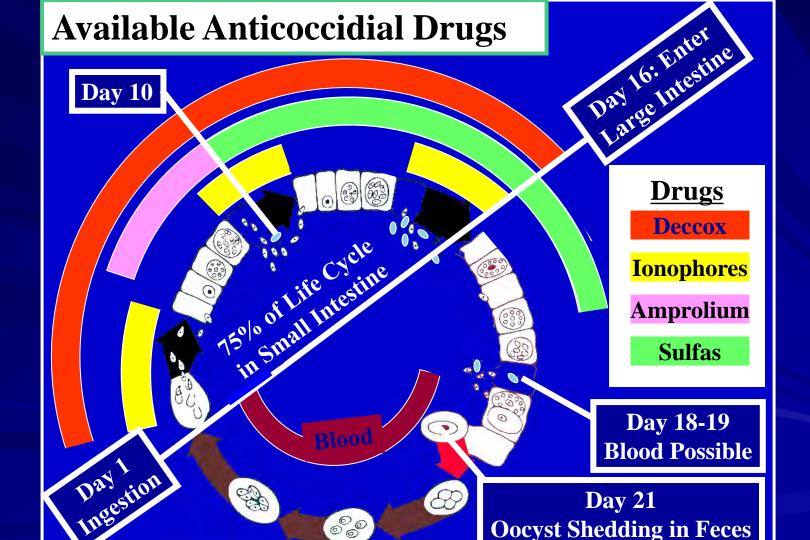


Any

System

Can

Be Over loaded Developing a Proactive Strategy to Minimize the Impact of Coccidiosis



Summary

Coccidiosis

- •A very costly disease, that is commonly overlooked
- If you wait until you see bloody stools...you are already behind!!!
- •We must create a proactive plan
- •This likely starts with feeding an anti-coccidial from day 1 of life

•Preventing cocci has advantages relative to: –Feed Intake, efficiency and BRD



Things to Think About

- 1) Am I keeping records on disease, treatments and death loss in my calves
- 2) Do I ever check total protein values in calves?
- 3) What are my birth to weaning ADGs?
- 4) Do I know what weight my heifers are calving in at?
- 5) Are there enough heifers in the pipeline to support current replacement needs?
- 6) Do I have a coccidiostat in the milk?



Conclusions

- Calves are an expense yet should be considered an investment in the farm's future
- The key is not only heifer survival but quality
- The quality of your calf crop will significantly affect how your lactating cows' milk in the future
- Prioritizing newborn and wet calf nutrition can help producers prevent disease when calves are most vulnerable

Questions?

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