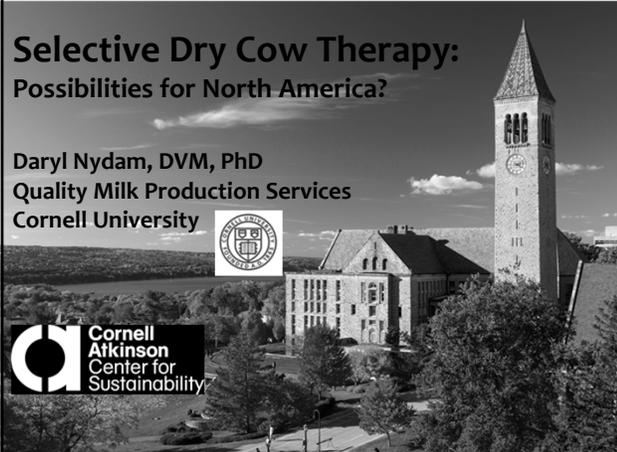


Selective Dry Cow Therapy: Possibilities for North America?

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





Though 60% of AMU in dairy is for mastitis... Shouldn't be a complicated discussion...

Product	Antibiotic	Bactericidal/Bacteriostatic	Spectrum	Dosage	Milk Withholding	Slaughter Withdrawal	Product Indications
Boehringer Ingelheim Vetmedica, Inc.							
To-MORROW [®]	Cephapirin Sodium	cidal	Broad	1 syringe repeat in 12 hours	96 hours	4 days	Treatment of mastitis in lactating cows caused by susceptible strains of <i>Streptococcus agalactiae</i> and <i>Staphylococcus aureus</i> including strains resistant to penicillin.
PolyMas [®] (R)	Metacillin Potassium	cidal	Broad	1 syringe repeat in 24 hours up to 3 days	72 hours	10 days	Treatment of acute, chronic or subclinical bovine mastitis in lactating cows caused by susceptible strains of <i>Streptococcus agalactiae</i> , <i>Streptococcus dysgalactiae</i> , <i>Staphylococcus aureus</i> and <i>Escherichia coli</i> .
Zoetis							
Prisac [®] (R)	Prilimycin Hydrochloride	static	Narrow	1 syringe repeat in 24 hours x 2 days 1 syringe repeat in 24 hours for 2 days (up to 8 days)	36 hours	9 days 21 days	Treatment of clinical and subclinical mastitis in lactating dairy cattle against <i>Staphylococcus aureus</i> and <i>Streptococcus agalactiae</i> , <i>Streptococcus dysgalactiae</i> , and <i>Streptococcus uberis</i> .
Spectramast [®] LC (R)	Ceftiofur Hydrochloride	cidal	Broad	1 syringe repeat in 24 hours x 8 days	72 hours	2 days	Treatment of clinical mastitis in lactating dairy cattle associated with coagulase-negative staphylococci, <i>Streptococcus dysgalactiae</i> , and <i>Escherichia coli</i> .
Merck							
Amoxi-Mast [®] (R)	Amoxicillin	cidal	Broad	1 syringe repeat in 12 hours for three treatments	60 hours	12 days	Treatment of subclinical mastitis in lactating cows due to <i>Streptococcus agalactiae</i> and penicillin-sensitive <i>Staphylococcus aureus</i> .
Duriclov [®] (R)	Sodium Cloxacillin	cidal	Narrow	1 syringe repeat in 12 hours for three treatments	48 hours	10 days	Treatment of bovine mastitis in lactating cows due to <i>Streptococcus agalactiae</i> and methicillin-producing <i>Staphylococcus aureus</i> .

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

Product	Antibiotic	Bactericidal/Bacteriostatic	Spectrum	Dosage	After Minimum Dry Period	Dry Period	Slaughter Withdrawal	Product Indications
Boehringer Ingelheim Vetmedica, Inc.								
To-MORROW [®]	Cephapirin Benzathine	cidal	Broad	1 syringe per quarter at dry off	72 hours	30 days	42 days	Treatment of mastitis in dry cows, when caused by <i>Streptococcus agalactiae</i> and <i>Staphylococcus aureus</i> , including penicillin-resistant strains.
Dry-Clox [®] (R)	Cloxacillin Benzathine	cidal	Narrow	1 syringe per quarter at dry off	0	30 days	30 days	Treatment of mastitis in dry cows when caused by <i>Streptococcus agalactiae</i> and <i>Staphylococcus aureus</i> including penicillin-resistant strains.
Zoetis								
Albady Plus [®]	Penicillin G, Procaine and Neostibocin Sodium	cidal	Broad	1 syringe per quarter at dry off	72 hours	30 days	30 days	Treatment of subclinical mastitis in dry cows caused by susceptible strains of <i>Staphylococcus aureus</i> and <i>Streptococcus agalactiae</i> .
Spectramast [®] DC (R)	Ceftiofur Hydrochloride	cidal	Broad	1 syringe per quarter at dry off	0	30 days	16 days	Treatment of subclinical mastitis in dairy cattle at the time of dry off associated with <i>Staphylococcus aureus</i> , <i>Streptococcus agalactiae</i> and <i>Streptococcus uberis</i> .
Merck								
Obenam [®] -DC (R)	Benzathine Cloxacillin	cidal	Narrow	1 syringe per quarter at dry off	0	28 days	28 days	Treatment and prophylaxis of mastitis in dry cows due to <i>Staphylococcus aureus</i> and <i>Streptococcus agalactiae</i> .
WG Critical Care								
Quatermaster [®] (R)	Penicillin-Dihydrostreptomycin	cidal	Broad	1 syringe per quarter at dry off	96 hours	42 days	60 days	Reduce the frequency of existing infection and to prevent new infections with <i>Staphylococcus aureus</i> in dry cows.

Quality Milk Production Services

Shouldn't be a complicated pharmacologic discussion...

Non-inferiority studies

- No meaningful differences in health and production outcomes:
 - Quartermaster v. Spectramast DC v. Tomorrow

Arruda, A.G., S. Godden, P. Rapnicki, P. Gordon, L. Timms, S.S. Aly, T.W. Lahnbauer, 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. Gordon, L. Timms, S.S. Aly, T.W. Lahnbauer, 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, Rojans 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

1960s “Blanket DCT”

**Treat all 4 quarters
of all cows**

**Treat & Control
Mastitis**

Quality Milk
Production Services

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

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					
Small (30–99)		Medium (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. error
81.9	(4.5)	82.6	(4.6)	96.4	(1.6)	94.3	(2.7)	91.9	(1.8)	93.0	(1.6)

13

aDCT Around the World

Spain = ~100% cows

Canada = ~85% cows

Brazil = ~20%

Netherlands = No preventive use in animal husbandry allowed (2012)

Denmark = very few herds (PCR approach) with prediction of only problem herds using it in 15 years

NMC proceedings, 2017

BDCT was awesome when:

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

73-95% of cultures at dry off return "Negative" results (44% 1985)

The national average for bulk tank SCC in 2014 was **193,000 cells/mL** (295,000 in 1997)

11.1% of overall test days were over 400,000 cells/mL in 2016 (27.2% in 1995)

Huxley et al., 2002, Anderson et al., 2003, Pantoja et al., 2009, Rajala-Schultz et al., 2011, du Preez and Greeff 1985, USDA-NAHMS 2014, CDCR 2016

Summary: Teat sealants + DCT

Equally effective

↓ new IMI at calving & Clinical mastitis

Addition of DCT lowers SCC

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

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, HOYIMAN -- 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.

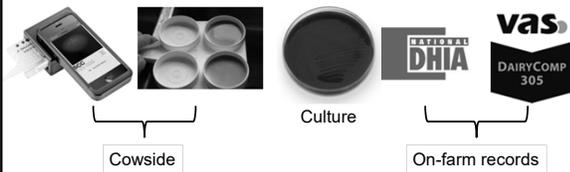
Selective Dry Cow Therapy (SDCT)

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:



How to figure out which cows to treat?

- Culture
 - Most accurate for finding bacteria
 - Can be done at cow/quarter level
 - Costs money
 - Takes extra time

- Some other cow side test

- On-farm data
 - Potentially already a sunk cost
 - SCC=Inflammation as proxy for BAD bacteria
 - Mastitis events

Cow-side Tests

- CMT
 - PPV ~30-50%; NPV ~75-80%
- Q-scout
 - PPV ~40-45%; NPV ~80-85%



J. Dairy Sci. 100:6527-6544
<https://doi.org/10.3168/jds.2017-12548>
© 2017, THE AUTHORS. Published by FAS and Elsevier Inc. on behalf of the American Dairy Science Association®.
This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/3.0/>).

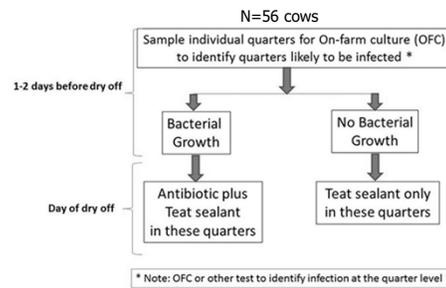
Evaluation of an automated milk leukocyte differential test and the California Mastitis Test for detecting intramammary infection in early- and late-lactation quarters and cows

S. M. Godden,¹ E. Royster,² J. Timmerman,³ P. Rapnicki,⁴ and H. Green¹
¹Department of Veterinary Population Medicine, University of Minnesota, St. Paul 55108
²Elanco Animal Health, Greenfield, IN 48140

=Treating wrong cows; not treating cows?
=Identifying at risk cows?

Pilot study: Impact of using a culture-guided selective dry cow therapy program targeting quarter-level treatment on udder health and antibiotic use

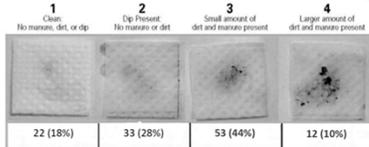
K. Patel¹, MVS; S. M. Godden¹, DVM, DVMSc; E. E. Royster², DVM, MS; J. A. Timmerman³, BS; B. A. Crooker⁴, MS, PhD; N. McDonald¹, BS
¹Department of Veterinary Population Medicine, University of Minnesota, Saint Paul, MN 55108
²Department of Animal Science, University of Minnesota, Saint Paul, MN 55108
³Herd Management Application Specialist, Boumatic, Madison, WI 53716
Corresponding author: Kruthikaben Patel; patel310@umn.edu



* Note: OFC or other test to identify infection at the quarter level

A good herd, but not the best...

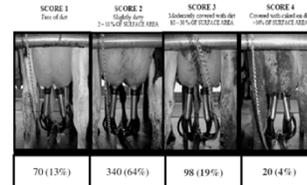
Teat Cleanliness Scorecard



- **54% of the teat ends that we scored were too dirty.** 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.
- **I would recommend that you start scoring teat end cleanliness by milker on a regular basis and include a refresher on this topic in your next milker training session.**

A good herd, but not the best...

Udder Hygiene



- 22% of the cows that we scored were in category 3 or 4.
- There is still some evidence of manure splash on lower legs and occasionally on the udders but overall there does not look to be a major problem with udder hygiene.

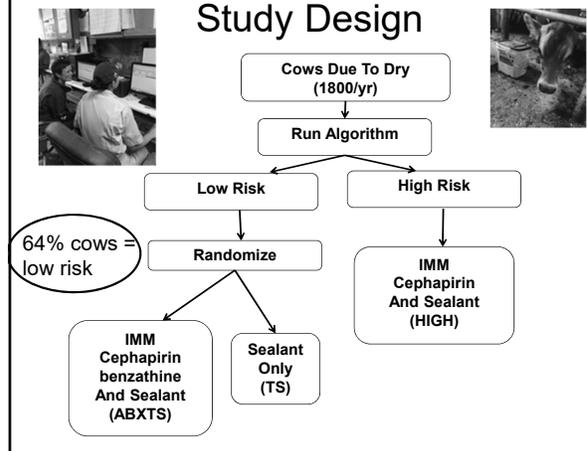
Computer Algorithm

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



41

Study Design



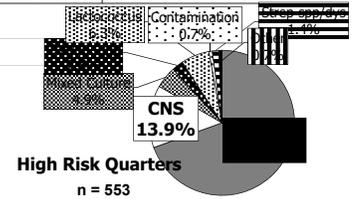
There were similar numbers of cows and quarters in each treatment group

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



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

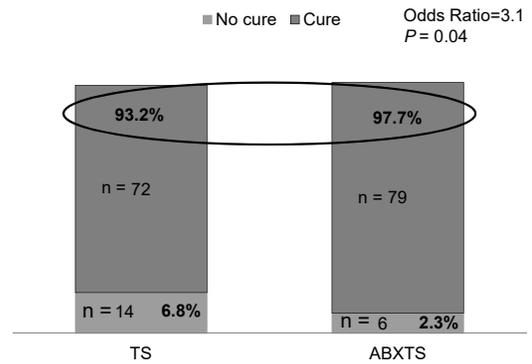
	Treatment Group				P-value
	Teat Sealant (n=1204)		Antibiotics & Teat Sealant (n=1183)		
	n	%	n	%	
Negative	1086	90.2	1064	90.0	0.84
Coagulase negative <i>Staphylococcus</i> spp.	59	4.9	78	6.6	0.08
Mixed Growth	22	1.8	20	1.7	0.88
<i>Corynebacterium</i> spp.	24	2.0	12	1.0	0.06
<i>Lactococcus</i> spp.	5	0.4	4	0.3	>99.99
<i>Streptococcus</i> 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



Results



There is a greater risk of cure for the antimicrobial treated quarters



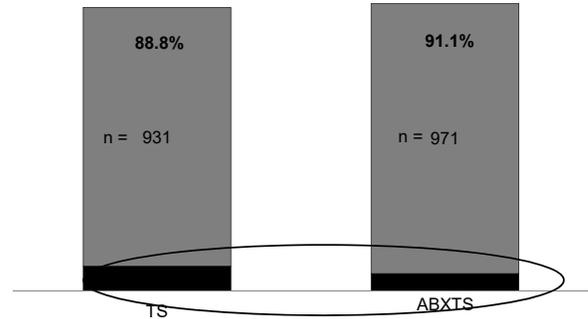
95% of non-cured quarters were characterized by the minor pathogens CNS

Non-cures: Fresh Culture	Treatment		Total
	TS	ABXTS	
No Growth	0	0	0
<i>Staph spp</i>	13	6	19
<i>Strep dysgalactiae</i>	1	0	1
<i>Strep uberis</i>	0	0	0
<i>Enterococcus</i>	0	0	0
<i>Lactococcus</i>	0	0	0

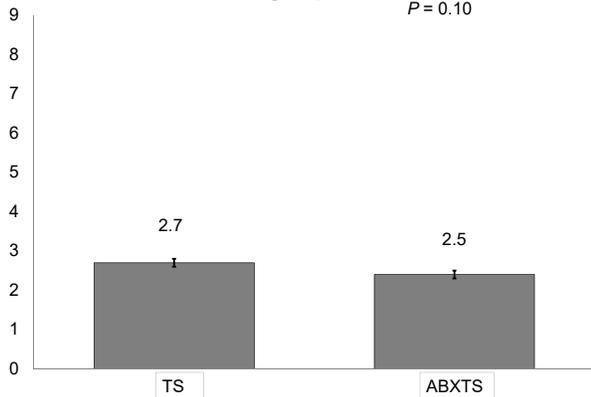


Infection risks were similar between groups

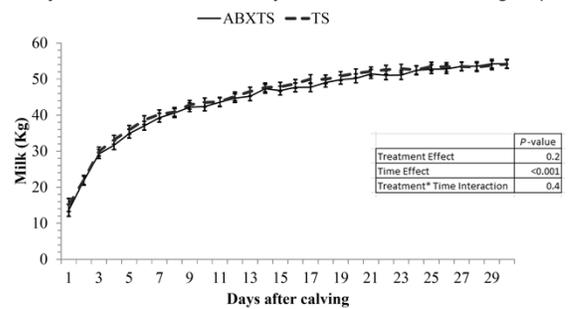
■ New Infection ■ No New Infection OR=1.3
P= 0.17



Linear Scores were similar between treatment groups P = 0.10



Milk yield over the first 30 days was similar between groups



No significant differences were found between treatment groups for culling or mastitis

	ABXTS	TS	Logistic regression P-value
Died/culled <30 DIM	18	15	0.6
Mastitis <30 DIM	9	5	0.33
Total Cows with data	304	307	

No growth x 4
Pasteurella
E. coli
T. Pyogenes x 2
Strep uberis

T. pyogenes
Klebsiella
Enterococcus
No growth
CNS

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

68

Selective Dry Cow Therapy on US Dairy Farms: Impact on Udder Health and Antimicrobial Use

Sandra Godden¹, Erin Royster¹, Jennifer Timmerman¹, Daryl Nydam², Amy Vasquez², Patrick Gorden³, Alfonso Lago⁴, Mark Thomas⁵

¹University of Minnesota, ²Cornell University, ³Iowa State University, ⁴DairyExperts, Tulare, CA ⁵Dairy Health & Management Services



Sam Rowe BVSc MVM DABVP MANZCVS
College of Veterinary Medicine
University of Minnesota



Acknowledgements

Funding

USDA-NIFA Grant: 2018-67015-28298



In-kind support



Fieldwork teams



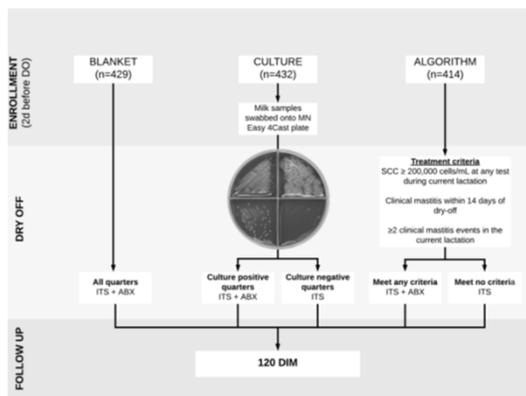
Study type

- 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)

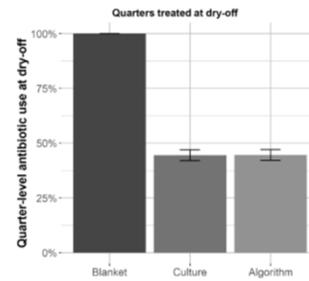


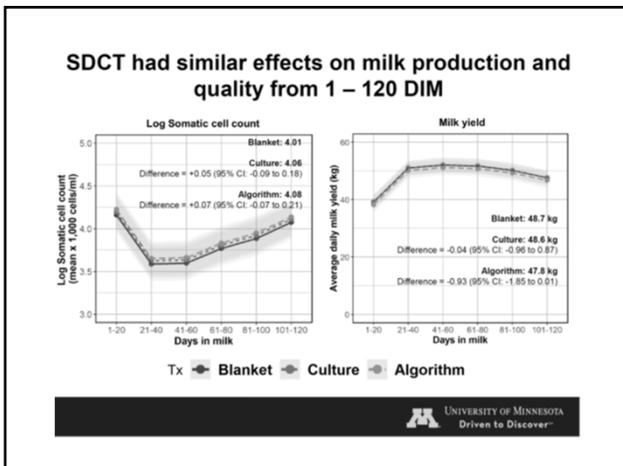
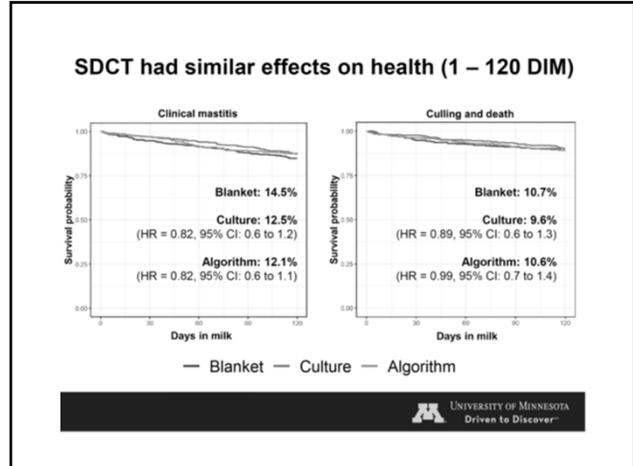
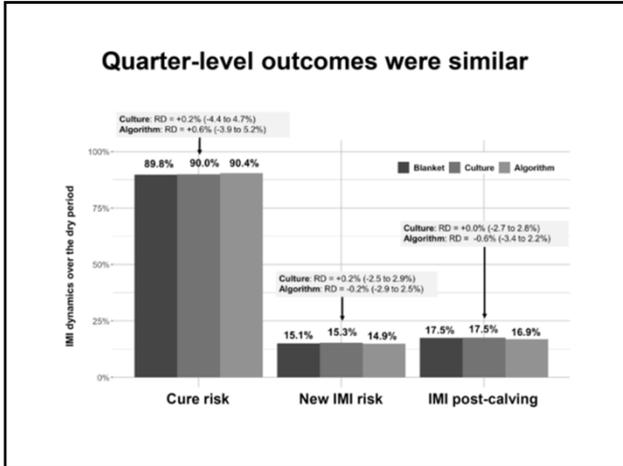
Herds

Herd	Milking herd	BTSCC	Dry cow bedding	Lactating cow bedding	Vax
A	850	200	Sand	Sand	J-vac
B	1150	100	Sand	Sand	J-vac
C	1500	150	Sand	Sand / Compost pack	Envirocore
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)	Envirocore
G	1750	90	Sand	Sand	Endovac bovi



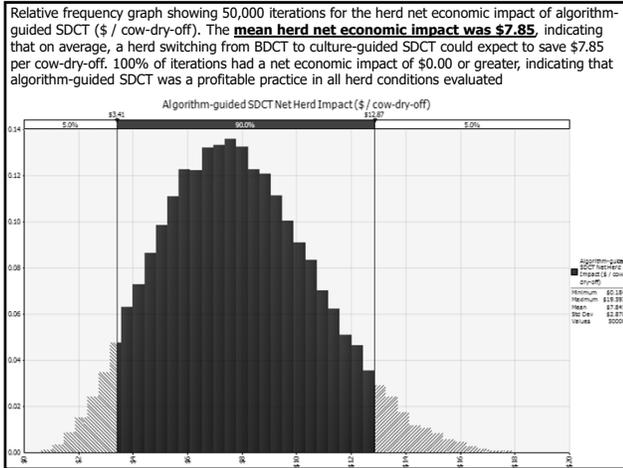
Antibiotic use was reduced by 55%





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



Mean net economic impact at the herd level (SUSD/cow-dry-off, 5th and 95th percentiles) for culture- and algorithm-guided SDCT at different levels of antibiotic use at dry-off (% of quarters treated) and increases in clinical and subclinical mastitis at 1-30 DIM due to SDCT

	Antibiotic use			
	20%	40%	60%	80%
Algorithm-guided SDCT				
No increase	11.76 (8.62, 15.25)	8.81 (6.46, 11.42)	5.86 (4.29, 7.60)	2.90 (2.12, 3.78)
+ 1 %	8.79 (5.54, 12.34)	5.84 (3.31, 8.59)	2.90 (0.99, 4.91)	-0.05 (-1.42, 1.36)
+ 2 %	5.85 (1.96, 9.87)	2.91 (-0.39, 6.25)	-0.04 (-2.80, 2.76)	-2.99 (-5.34, -0.57)
+ 5 %	-3.00 (-9.55, 3.74)	-5.94 (-12.18, 0.35)	-8.87 (-14.84, -2.91)	-11.81 (-17.60, -6.02)

- ### SDCT: What herds?
- Veterinarian of record involvement
 - Constitutes proscribing
 - Bulk tank SCC <250,000
 - Limited "contagious pathogens"
 - No Strep ag, little Staph aureus
 - Good herd records
 - Ability to implement new management
 - Mastitis pathogen surveillance
-

ECON\SDCT

Selective Dry Cow Therapy

Constraints for this lactation to mark cows that are at high risk of infection.

- 1 150 DCC > X (Default 150)
- 2 200 SCC Cutoff >= (Default 200)
- 3 99 # of Previous Test Days to check for SCC cutoff (Default 99 for all)
- 4 2 >= Times Mastitis this lactation (Default 2)
- 5 30 If only 1 Mastitis Event, treat if it occurred in the last () days (Default 30)

OK Cancel

ALTER3: Command Abbreviations

Abbreviation: COW2DRY

Content: SHOW ID PEN DIM DCC MLK SDCTC DUDRY FOR LACT>0 DRCON\I

Title (Optional): Cows to Dry Off

Buttons: OK, Test, Cancel



Acknowledgments



95