



Udder Health and Milk Quality: *from science to practice*

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From Science to Practice

- **Implementation of udder health PROFIT TEAMS**
 - Continuously incorporate the most important scientific findings in on-farm udder health programs
 - Routine monitoring & surveillance programs
 - Development of practical udder health improvement protocols



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Objectives

- Identifying the issues and understanding farm culture.
- Establishing goals and guidelines.
- Risk assessment.
- Plan Development.
- Motivating change.
- Monitoring and Surveillance



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Scientific Progress

1. Bacterial pathogens

3. Human Factors



2. Host

4. Environmental Management

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Key scientific issues:

Chronic IMI are quite prevalent and cause long term high SCC and recurrent clinical mastitis:

- We observed the occurrence of host-adapted strains across bacterial species:
 - Adopt advanced diagnostics.
 - Focus on elimination of host-adapted strains.
- Hosts are becoming more susceptible to mastitis, dry period is high risk time.
 - Develop and adopt dry cow management programs.
 - Develop breeding programs against clinical mastitis.
- Management needs to recognize that early diagnosis and intervention is important
 - Adopt aggressive treatment programs when management is appropriate.



Human Factors

- Producer motivation:
 - Premium programs
 - Economic value of programs
- Milking procedures.
- Treatment programs for both clinical and high SCC cows.

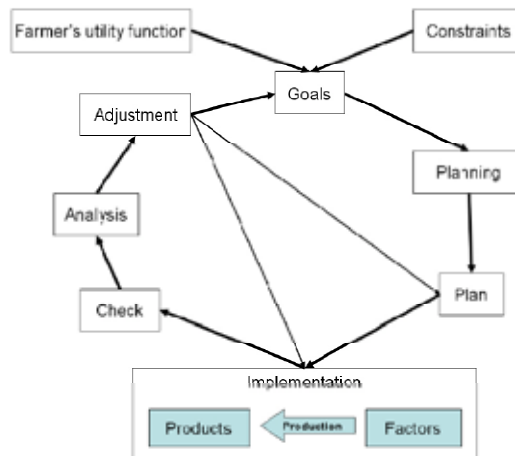


Environmental Management

- Heifer, dry cow and lactating cow hygiene.
- Milking equipment
- Nutrition: minerals/vitamins and water



Herd Health Improvement



Identify the Concern

- **High BTSCC (economics and productivity)**
 - **Decreased Milk value**
 - **Market at risk**
 - **Unappreciated consequences**
 - **Milk loss**
 - **Poor treatment results**
 - **Increased culling**



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Identify the Concern

- **High SPC/PIC**
 - **Decreased Milk value**
 - **Market at risk**
 - **Unappreciated consequences**
 - **Cow hygiene**
 - **Milking procedures**
 - **Undetected Mastitis**



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Identify the Concern

- **Clinical Mastitis**
 - **Increased culling & death**
 - **Treatment costs**
 - **Milk Lost**
 - **Poor treatment results**



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Udder health improvement protocol

1. Resolve immediate udder health and milk quality issues
2. Goal setting
3. Risk assessment and problem analysis
4. Prioritize main issues and planning
5. Execution of proposed solution
6. Evaluation and monitoring



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1. Resolve short term problems

- IDENTIFY The Chronic High SCC Cows
 - Test day Linear Score Information.
 - Contribution to the bulk tank list
 - Chronic infection List (Dairy Comp, PC Dart)
 - CMT
 - Must be done on a routine basis. (monthly?)
 - History of clinical mastitis?



Analyzing 242 cows on Test Date 8/10/09
 Without any cows removed :Bulk Tank SCC 208

ID	DIM	LACT	LS1	PLS	LS	MILK	PSCC	SCC	*Tank
855	104	5	6.2	5.0	7.9	112	400	2986	9.1
1279	2	2	8.0	0.0	8.0	69	0.0	3159	6.0
140	4	3	8.7	0.0	8.7	38	0.0	5199	5.4
135	14	3	7.7	0.0	7.7	65	0.0	2599	4.6
159	184	2	5.8	5.3	7.2	83	492	1838	4.2
969	205	4	6.8	6.3	7.9	51	985	2986	4.2
46	164	3	7.4	7.4	7.0	83	2111	1600	3.6
742	113	6	5.7	6.1	6.5	94	857	1213	3.1
926	9	5	7.2	0.0	7.2	61	0.0	1838	3.1
882	77	5	5.1	3.4	6.5	76	141	1213	2.5
928	19	5	6.1	0.0	6.1	106	0.0	857	2.5
71	126	3	1.3	4.4	6.5	69	283	1213	2.3
697	96	6	4.2	6.8	6.2	90	1393	919	2.3
1222	203	2	2.6	2.6	6.5	65	76	1213	2.2
178	317	2	2.2	5.9	6.2	65	746	919	1.6
155	347	2	2.8	2.0	5.5	83	50	606	1.4
965	13	4	5.5	0.0	5.5	83	0.0	606	1.4
27	263	3	6.9	4.4	6.2	54	264	919	1.4
47	284	3	4.7	7.3	5.5	74	1970	606	1.2
1373	40	1	3.2	3.2	5.9	60	115	746	1.2
90	493	2	1.4	3.4	5.9	58	141	746	1.2
923	3	5	5.4	0.0	5.4	72	0.0	549	1.1
1233	6	2	5.4	0.0	5.4	72	0.0	528	1.0
1368	21	1	5.7	0.0	5.7	58	0.0	650	1.0
158	267	2	1.3	5.3	5.5	56	492	606	0.9
1246	78	2	6.4	4.5	4.5	97	303	303	0.8
174	65	2	5.4	5.4	4.5	87	528	303	0.7
36	243	3	0.7	5.4	4.3	105	528	246	0.7
179	308	2	1.9	2.6	6.0	31	76	800	0.7
878	223	5	6.0	5.8	4.7	69	696	325	0.6

1. Resolve short term problems

- **Manage the high cell count milk – cow or quarter level:**
 - Use CMT
 - Quarter milkers / dry-off / cull
- **Segregate suspect animals**
 - Chronic infection group
 - High cell count group
 - Infection dynamics – reduced risk for transmission



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Quarter Milker Systems



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1. Resolve short term problems

- **Manage the high cell count milk – cow or quarter level:**
 - Use CMT
 - Quarter milkers / dry-off / cull
- **Segregate suspect animals**
 - Chronic infection group
 - High cell count group
 - Infection dynamics – reduced risk for transmission



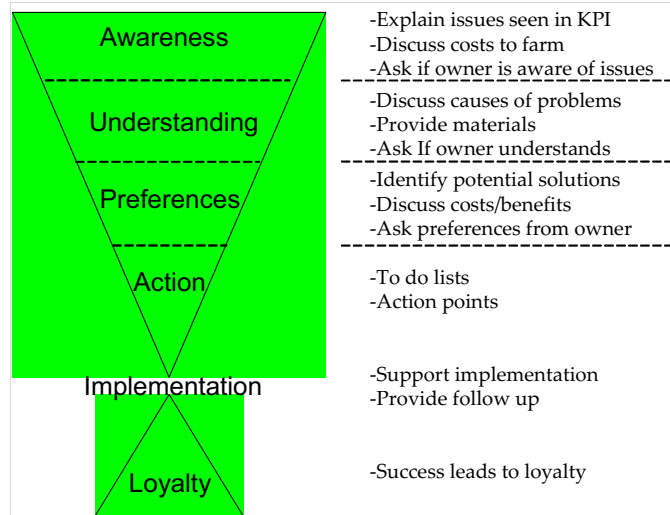
2. Goal setting

- Identify key performance indicators:

Key Performance Indicator (KPI)	Goal values			Remarks
	Top	Ok	Not Ok	
1. Incidence of clinical mastitis per month.	< 1%	<2%	> 2%	Incidence calculated as all mastitis cases per month / cows milking.
2. Bulk Milk Somatic Cell Count.	< 150	<250	>300	Average of all bulk milk SCC measurements in a given month.
3. Prevalence of culls for udder health reasons.	< 3%	<5%	>10%	Calculated as all udder health culls / average number of lactating and dry cows in the herd.



Producer motivation



Producer motivation

- \$\$, increase net income
 - Ask objectives – listen and record
 - Help increase income
 - Help reduce costs
 - Be creative to help producer increase bottom line (share ideas !)
- Make teams work on the farm
 - Teach, always
 - Motivate workers on the farm
- Help enjoy farming
 - Everyone enjoys healthy animals
 - Farmers enjoy good health data
 - Build enduring relationships with producer
 - Respect, not arrogance
 - Praise success



3. Risk assessment and problem analysis

- Four potential areas of:
 - Clinical mastitis
 - SCC
 - Culling
 - High bacteria counts (SPC, PIC)
- What are the customers concerns?
- What concerns have you identified?
 - Are there other concerns or priorities?



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Herd mastitis audit

- Analyse herd data
- Perform herd audit
 - Menu system (NYSCHAP risk assessi
 - Herd observations
- Summarize findings
 - On farm presentation
 - Written summary

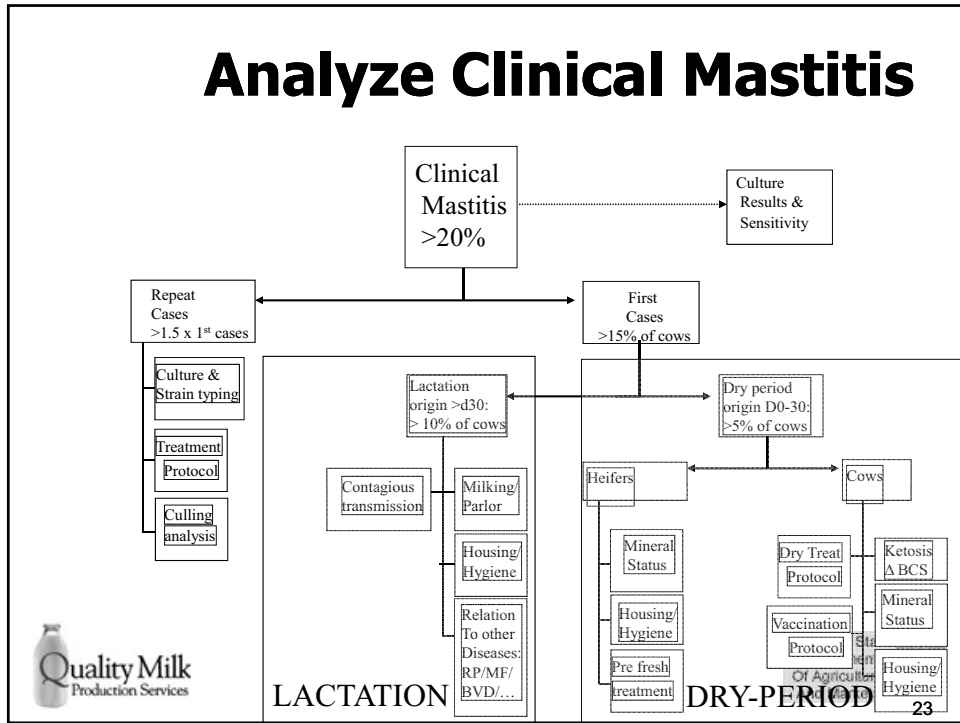


<http://nyschap.vet.cornell.edu>

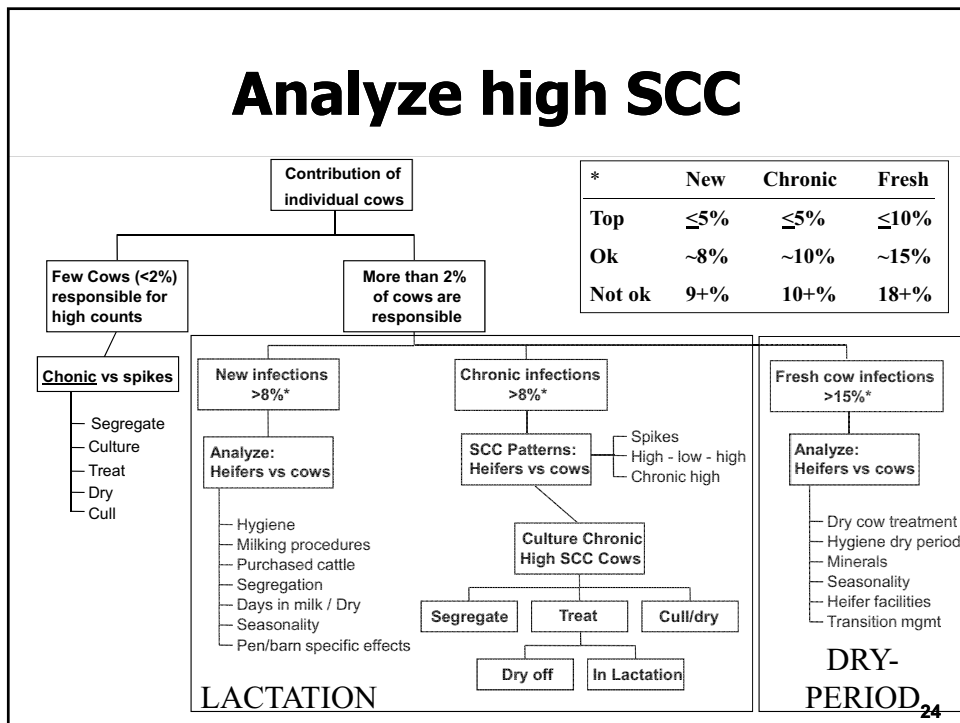


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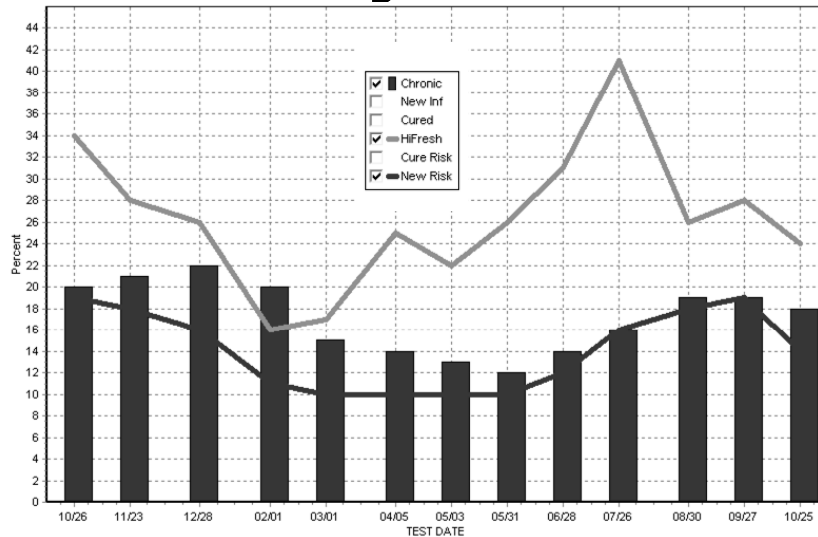
Analyze Clinical Mastitis



Analyze high SCC

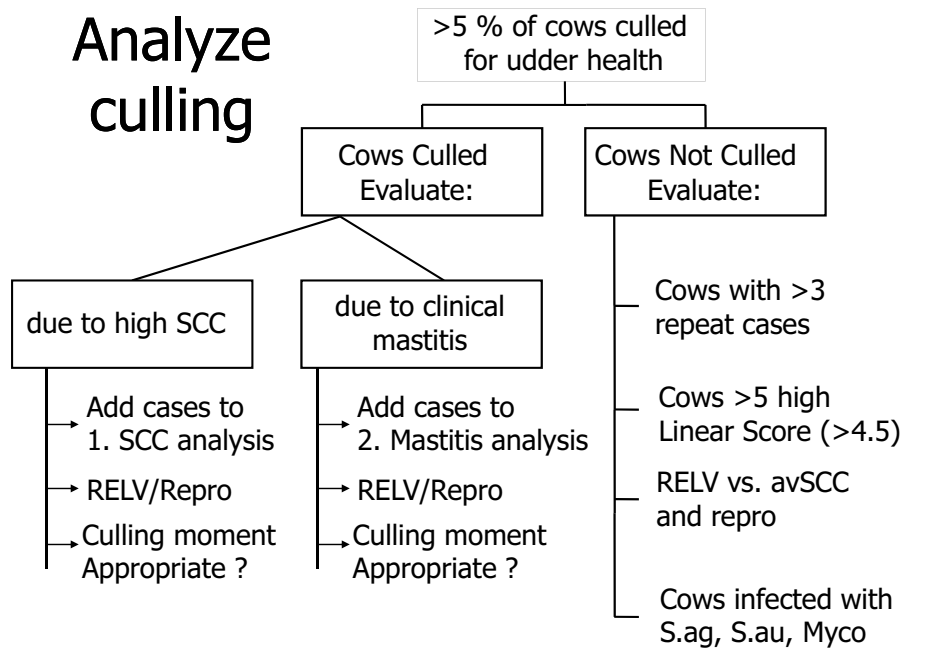


High new infection, chronics and high fresh SCC



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Analyze culling



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Herd audit - menu

	Area/Topic	Management Concern	Materials	Estimated time commitment
<input type="checkbox"/>	Milking routine evaluation	Throughput Routine compliance Efficiency Milking time Prep-lag time Habits	Forms Stopwatch	2 or more hours
<input type="checkbox"/>	LactoCorder® graphing	Routine efficacy Prep-lag time Milking process cluster removal	Forms Stopwatch LactoCorder®	1-2 or more hours
<input type="checkbox"/>	Hygiene scoring	New infections Clinical cases Bacteria counts	Forms	1 hour
<input type="checkbox"/>	Teat end scoring	New infections Clinical cases Machine function	Forms Pen light	Varies (20% of every group)
<input type="checkbox"/>	Teat end cleanliness	New infections Clinical cases Bacteria counts	Forms Gauze pads	1 hour
<input type="checkbox"/>	Body condition scoring	Transition management	Forms	1 hour
<input type="checkbox"/>	Milking equipment evaluation	New infections Clinical cases Milking process	NMCMethods (ISO 6690 Standard)	1.5 hours

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4. Prioritize main issues and 5. execution of plans

- Decision making procedures
 - Models to aid decision making
 - How well do interventions work on a farm ?

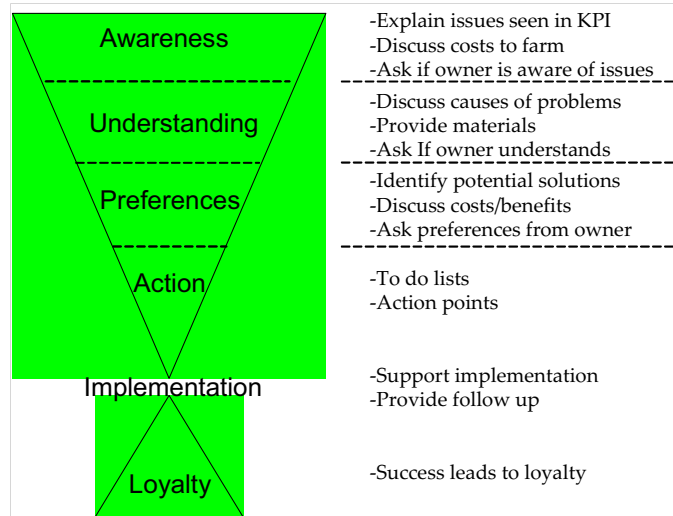
- Motivation of owner and workers
 - Communication for attitude change
 - Training methods

- Standard operating procedures
 - Written and pictorial



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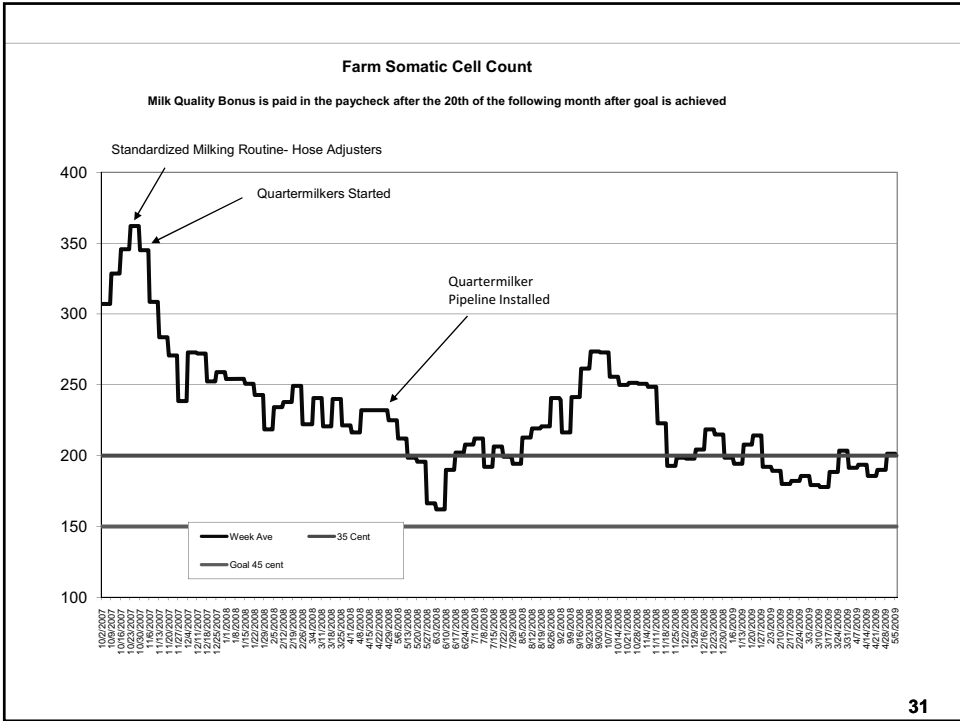
Motivation: 'marketing funnel'



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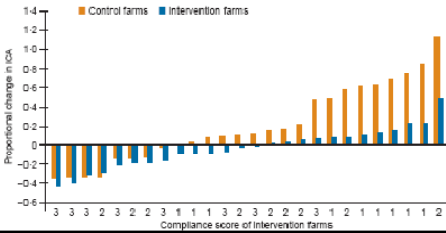
6. Evaluation and monitoring

- Bulk milk monitoring
- Clinical mastitis and culling monitoring
- Monitoring of chronic high SCC and repeated clinical cases



Success of mastitis control program

- Clinical mastitis reduction of 20% was obtained when farmer compliance with advice provided was over 67% (2/3).
- Similarly, at high compliance a decrease in new infection rate of 17% was obtained.



Green et al. 2007



Key program components

- Milking machine function
- Milking technique
 - Prep, gloves, PMTD
- Milking cow hygiene
- Dry cow and heifer hygiene
- Nutrition
 - Vitamins and minerals
 - Water
- Clinical mastitis treatment and segregation
- High SCC treatment and segregation



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Conclusions

- Milk quality and low bulk milk SCC are manageable.
- Clinical mastitis incidence is more difficult to manage but adequate control programs will lead to reduction in both first cases and repeated cases.
- Udder health consultancy according to standard procedures:
 - Goal setting
 - Risk evaluation
 - Planning
 - Execution
 - Evaluation and monitoring
- Producer motivation is key component
- Continuous incorporation of improved knowledge is valuable

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Got Questions ?



Milk Quality and Udder Health Key Performance Indicators				
Key Performance Indicator (KPI)	BEST	OK	NOT ACCEPTABLE	Remarks
Bulk Milk Somatic Cell Count.	<150	<250	>350	Average of all bulk milk SCC measurements in a given month.
Standard Plate Count (SPC or PLC)	<5,000 cfu	<10,000 cfu	>10,000 cfu	Average of all bulk milk SPC measurements in a given month.
NEW Infection Rate	<5%	≈6%	>10%	% LS>4.5 PLS<4.5 for lactating animals per test period
CHRONIC Infection Rate	<5%	≈10%	>10%	% LS>4.5 PLS>4.5 for lactating animals per test period
HiFresh cow Infection Rate	<10%	≈15%	>15%	% LS1>4.5 for calving animals per test period
% of lactating herd <4.5 Linear score	>90%	80%-90%	<80%	% LS>4.5 / all lactating animals per test period
Incidence of clinical mastitis per month.	<1%	<2%	>2%	Incidence calculated as all mastitis cases / cows milking/ month.
Prevalence of culls for udder health reasons.	<3%	<5%	>10%	Calculated as all mastitis culls / all culls in a given 12 month period.

DATE: _____
 FARM: _____
 GROUP: _____

UDDER HYGIENE SCORING CHART

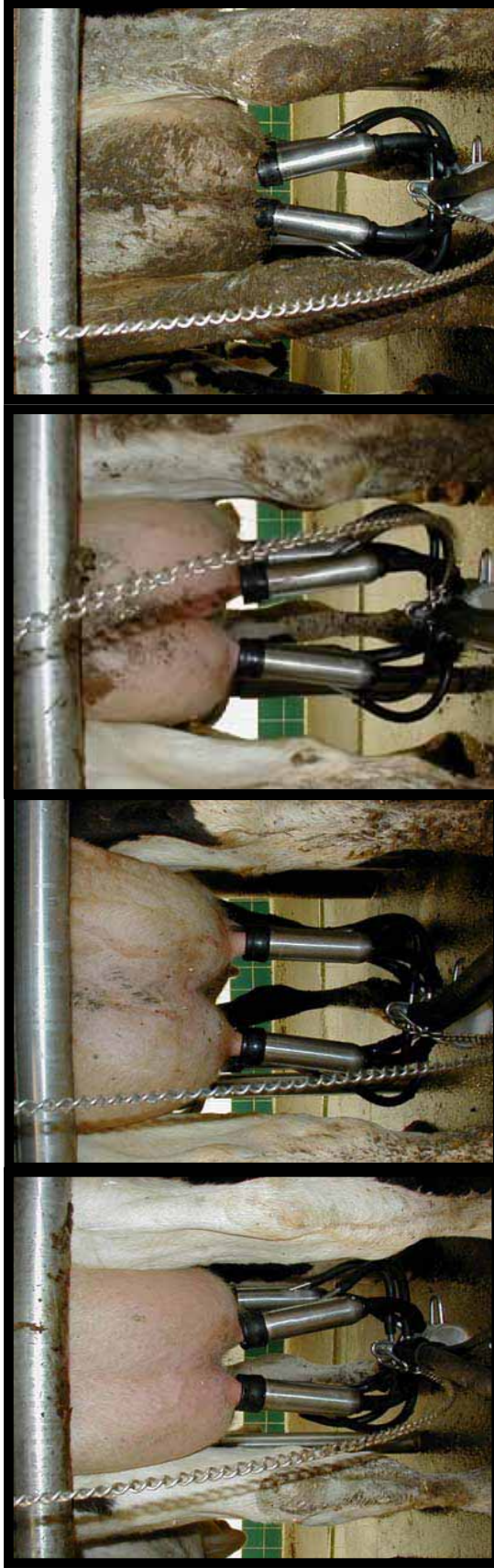
Score udder hygiene on a scale of 1 to 4 using the criteria below.
 Place an X in the appropriate box of the table below the pictures.
 Count the number of marked boxes under each picture.

SCORE 1
Free of dirt

SCORE 2
Slightly dirty
2 – 10 % OF SURFACE AREA

SCORE 3
Moderately covered with dirt
10 – 30% OF SURFACE AREA

SCORE 4
Covered with caked on dirt
>30% OF SURFACE AREA






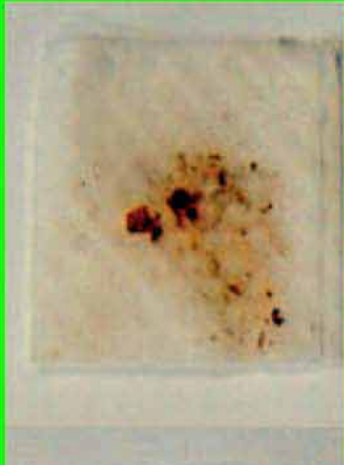
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6	7	8	9	10	6	7	8	9	10	6	7	8	9	10	6	7	8	9	10
11	12	13	14	15	11	12	13	14	15	11	12	13	14	15	11	12	13	14	15
16	17	18	19	20	16	17	18	19	20	16	17	18	19	20	16	17	18	19	20
21	22	23	24	25	21	22	23	24	25	21	22	23	24	25	21	22	23	24	25

Total Number of udder scores: _____
 Number of udders scored **1**: _____
 Number of udders scored **2**: _____
 Number of udders scored **3**: _____
 Number of udders scored **4**: _____

Percent of Udders Scored 3 & 4: _____
 Udders scored 3 and 4 have increased risk of mastitis
 as compared to scores 1 & 2

Teat Cleanliness Scorecard

1 Clean: No manure, dirt, or dip
2 Dip Present: No manure or dirt
3 Small amount of dirt and manure present
4 Larger amount of dirt and manure present

																			
1	2	3	4	5	1	2	3	4	5	1	2	3	4	5	1	2	3	4	5
6	7	8	9	10	6	7	8	9	10	6	7	8	9	10	6	7	8	9	10
11	12	13	14	15	11	12	13	14	15	11	12	13	14	15	11	12	13	14	15
16	17	18	19	20	16	17	18	19	20	16	17	18	19	20	16	17	18	19	20
21	22	23	24	25	21	22	23	24	25	21	22	23	24	25	21	22	23	24	25

Number of teats scoring 1 _____
 Number of teats scoring 2 _____
 Number of teats scoring 3 _____
 Number of teats scoring 4 _____
 Total scores _____

- Teats scoring 3 & 4 have an increased risk of mastitis as compared to scores of 1 & 2.
- Milkers tend to get scores of 1 & 2 on smoother teat ends and trend toward 3 & 4's as hyperkeratosis is more prevalent. For this reason, it is very important for milkers to make a physical pass across teat ends, making sure to pinch the end of the teat with the towel.

Percent of teats scoring 3 & 4 _____

Farm Name: _____

Date: _____



New York State Cattle Health Assurance Program Fact Sheet *Udder Health Herd Goals*

Goal setting

To be able to define realistic goals for future performance for a specific dairy farm it is probably important to get an idea of current performance. There are no generally applicable udder health and milk quality goals, except to meet the minimum legal standards for milk quality. Any dairy farm will need to decide what the optimal investment is into udder health and milk quality to maximize its overall performance. This decision is likely based on the knowledge of current performance and the short term and long term plans of the management of the dairy farm.

To define performance a set of primary and secondary parameters is provided below. Primary parameters are meant to be an indicator for overall performance. They provide the general state of the farms health status, or flag the presence or potential presence of performance flaws. Secondary parameters are especially useful when primary parameters indicate sub-optimal performance. These parameters guide the user to the cause of the underlying problems.

Udder Health

Primary parameter:

Bulk milk somatic cell count (bulk milk SCC or mean SCC and mean Linear Score over time). These parameters are usually provided through the milk buyer or through results from the Dairy Herd Improvement Association (Dairy One in New York).

Secondary parameters:

- Proportion of cows with high SCC
- Proportion of cows with new high SCC ('new infections')
- Proportion of cows with chronic high SCC
- Culture results of high SCC cows

The preceding parameters are only available when individual somatic cell counts are measured on a regular basis (preferably monthly) for all cows in the dairy.

Primary parameter:

Clinical mastitis incidence (% cows with ≥ 1 case of clinical mastitis per month)

Secondary parameters:

- Mastitis incidence per lactation group
- Graph of mastitis cases by dim
- Repeat cases of mastitis
- Mastitis incidence per season
- Culture results of mastitis cases

The preceding parameters can only be calculated from records held at the dairy farm. Either hand help records or on-farm computerized records must be kept by the dairy producer.

Primary parameter:

Proportion of cows culled for udder health reason (% culled for mastitis as a percentage of all cows in the herd)

Secondary parameters:

- List of cows culled
- Cows not culled but should have been culled

The preceding parameters can only be calculated from records held at the dairy farm. Either hand help records or on-farm computerized records must be kept by the dairy producer.

Criteria that define excellent udder health status of individual cows and the herd.

Criteria	Ideal udder health targets
Bulk milk somatic cell count	< 250,000 cells/ml
Herd average (actual)	< 200,000 SCC
Herd average (DHI Linear Score)	< 3.0 LS SCC
100 % of first calvers (DHI)	< 100,000 SCC
> 85% of herd	< 200,000 SCC
> 95% of herd	< 500,000 SCC
Incidence of clinical mastitis	< 25 cases / 100 cows per year
Number of culls due to mastitis or other udder health problems	< 5 cases / 100 cows per year

Table 1. Secondary Parameters to be Calculated in Herds with Udder Health Problems

Somatic Cell Counts:

Define cut-off for infection vs no infection (e.g. SCC >250 or LS > 4.5). This is referred to as LS-cut-off in the formula's below.

$$\% \text{ cows infected in the herd: } \frac{\# \text{ cows above LS-cut-off}}{\# \text{ cows SCC tested}}$$

$$\% \text{ new Infections: } \frac{\# \text{ cows below LS-cut-off last sample and above LS-cut-off this sample}}{\# \text{ cows below LS-cut-off last sample date}}$$

$$\% \text{ Chronic Infections: } \frac{\# \text{ cows above LS-cut-off last sample and above LS-cut-off this sample}}{\# \text{ cows SCC tested at both sample dates}}$$

$$\% \text{ Cured infections: } \frac{\# \text{ cows above LS-cut-off last sample and below LS-cut-off this sample}}{\# \text{ cows above LS-cut-off last sample}}$$

$$\text{contribution of highest SCC cows} = \frac{(\text{SCC} * \text{lbs. milk}) \text{ for highest SCC cows}}{\text{Sum of } (\text{SCC} * \text{lbs. Milk}) \text{ for all cows}}$$

Incidence of clinical mastitis:

$$\text{Cumulative Incidence per lactation: } \frac{\# \text{ cows with at least one case of mastitis in this lactation}}{\# \text{ cows that have completed a lactation}}$$

$$\text{Percent of mastitis cases per months: } \frac{\# \text{ cases of mastitis in a given month}}{\text{Avg \# cows lactating in a given month}}$$

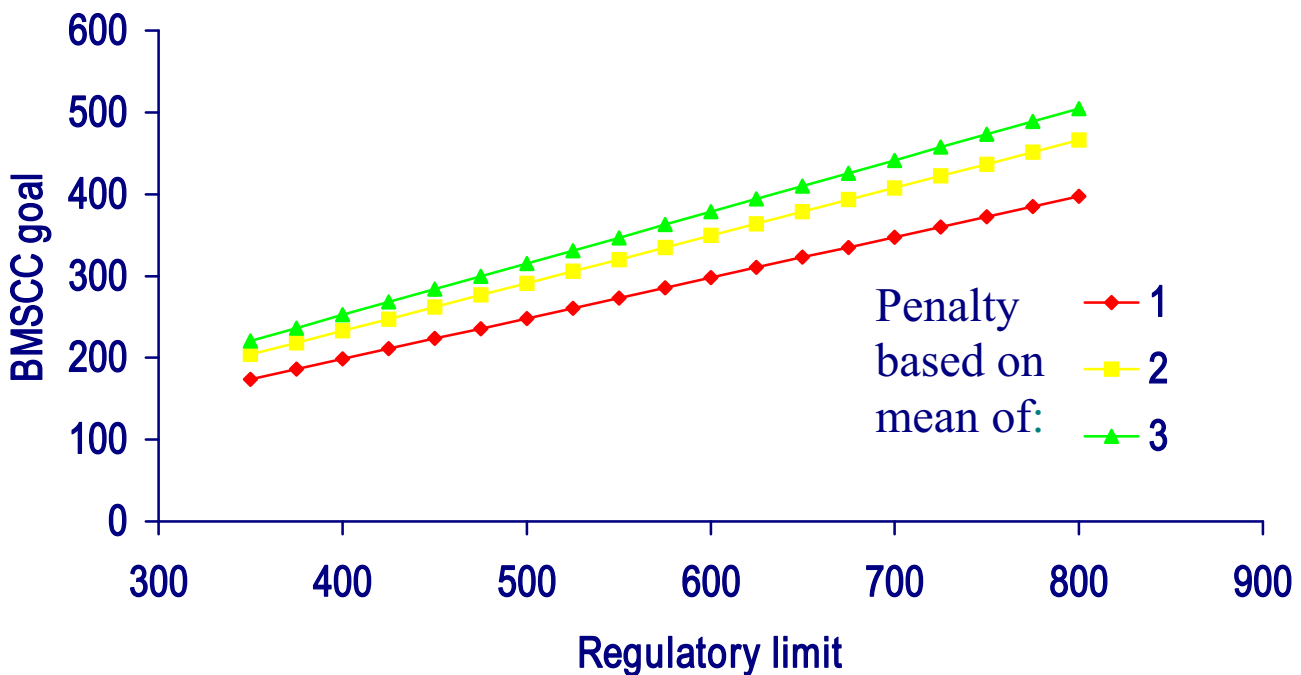
Culling due to udder health:

$$\text{Incidence of culling due to udder health : } \frac{\# \text{ cows culled for mastitis in a given year}}{\text{Avg number of cows present in a given year}}$$

$$\text{Proportion of culling due to udder health: } \frac{\text{\# cows culled for udder health}}{\text{Total \# cows culled in a given year}}$$

Milk Quality

Primary milk quality parameters are often reported to the producer by the milk buyer. The parameters usually include Somatic Cell Counts (SCC), Plate Loop Counts (PLC), freezing point information to check for added water, acidity or rancidity, and visible milk cleanliness. Every load of milk is also test for antibiotic residues. Goal setting for bulk milk SCC depends on the ambition of the producer and the possible penalty or additional benefits that may happen by crossing a specific SCC level. In the graph below the advised SCC performance goal is graphed as a function of penalty level. For example, to remain in almost all situations below a level of 750,00 cells, the producer should aim for a mean somatic cell count of approximately 500,000. Similarly, if benefits are paid for milk with a cell count below 300,000, then the performance goal should be approximately 200,000.



Bulk milk PLC should be as low as feasible, but year round production of milk with a bacteria count below 10,000 bacteria is certainly feasible.

Possibly extra information on bacteria counts in milk comes from Preliminary incubation (PI) counts, Coliform counts, and Laboratory Pasteurized Counts (LPC). These tests are described elsewhere and are claimed to make a distinction between washing failures, pipe line contamination and manure contamination in milk.

Residue violations or Growth Inhibitors indicate the presence of antibiotic residues in milk. The average risk of a producer obtaining at least one violation per year is in New York State approximately 3%. It is feasible to put policies in place that there should be no antibiotic residue violation in the herd.



Mastitis Module Risk Assessment Guide

Risk Factors	Risk Information ❖ Informational Statement ➤ Intervention tactic	Risk factors on this farm (level of implementation)	Farm Feasibility Y,N
1.) Biosecurity ❖ Purchased herds ❖ Purchased cattle	❖ The majority of herds that are sold are infected with contagious mastitis pathogens. ➤ Culture (aerobic and Mycoplasma) the bulk tank of the prospect herd at least once, and ideally three times (at weekly intervals) prior to purchase ❖ Contact with non-resident livestock creates a risk for introduction of contagious mastitis pathogens into the herd. ➤ Test all incoming cattle for contagious mastitis (S.agalactia, S.aureus, and Mycoplasma) ➤ Milk incoming cattle separate or last until culture results or at least two somatic cell counts are available		
❖ Fairs and shows ❖ Infected resident cattle	❖ Contagious mastitis infections often are transmitted at fairs and shows. ➤ Do not share milking equipment at fairs or shows. ❖ Cattle infected with contagious mastitis will transmit the infection to other cattle. ➤ Milk known infected cattle last ➤ Clean or disinfect equipment after milking infected cattle		
2.) Milking procedures ❖ Check foremilk and udder ❖ Predip ❖ Dry thoroughly ❖ Attaching the unit	❖ Many new infections occur during milking. Additionally, milk can become contaminated with coliforms and other harmful bacteria during the milking process. ➤ Wear latex gloves to reduce bacterial exposure to the teats ➤ Checking foremilk helps to detect clinical mastitis earlier ➤ Get good coverage of teat for at least 30 seconds ➤ Dry with an individual towel ➤ Attach unit within 60 seconds of stimulation ➤ Vacuum fluctuation and liner squawks may be		

<ul style="list-style-type: none"> ❖ Cluster removal ❖ Post milking disinfection ❖ General hygiene 	<p>prevented by precise attachment</p> <ul style="list-style-type: none"> ➤ Timely removal of the cluster prevents over-milking and teat lesions. <p>Post milking teat disinfection is the single most important factor in preventing new infections.</p> <ul style="list-style-type: none"> ➤ Ensure that at least the lower half of the teat is dipped. ➤ Flaming udders removes a bacterial reservoir. 		
<p>3.) Milking equipment</p> <p>Maintenance</p>	<p>Faulty milking equipment may cause new infections in the milking herd.</p> <ul style="list-style-type: none"> ➤ Change teat cup liners according to manufacturer recommendations ➤ Check other rubber parts (e.g. short milk tubes) regularly ➤ Provide regularly scheduled maintenance ➤ Milking system should be professionally evaluated at least annually. 		
<p>4.) Treatment protocol and residue avoidance</p> <ul style="list-style-type: none"> ❖ Culture clinical and high SCC cows ❖ Review culture results with your veterinarian ❖ Avoid violative drug residues 	<p>Culture and sensitivity results can help to discern the cause of mastitis, and aid in developing treatment protocols.</p> <ul style="list-style-type: none"> ➤ Develop treatment protocols based on the organism present (high SCC), or likely to be present (clinical cases), clinical signs, and farm goals ➤ Evaluate treatment success on a regular basis, at least once yearly. ➤ Follow manufacturer's (OTC and Rx drugs) or veterinarian's (ELDU) recommended withholding times. ➤ Follow the 10 Point Plan. 		
<p>5.) Vaccination considerations</p>	<ul style="list-style-type: none"> ❖ Mastitis vaccines are becoming available and appear to be efficacious, especially to lessen the severity of Gram negative infections. ➤ Vaccination protocols should be developed and implemented in collaboration with the herd health advisor, and reviewed by the management team on an annual basis 		
<p>6) Nutrition</p> <ul style="list-style-type: none"> ❖ Energy 	<p>The two main nutritional areas adversely affecting immunity are energy and trace mineral/vitamin deficits</p> <ul style="list-style-type: none"> ➤ Monitor DMI for dry, pre-fresh, and lactating cows. ➤ Review management procedures that may increase DMI (forage quality, amount fed, times pushed up, bunk characteristics, ventilation, etc.). 		

<ul style="list-style-type: none"> ❖ Trace minerals/vitamins 	<ul style="list-style-type: none"> ➤ Review ration characteristics that may affect intake (forage quality, chop length, fat levels, degradable protein, etc.). ➤ Ensure that all animals are fed .3 ppm selenium. Lactating cows should receive 600-800 IU vitamin E, dry cows 1,000, and pre-fresh cows at least 1800 IU. ➤ Iron is an oxidant. Supplemental iron is rarely necessary and may be harmful. 	
<p>7.) Environment and Housing</p> <ul style="list-style-type: none"> ❖ Avoid overcrowding ❖ Keep stalls clean and comfortable ❖ Keep stalls adequately bedded ❖ Use the right bedding material ❖ Keep walkways clean 	<p>In well-managed herds the majority of mastitis cases are caused by environmental bacteria. In most herds, the majority of environmental infections (streps and coliforms) occur during the dry period.</p> <ul style="list-style-type: none"> ❖ Over-crowding can compromise overall herd hygiene, and lead to cows laying down in alleyways. Hygiene is improved at the following stocking rates: <ul style="list-style-type: none"> ➤ For bedded packs space requirements should be at least 100 sq. ft. per cow. ➤ For freestall facilities, strive for 100 – 110% stocking rate. ❖ Comfortable stalls encourage cows to lay down <ul style="list-style-type: none"> ➤ clean manure off stalls when cows are milked ➤ bed stalls frequently with dry, clean, bedding materials. Sand is the bedding of choice. ❖ Bedding materials can harbor mastitis pathogens (e.g. green sawdust) <ul style="list-style-type: none"> ➤ culture bedding materials if they are suspected as a source of mastitis. ❖ Heavily soiled walkways cause manure to be splashed onto udders, and soiled hooves bring manure into stalls. 	
<p>8.) Data collection and record keeping</p> <p>Clinical cases</p> <p>Subclinical mastitis</p>	<ul style="list-style-type: none"> ❖ Strive to have fewer than 2 clinical cases of mastitis per 100 cows each month ❖ and less than 5% new infections (previous month's Is < 4.0, current Is > 4.0) each month, ❖ and less than 5% chronic infections (previous and this 	