

Pathogen Based Treatment Decisions for Clinical Mastitis

Why do this?

Make More Money while not compromising animal health

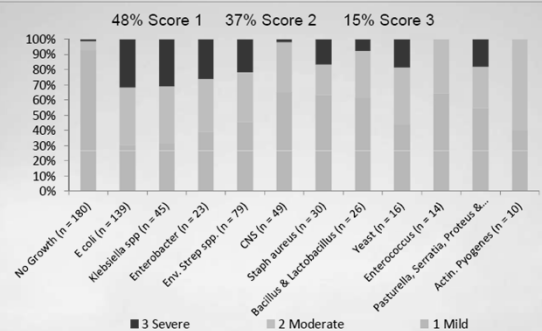
- Save money on tubes and labor
- Hospital pen density
- Decrease risk of residues in the tank
- Bogey man
 - Someone tells you that you have to
 - Mitigate risk of antimicrobial resistance
- Sell more milk

Why this might work?



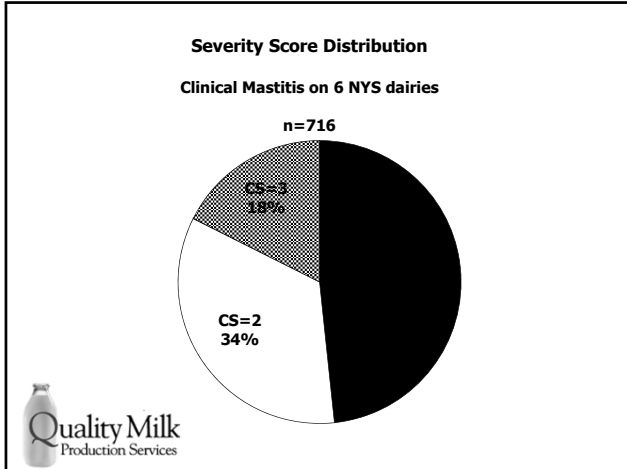
- Not all cases should/need to be treated
- ~85% of cases are mild or moderate
 - Delaying treatment ~ 24 hours doesn't change outcome
 - Don't need systemic treatment
- ~15% of cases should be treated immediately and systemically

Almost All the Cases Are Mild

(622 cases from 52 farms)



Ruegg et al.




Incidence Risk Of Clinical Mastitis In Eight Commercial Dairy Herds In Central New York

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Materials and methods

Study population

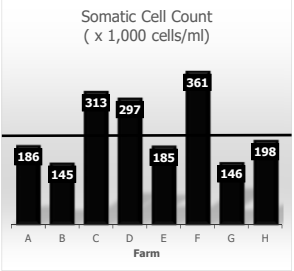


- 8 commercial dairy farms
- 1,100 and 2,000 cows
- SCC 234,000 cells/ml
- Milk production 90 lbs
- Daily milk sample pick-up and 24 hour result program of Quality Milk Production Services
- May 2016 to May 2017

Quality Milk Production Services

Materials and methods

Study population

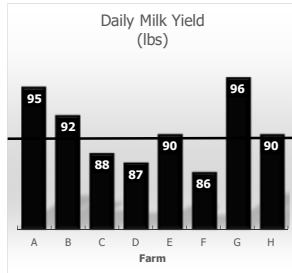


Farm	Somatic Cell Count (x 1,000 cells/ml)
A	186
B	145
C	313
D	297
E	185
F	361
G	146
H	198

- 8 commercial dairy farms
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Materials and methods

Study population

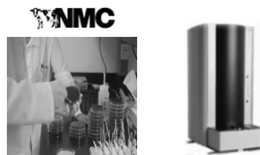


- 8 commercial dairy farms
- 1,100 and 2,000 cows
- SCC 234,000 cells/ml
- Milk production 90 lbs
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- May 2016 to May 2017

Materials and methods

Milk analysis

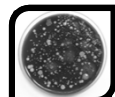
- Aerobic culture + MALDI-TOF MS



Monoculture



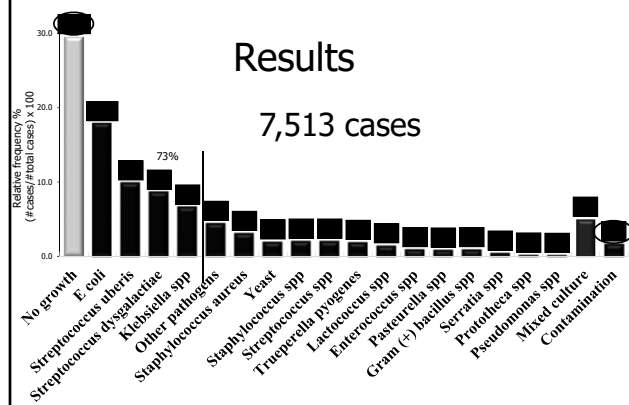
2 pathogens = Mixed culture



3 or more = Contamination

Results

7,513 cases



Why no bugs?

- Mastitis detection based on results of immune response, not the act of infection
- Clinical signs are inflammation, **not** infection
- At least 20% of milk samples will be culture negative if they are properly collected
 - If something grows from all of them...Sampling was not correct

How to figure out which cows to treat?

1. Guess – no culture
2. You do it yourself – on-farm culture
3. Someone does it for you – reference lab



Guess

- Most commonly used method on dairy farms
 - Treat them all
 - Over treating
 - Treat none
 - Under treating
 - Treat some based on subjective criteria
 - Over treating and under treating
- However, no “cost” and no delay



On-Farm Culturing

- Timely decision-making for treatment or not
- 24 hour results
 - No growth/growth
 - Gram +/-
 - ~90% PPV, ~60 %NPV/~80PPV, ~90 NPV
 - Royster et al
 - ~78% PPV, ~96% NPV
 - McCarron et al
 - Strep spp, CNS, Staph aureus +/-
 - <~60%PPV/~80%NPV

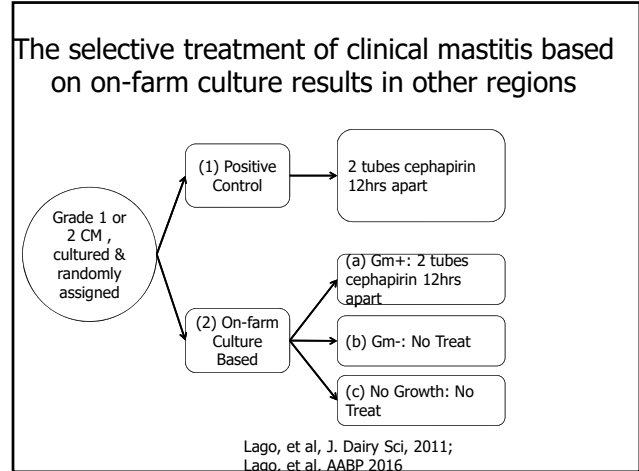


On Farm Culturing

- Supplies and training for on-farm milk cultures

Tri-Plate

\$3.00 + labor + supplies + equipment + training



- Selective treatment of clinical mastitis based on on-farm culture resulted in no differences in bio-economic outcomes

Recurrence of CM in the same quarter	SCC
Milk Production	Cow survival for the rest of the lactation after CM

Lago, et al, J. Dairy Sci, 2011
Lago et al, AABP 2016

On-farm culturing

- Upsides
 - Reference lab too far away
- Downsides
 - Can't detect *Mycoplasma* easily
 - Prototheca* difficult
 - Staph aureus* false positive risk
 - Protocol drift
 - Equipment maintenance and inventory
 - Opportunity cost of valuable people's time
 - 1000 cow dairy ~ 3 people who are good at it

Lab Proficiency Support



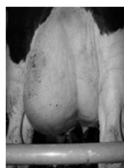
- External Quality Assurance for farms and vet practices doing in-house cultures
- Quarterly unknowns sent to enrolled farms & practices for ID
- QMPS reviews the results
- Evaluation and additional training, if needed

Reference lab diagnosis

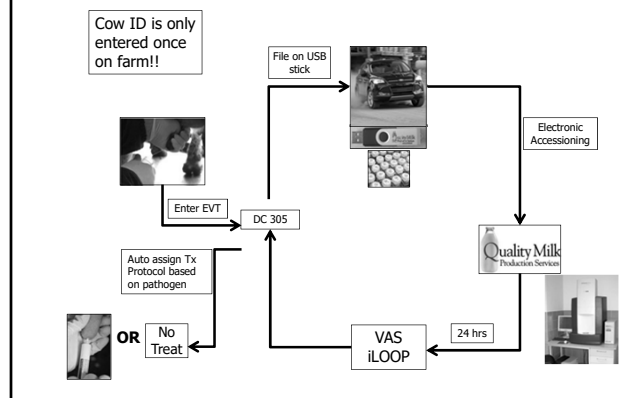
- Upsides
 - Experts doing the work (e.g. AAVLD cert)
 - All pathogens (e.g. Myco, Prototheca, Listeria)
 - Quality control is daily
 - No maintenance or inventory
 - “Only” training to take milk samples
 - \$5.50 in NYS
- Downsides
 - Too far away to get samples to lab
 - Rely on someone else to do your work

QMPS 24 hr - 7d/wk service

- Cows gets mastitis
- Milk samples taken
- Events entered into computer
- Courier picks up samples
- Accessioned at lab
- Pathogen results reported 24 hours after pick-up
- Protocol driven treatment/automated treatment assignment in DC305



Data and Sample Flow



Events	Breeds	Items2	TestDays	PreLacts	Lactation	ID 6893	
ID	6893	CWVAL	0	CSEX	MSA	RFRO	OK/OPEN
PEN	1	PDVAL	0	305ME	28440	DSLM	0
LACT	3	PSCC	0	PMLK	0	DCC	0
DM	31	SCC	174	MLX	122	DSI	-
01/18/15	FRESH	Bull Live	01/23/15	MAST	NOTRFP.1		
01/20/15	MOVE	F00T010	01/23/15	MOVE	F00T001		
01/21/15	MAST	SLC4RF	01/28/15	VACC	ZDVAC		
01/28/15	MOVE	F00T008	02/04/15	VACC	FRSVAC		
01/20/15	CULTURE	LABRFP					

When Cow Entered

Events	Breeds	Items2	TestDays	PreLacts	Lactation	ID 6893	
ID	6893	CWVAL	0	CSEX	MSA	RFRO	OK/OPEN
PEN	1	PDVAL	0	305ME	28440	DSLM	0
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01/20/15	CULTURE	LABRFP					

When Sample at Lab

Events	Breeds	Items2	TestDays	PreLacts	Lactation	ID 6893	
ID	6893	CWVAL	0	CSEX	MSA	RFRO	OK/OPEN
PEN	1	PDVAL	0	305ME	28440	DSLM	0
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01/28/15	MOVE	F00T008	02/04/15	VACC	FRSVAC		
01/20/15	CULTURE	LABRFP					

24 Hour Results

Quality Milk Production Services

From: Server@bas.com
To: capelnik@gmail.com
Cc: Paul Douglas Wilder, Daryl Van Nydam
Subject: Mastitis Compliance Monitor for [redacted]

- Dairy Comp 305 ----- Page 1
- Command : HERDSTAT
- EVENTS:INSH120 ID INMAST:1 SEV:3 LCCAT:6 CUIQO FOR PRTDQ=2 LMAST=TODAY RENK+*
- C:\COMFILE1.DAT ----- Valley Ag Software ----- 5/11/16

ID	IN	SEU	ICD	CT	QO	Event	DIM	Date	Remark	Protocol
38100	1	0	9/13	0	RSR	MAST	348	09/16/16	TODLIR.1	BT- Today1
38190	4	1	09/13	0	RSR	MAST	314	09/16/16	TODLIR.1	BT- Today1
39170	1	0	9/13	1	LSR	MAST	94	09/16/16	MOTDILR.1	NOTTr
41348	2	1	09/13	0	RSR	MAST	124	09/16/16	MOTDILR.1	NOTTr
41474	1	1	09/13	0	LSF	MAST	113	09/16/16	TODLIF.1	BT- Today1
41515	1	1	09/13	0	RSR	MAST	39	09/16/16	TODLIR.1	BT- Today1
41816	3	1	09/13	0	LSR	MAST	285	09/16/16	MOTDILR.1	NOTTr
41857	2	1	09/13	0	RSR	MAST	99	09/16/16	MOTDILR.1	NOTTr
42004	1	0	09/13	0	RSR	MAST	63	09/16/16	MOTDILR.2	NOTTr
44391	1	0	9/12	0	LSF	MAST	108	09/16/16	MOTDILF.1	NOTTr
45090	2	1	09/13	0	LSR	MAST	83	09/16/16	MOTDILR.1	NOTTr

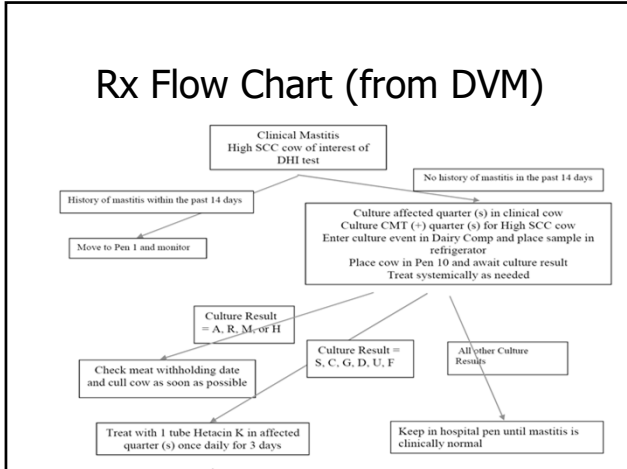
Total events listed : 11
Total cows listed : 11

Quality Milk Production Services

Increased apparent incidence when we started

Quality Milk Production Services

Roberson, Vet. Clin. North Am. 2003; Lago et al. NMC 2006



J. Dairy Sci. 100:1–12
<https://doi.org/10.3168/jds.2016-11614>
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Clinical outcome comparison of immediate blanket treatment versus a delayed pathogen-based treatment protocol for clinical mastitis in a New York dairy herd

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[‡]Valley Agricultural Software, King Ferry, NY 13081

Local Dairy Results Pathogen-based Treatment

75,000 cows supported by QMPS in NY with pathogen based treatment

Quality Milk
Production Services

The question:

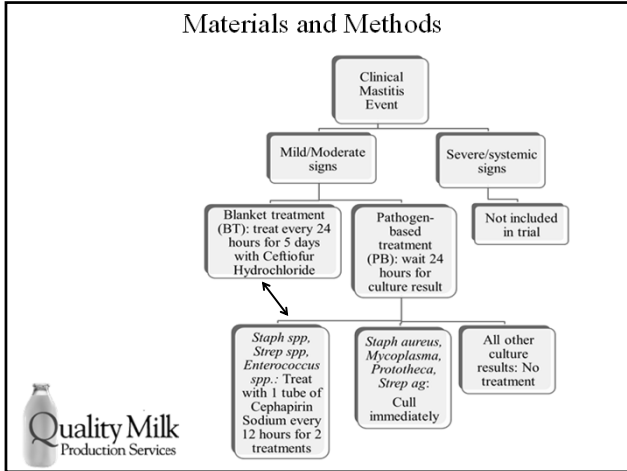
Can I selectively use a less expensive antibiotic with a short label duration of treatment instead of using a more expensive antibiotic on all CM cases for a typical duration of 5 days?

Quality Milk
Production Services

Study Herd

- 3500 commercial dairy in central NY
- 24-36 hour return of pathogen identification
- Electronic data transmission (DC305)
- Good paper and computer records
- Access to monthly component information

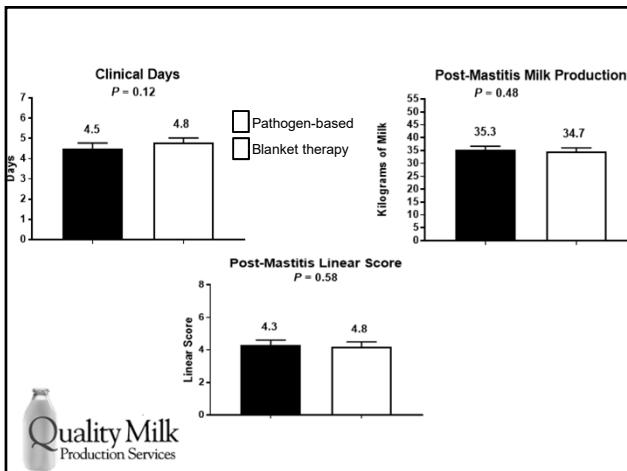
Quality Milk
Production Services



Descriptive Results

- 725 cases of clinical mastitis
 - 16% had CS=3 (n=114)
 - 37 cows culled and excluded for Staph aureus or Mycoplasma
 - 85 others excluded for other diseases, protocol errors, etc.
- 246 Pathogen Based / 243 Blanket Therapy
 - PB: 167 = no treatment; 79 Today 2x
 - BT: 243 = Spectramast 5x

Quality Milk Production Services



Survival

Odds of survival post mastitis for PB versus BT

Survived	% dead/culled	Odds ratio	95% CI
>30 days	4.7	1.57	0.66-3.74
PB	3.7		
BT	5.8		
>60 days	11	1.39	0.75-2.57
PB	9.3		
BT	11.1		

Quality Milk Production Services

Does waiting >24 hours for pathogen ID and then treating only Streps and Staphs with Today 2x v. treating with Spectrmast 5x change:

- the days the cow is out of the tank- **YES**
 - 3 more days of saleable milk in the PB group compared to BT (p<0.001)
 - 5.8 v. 8.8 d



Assumptions		Economics:					
On Farm Labor Rate/Hour	\$ 15.00						
Per Tube Cost-Spectramast	\$ 3.80						
Per Tube Cost- Today	\$ 3.10						
Milk Price/cwt	\$ 20.00						
Daily Production (lbs)- Mastitis Cow	60						
Clinical Mastitis Incidence/Month	5%						
Culture Based Therapy							
MM Treatment Rate	35%						
No IMM Treatment Rate	65%						
		Per Cow Estimates		Blanket Therapy		Culture Based Therapy	
		Materials and Labor		IMM Therapy	No Treat		
Antibiotic Cost		\$ 19.00	\$ 6.20	\$ -			
Labor Cost		\$ 7.50	\$ 3.75	\$ 1.25			
Culture Cost		\$ -	\$ 6.00	\$ 6.00			
Total		\$ 26.50	\$ 15.95	\$ 7.25			
Lost Milk Income							
Days of Nonesaleable Milk		8.8	5.8	5.8			
Total Lost Milk		528	348	348			
Lost Income		\$ 105.60	\$ 69.60	\$ 69.60			
Direct Cost per Case		\$ 132.10	\$ 85.55	\$ 76.85			
		Calculations Projected to 1000 Cows					
Clinical Cases Treated per Year		600	210	390			
Total Costs / 12 Months		\$ 79,260.00	\$ 17,965.50	\$29,971.50			
Total Cost / Treatment Strategy		\$ 79,260.00	\$ 17,965.50	\$29,971.50			
		Difference					
						\$31,323.00	



Per Cow Estimates		Blanket Therapy		Culture Based Therapy			
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		Calculations Projected to 1000 Cows					
Clinical Cases Treated per Year		240	84	156			
Total Costs / 12 Months		\$ 31,704.00	\$ 7,182.20	\$ 11,988.60			
Total Cost / Treatment Strategy		\$ 31,704.00	\$ 7,182.20	\$ 11,988.60			
		Difference					
						\$12,529.20	

Quality Milk Production Services Changing monthly incidence to 2%
Prevention is still the most important thing!

Per Cow Estimates		Blanket Therapy		Culture Based Therapy			
Materials and Labor			IMM Therapy	No Treat			
Antibiotic Cost		\$ 19.00	\$ 6.20	\$ -			
Labor Cost		\$ 7.50	\$ 3.75	\$ 1.25			
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Total		\$ 26.50	\$ 15.95	\$ 7.25			
Lost Milk Income							
Days of Nonesaleable Milk		8.8	5.8	5.8			
Total Lost Milk		528	348	348			
Lost Income		\$ 0	\$ 0	\$ 0			
Direct Cost per Case		\$ 26.50	\$ 15.95	\$ 7.25			
		Calculations Projected to 1000 Cows					
Clinical Cases Treated per Year		600	210	390			
Total Costs / 12 Months		\$ 15,900.00	\$ 3,349.50	\$ 2,827.50			
Total Cost / Treatment Strategy		\$ 15,900.00	\$ 3,349.50	\$ 2,827.50			
		Difference					
						\$9,723.00	

Quality Milk Production Services Change milk price to \$0/cwt
Even if you value discarded milk at 0 because you feed it to calves it's still profitable

Summary: PB treatment...

Decreased milk withholding time by approximately 3d

No significant differences in:

- ❖ Days to clinical cure
- ❖ Post MAST milk yield
- ❖ Post MAST LS
- ❖ Risk of cull in 1-2mo following MAST

>\$32,000 per 1000 cows

Over 65% of mild/moderate mastitis will NOT be treated with antimicrobials if this protocol is employed.



Prudent Antimicrobial Use

- Work for local veterinarians to devise and monitor appropriate protocols
 - Save money on tubes and labor
 - Decrease risk of residues in the tank
 - Mitigate risk of antimicrobial resistance
 - Legislation/rules
 - Human risk?
 - Preserve use in animals
 - Better hospital pen management
 - **Sell more milk**

