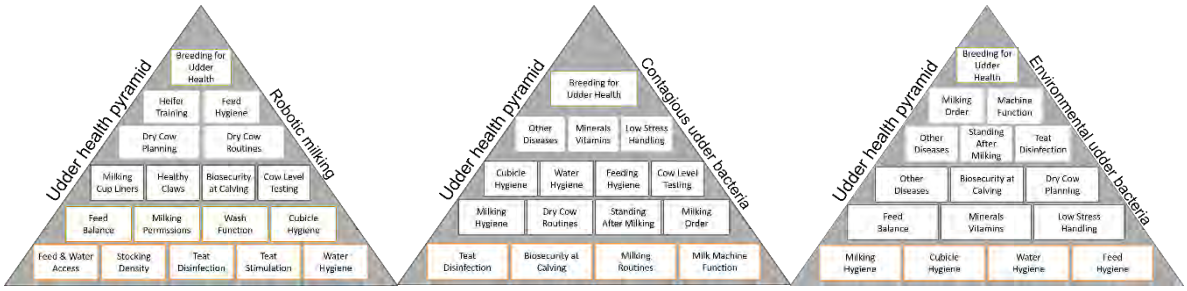
Europeiska jordbruksfonden för landsbygdsutveckling: Europa investerar i landsbygdsområden

The Udder Health Pyramids

Advisory support for farmers and veterinarians

Pyramids of action areas that improve udder health in dairy herds



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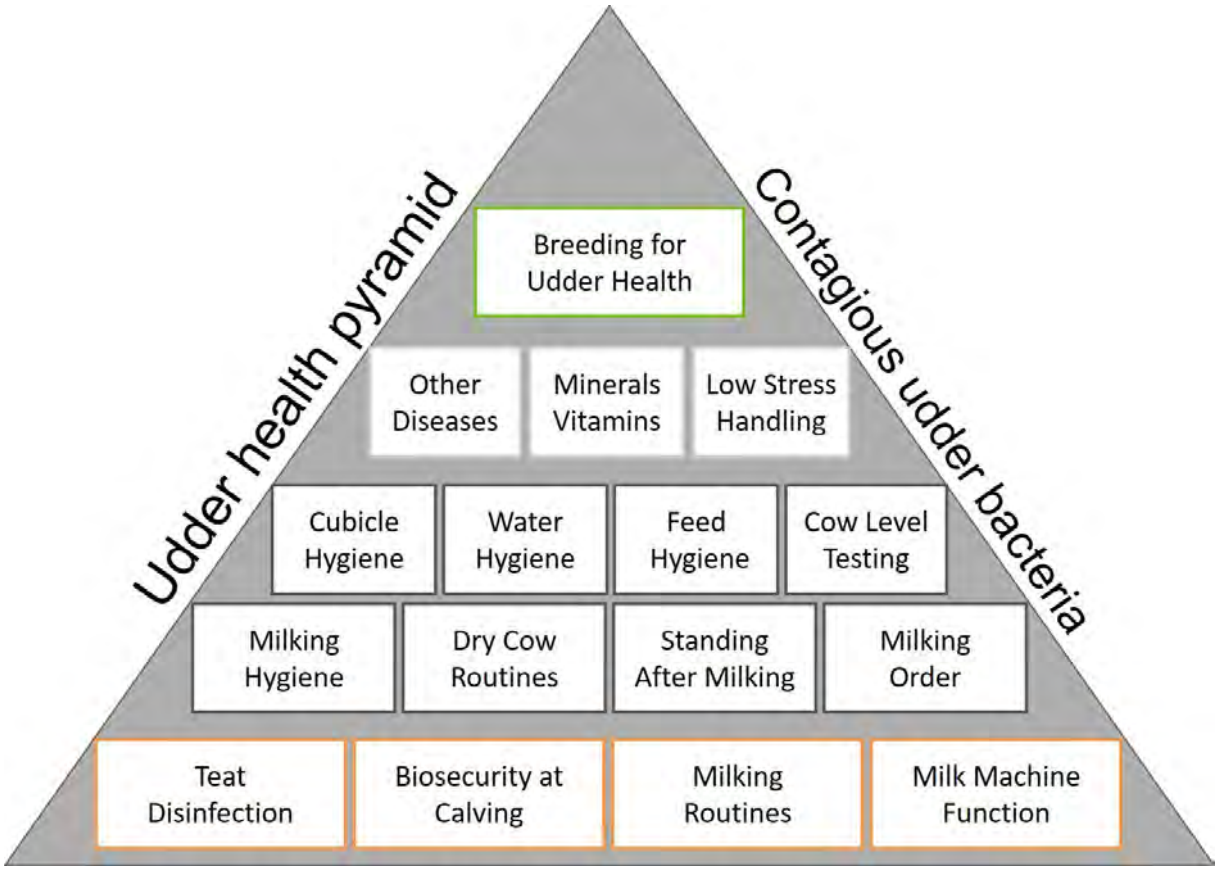
Herd Health Actions for Better Udder Health

Herd health actions for improved udder health will be principally different to traditional health care for clinically sick animals. Udder health is, in fact, rather about overall animal health and welfare. The udder of a milking cow is more burdened than most other bodily functions and, therefore, should be regarded as the cow's shock organ. This means that any negative load on the cow, such as stress, under-feeding or infection, results in an increased incidence of both clinical (visible) and sub-clinical (invisible with an elevated somatic cell count; SCC) mastitis. Even a mild udder disorder is of great significance to the farmer, as any grade of inflammation in the udder has a potentially huge negative effect on milk yield. Therefore, a signaling system which accurately and early detects also sub-clinical signs of udder health disorders in the cow is required.

A cow functions and thrives at her very best if she has a healthy udder with a constant SCC level below 100,000 cells/ml of milk. Cows with SCC levels below 50,000 are the ones that have the highest yield, and almost never suffer from mastitis. Today the most common SCC level of Swedish cows is in fact, regardless of breed and age, steady at between 20,000 and 50,000 cells/ml. However, average bulk tank milk SCC (BTSCC) in Sweden is well above 200,000 cells/ml, suggesting that many cows still have an increased SCC and that herd actions for better udder health often are well needed.

Use the udder health pyramid that best fits your herd. If the herd is using an automatic milking system, the robotic milking pyramid should be used. If the herd is conventionally milked, chose pyramid from bacteriological sampling of mastitis cases – the pyramid for contagious udder bacteria if staphylococci and contagious streptococci are common, or otherwise the pyramid for environmental udder pathogens.



Contagious udder bacteria are spread from cow to cow via direct or indirect contact, most often at the time of milking.

There are 16 different management areas to focus on. The areas are distributed on 4 levels depending on their effect on udder health and somatic cell count, as per the pyramid above. Management actions can affect udder health both on the cow and at herd level.

Start from the base and work upwards towards the goal of ≤ 150,000 in herd average BTSCC.

Contagious udder bacteria

Action area 1

Post-milking Teat Disinfection

How to succeed

1. Use a teat dip rather than a teat spray
2. Use a disinfectant with iodine if you have problems with streptococci and staphylococci
3. Dip or spray immediately after removal of the cluster unit
4. Wash/rinse the bottle/equipment daily
5. Make sure the teat disinfectant does not freeze
6. Use a teat dip with UV-protection during summertime

Common mistakes

- The teats are not completely dipped or sprayed
- The teat disinfectant is too diluted
- The teat disinfectant has been stored incorrectly
- The teat disinfectant equipment is not properly cleaned between milkings

Evaluation

Parameter	Target	OK	Alarm
Method	Dip	Spray	None
Teat coverage	Complete	Moderate	Incomplete
Storage	Cool, < +10°C	Around 0°C	Risk of freezing
Function check	Weekly	Sporadic	Never
Choice – staphs and strepts	Iodine, ≥ 1,500 ppm	Iodine	Other

Contagious udder bacteria

Action area 2

Biosecurity at Calving

How to succeed

1. Group according to udder health at calving
2. Use individual calving pens
3. Clean the calving pens between each calving
4. Separate heifers from older cows during last 3 weeks of pregnancy
5. Dry cow treatment according to guidelines
6. Perform CMT on fresh cows and culture if CMT ≥ 3

Common mistakes

- Cows calve in a group pen
- Infected cows are housed with healthy cows before calving
- Udder health status of newly calved cows is not evaluated

Evaluation

Parameter	Target	OK	Alarm
New infection rate in newly calved cows	< 5%	< 10%	> 15%
Incidence of mastitis treatments	5%	10%	≥ 20%
Calculated BTSCC	< 150,000	< 200,000	> 250,000
Cleared infections during dry period	70%	50%	< 30%
Proportion *S. aureus* infected cows in herd	< 5%	10%	20%
***Str. agalactiae* at BT* PCR**	0	0	Detected
***Mycoplasma bovis* at BT* PCR**	0	0	Detected

*BT = Bulk Tank analysis

Contagious udder bacteria

Action area 3

Milking Routines

How to succeed

1. Use the same routine at every milking
2. Ensure enough contact time with teats when preparing cows for milking
3. Foremilk all teats in a test cup
4. Perform a pre-milking routine of a minimum of 60 seconds
5. Attach cluster after milk let down
6. Do not let air in at any stage of milking

Common mistakes

- Teat contact-time is too short
- No waiting time (lag-time) to allow for milk let-down after preparation
- Milking routine varies
- Cows are stressed during milking

Evaluation

Parameter	Target	OK	Alarm
Preparation time, total	60-90 sec	45-60 sec	< 45 sec
Teat contact time if 2x milking	15 sec	10 sec	< 10 sec
Teat contact time if 3x milking	30 sec	20 sec	< 20 sec
Bimodal milk let-down	None	≤ 10%	> 10%
Defecation during milking	Never	≤ 10%	> 10%
Time spent in waiting pen	≤ 45 min	≤ 60 min	> 60 min
Vacuum drop in milk line*	< 2	< 5	5 or more
Teat-end vacuum* kPa	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Mouth-piece vacuum* % OK	> 75%	> 60%	≤ 50%

*Milking Time Test with a vacuum logger

Contagious udder bacteria

Action area 4

Milk Machine Function

How to succeed

1. Service the machine at least annually
2. Change liners at recommended intervals
3. Use teat cup liners that fit the cows in your herd
4. Use same type of liner in the milking machine for your newly calved cows
5. Use milking equipment according to the ISO-norm
6. Perform a Milking time test with a vacuum logger

Common mistakes

- Under-dimensioned milk pipes
- Too many cluster units in relation to plant dimension
- Vacuum-valve function is not checked

Evaluation

Parameter	Target	OK	Alarm
Machine service, agree ISO	Every year	Every year	< yearly
Liner change after number of milkings (nitrile/silicone)	2,000/8,000	2,500/10,000	> 2,500/10,000
Machine-on-time	5 min	6 min	> 8 min
Vacuum drop in milk line*	< 2	< 5	5 or more
Vacuum at teat end*	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Vacuum in mouthpiece*	10-15 kPa	8-25 kPa	< 8 or > 25 kPa

* Milking Time Test with a vacuum logger

Contagious udder bacteria

Action area 5

Milking Hygiene

How to succeed

1. Use gloves and clean clothes at every milking
2. Use one pre-moisturized cloth per cow
3. Multi-use cloths should be washed at 95° C
4. Wash the milking plant at ≥ 65° C for at least 5 minutes
5. Wash bucket milking units for newly calved cows between every milking
6. Clean the outside of the milking clusters every day

Common mistakes

- Temperature at washing is too low
- Not enough hot water (≥ 80° C)
- Washing solution stored at temperatures too high or too low
- Incorrect dose of washing solution
- Milking machine for newly calved cows is of lower standard than the regular one

Evaluation

Parameter	Target	OK	Alarm
Individual bacterial count (IBC)	< 20,000	≤ 30,000	> 60,000
Bulk tank SCC	150,000	200,000	> 250,000
Washing solution, storage temperature	10°C	10°C	< 5°C
Winter spores (clostridia)	< 200	< 400	1,000
Enterococcus, PCR of milk tank	0	Few	Moderate/heavy
Thermo-resistant bacteria	< 100	< 300	1,000
Temperature wash water,°C	55	45	< 40

Contagious udder bacteria

Action area 6

Dry Cow Routines

How to succeed

1. Adjust feeding to reach daily production of 15–25 kg before initiation of dry off
2. Exclude concentrates and move cows to separate pen at the start of dry off
3. Milk at intervals of 36–48 hours
4. Only use dry cow treatment on cows with good prognosis of clearing infections

Common mistakes

- Dry period is longer than 10 weeks
- Insufficient feed distribution to cows
- Insufficient hygiene when treating dry cows

Which cows should I treat with long-acting dry cow therapy (DCT)?

- Check the cows' cell count series and use dry-cow preparations selectively:
- Do not treat cows in udder health class (UHC) 0-2 at dry off, corresponding to SCC < 200,000 during the last 3 months prior to dry off
- Treat cows in UHC 3-8, corresponding to cows with SCC 200,000-500,000 during the last 3 months prior to dry off, according to mastitis during lactation, SCC dynamics and bacterial findings
- Do not treat cows in UHC 9, corresponding to cows with SCC consistently above 500,000

Never treat:

- Cows with penicillin-resistant staphs

Evaluation

Parameter	Target	OK	Alarm
Housing of dry cows	Separate barn	Part of milking barn	With lactating cows
Length of dry period	7 wks.	6 – 9 wks.	< 5 or > 10 wks.
Dry off, number of days	4–5	6–8	> 8
Test milkings per lactation	12	11	< 11
Cleared infections during dry period	> 70%	> 50%	< 30%
New infection rate at calving	< 5%	< 10%	> 20%
Cows selected for DCT	SCC, culture	CMT	Haphazard
Proportion of cows that get DCT	20–30%	10–40%	< 10 or > 80%

Contagious udder bacteria

Action area 7

Standing After Milking

How to succeed

1. Fresh feed and water should be available to all cows after milking
2. One feed slot per cow
3. Access to forage for at least 23 hours per day
4. Keep waiting time in holding pen before milking to less than an hour
5. One cubicle per cow in resting area

Common mistakes

- Feed older than 24 hours on feeding table/alley troughs
- Competition for feed - not enough feed slots or not enough feed
- Cows spend too much time waiting in holding pen before milking
- Cows enter resting area directly after milking

Evaluation

Parameter	Target	OK	Alarm
Stocking density, cows/feed slot	≤ 1.5	≤2	>2
Stocking density, resting area	< 1	1	> 1
Forage; kg DM*/cow /24 hours	12	10	< 8
Time spent waiting, min	25	35	70
Cows milked per hour	≥ 70	≥ 50	< 30
Access to feed, hours/day	23	22	< 20
Percent forage in diet	60%	55%	< 50%
Water, flow at feed slot	20 l/min	10 l/min	< 10 l/min

*DM – dry matter content

Contagious udder bacteria

Action area 8

Milking Order

How to succeed

1. Milk healthy cows before less healthy cows
2. Milk newly calved cows after healthy cows
3. Conduct test milkings every month
4. CMT and sampling for bacteriology of high cell count cows after every test milking
5. CMT and sampling for bacteriology of cows that appear unhealthy

Common mistakes

- No consistent and well-designed milking order
- Newly calved cows are milked before healthy ones
- No knowledge, or markup, of cows with high cell counts
- No grouping of cows in barn

Evaluation

Parameter	Target	OK	Alarm
Re-grouping of cows according to udder health	12 times/year	6 times/year	Never
New infection rate/month	< 2%	< 5%	> 10%
CMT equipment available	At milking	On farm	No
Equipment for bacteriological sampling available	At milking	On farm	No
Bacteriology of cows with high SCC	Laboratory	Clinic or on farm	Never
Test milkings per year	12	11	< 11

Contagious udder bacteria

Action area 9

Cubicle Hygiene

How to succeed

1. Clean the cubicles/lying areas twice a day
2. Replace all bedding material within 48 hours
3. Store bedding material in an area separate from where animals are housed
4. Adjust cubicles according to size of your cows
5. Good ventilation for drier air in barn
6. Use disinfecting additives in bedding material

Common mistakes

- Lying areas are not clean and dry
- Milk leakage from cows in lying areas
- Bedding material is stored in barn in front of cows
- Bedding material is wet and feels warm

Evaluation

Parameter	Target	OK	Alarm
Cleaning of lying areas/day	3-4	2	< 2
Dry bedding under udders	At every cleaning	Every day	> 2 days
Replacement of bedding	24 hours	48 hours	> 3 days
Cubicles with milk	None	< 10%	> 20%
Bedding, properties	Clean and dry	Damp but unsoiled	Mixed with dirt
Bedding, storage	Cool and dry	Not dry, in barn	Wet and damp

Contagious udder bacteria

Action area 10

Water Hygiene

How to succeed

1. Drinking-quality water for cows
2. Water troughs cleaned twice a day
3. Water cups cleaned twice a week
4. Water troughs on pastures cleaned twice weekly
5. Fence off lakes, brooks and fields with stagnant water
6. Take water samples regularly

Common mistakes

- Water source has water of inferior quality
- Bacterial growth in water troughs and cups
- Well is contaminated by surface water
- UV-filter is not working properly

Evaluation

Parameter	Target	OK	Alarm
Result of water analysis	Good	Good	Remark on quality
Water troughs, surface	No remark	Slime on surface	Visible contamination
Water cups, surface	No remark	Slime on surface	Visible contamination
Water source	Public	Drilled well	Dug well
Nitrate, mg per litre	20	40	> 200
pH	7	6-9	> 9 or < 6

Contagious udder bacteria

Action area 11

Feed

How to succeed

1. Feed a high proportion of forage (silage or hay) in total ration
2. Adapt cows to lactation feeding 3 weeks prior to calving
3. Feed adequate amounts of energy at calving
4. Less than 1-unit loss in body condition score in first month after calving
5. Analyze content of nutrients when using home produced feeds
6. Adjust feeding regime according to milk production and stage of lactation

Common mistakes

- Feed bunkers/alley empty for more than 1 hour per 24 hours
- Not enough feeding slots – leads to competition and stress
- No adaptation of feeding period in last weeks before calving

Evaluation

Parameter	Target	OK	Alarm
Percent forage in total ration	> 50%	≥ 40%	< 40%
NDF in total ration, g/kg DM*[1]	320-450	320-360	< 320
Chewing time index min/kg DM[1]	> 32	> 32	< 32
Total DM-intake kg/cow*	> 22	> 21	< 20
Adaptation period before calving	3 weeks	2 weeks	< 1 week
UREA per cow, average	4–5	3–6	< 3 or > 6
Percent cows BHBA FPM[2] > 1,2**	≤ 5%	≤ 10%	> 20%

*Depends on stage of lactation, total feed ration and cow **Measured with Freestyle Precision Unit 5-15 days after calving

[1]According to NORFOR [2]FPM=First Test Milking

Contagious udder bacteria

Action area 12

CMT and Bacteriology

How to succeed

1. Note the behavior of cows every morning and evening
2. Check the body temperature of cows with peculiar behavior
3. CMT on cows with body temperature > 38,5ºC
4. Check cell count history of cows with suspected mastitis before treatment
5. Call your veterinarian directly regardless of day of the week or time of day
6. Use only antibiotic preparations that contain penicillin

Common mistakes

- Udder diseases are not detected
- Body temperature and CMT are not evaluated
- The veterinarian is not called at nights and weekends
- The veterinarian is called only when the milk “looks like porridge”

Do not use antibiotics on

- Cows with a poor prognosis, such as:
  - Cows with clinical mastitis for the third time in the same lactation
  - Cows with clinical mastitis that have had high cell counts in the last 3 months
- Cows with no other symptoms than high cell counts

Evaluation

Parameter	Target	OK	Alarm
Phone number of vet available	At milking	Yes	No
CMT equipment available	At milking	On farm	No
Equipment for bacteriological sampling available	At milking	On farm	No
Notes for peculiar behavior	Yes, in specific spot	Yes	No
Percent penicillin used for mastitis	> 90%	> 85%	< 80%

Contagious udder bacteria

Action area 13

Other Diseases

How to succeed

1. Separate entrance for visitors. Visitors change into visitors' clothing and footwear
2. Visitors' entrance should have facilities for washing hands, clothes, boots and equipment
3. Ensure your farm is free of BVDV, salmonella, RS- and coronaviruses
4. Do not buy animals from other herds - maintain a closed herd
5. Keep a high level of general biosecurity on your farm
6. Hire a claw trimmer that can register and treat claw diseases in your cows

Common mistakes

- No separate entrance and no on-farm visiting clothing/footwear
- Live animals are bought from herds with unclear health status
- Live animals are bought from herds with contagious diseases such as salmonella, RS- and coronaviruses or *Str. agalactiae*

Evaluation

Parameter	Target	OK	Alarm
Recruitment by buying animals	Never	Heifers some years	Every year
Pneumonia in calves	None	Low level	Every month
Diarrhea in calves	None	Low level	Every month
Calf mortality 1-90 days	None	< 8%	> 10%
On-farm protective clothing	Boots and coat	Coat only	None
Claw trimming	All cows ≥ 2 per year	2 per year	When needed
Claw diseases, registration	Database registration	Leaves a written report	No

Contagious udder bacteria

Action area 14

Minerals & Vitamins

How to succeed

1. Check the total feed ration's contents of minerals and vitamins
2. Give pregnant cows minerals and vitamin E during the last 2 months before calving/during dry period
3. Provide one feed slot per cow
4. Give minerals and vitamins that are tasty
5. Avoid permanent and fertilized pastures

Common mistakes

- Low levels of minerals and vitamins in feed
- Pregnant cows do not receive minerals and vitamins
- Low ranking cows have limited access to feed, minerals and vitamins
- High potassium content in silage

Evaluation

Parameter	Target	OK	Alarm
Paresis and muscle spasms	< 2%	< 3%	≥ 5%
Potassium level in silage, g/kg DM	< 20	< 25	≥ 25
Magnesium in forage, g/kg DM	≥ 1.8	≥ 1.7	< 1.7
Cows per feed slot	≤ 1.5	≤ 2	> 2

Contagious udder bacteria

Action area 15

Low Stress Handling

How to succeed

1. One cubicle per cow
2. One cow per feeding slot
3. Forage or TMR available 23 hours per day
4. Designated days and times of day for moving animals
5. Always move at least two cows together
6. Make sure that the calf attaches to the handler in the first 10 days of life

Common mistakes

- Too many cows in resting area
- Too many cows in eating area
- Too much time spent in holding pen before milking
- Access to feed less than 22 hours per day
- Aggressive and loud handling of animals

Evaluation

Parameter	Target	OK	Alarm
Stocking density resting area	<1 cow/cubicle	1 cow/cubicle	> 1 cow/cubicle
Stocking density, cows/feed slot	≤ 1.5	≤ 2 cows	> 2
Time spent waiting before milking	≤ 45 min	≤ 60 min	≥ 80 min
Access to feed	≥ 23 hours	≥ 22 hours	< 20 hours
Defecation during milking	Never	≤ 10% of cows	> 10% of cows
Oxytocin to heifers	Never	≤ 10 %	≥ 10%
Oxytocin to cows	Never	Never	Sometimes

Contagious udder bacteria

Action area 16

Breeding for Udder Health

How to succeed

1. Monitor breeding parameters for milk flow, mastitis & high cell counts
2. Do not recruit heifers from cows with low milk flow or poor udder health
3. Inseminate cows with low breeding scores for milk flow with beef semen
4. Use bulls with high breeding scores for udder health
5. Do not use untested bulls for your recruitment animals
6. Check udder health scores of import semen bulls*

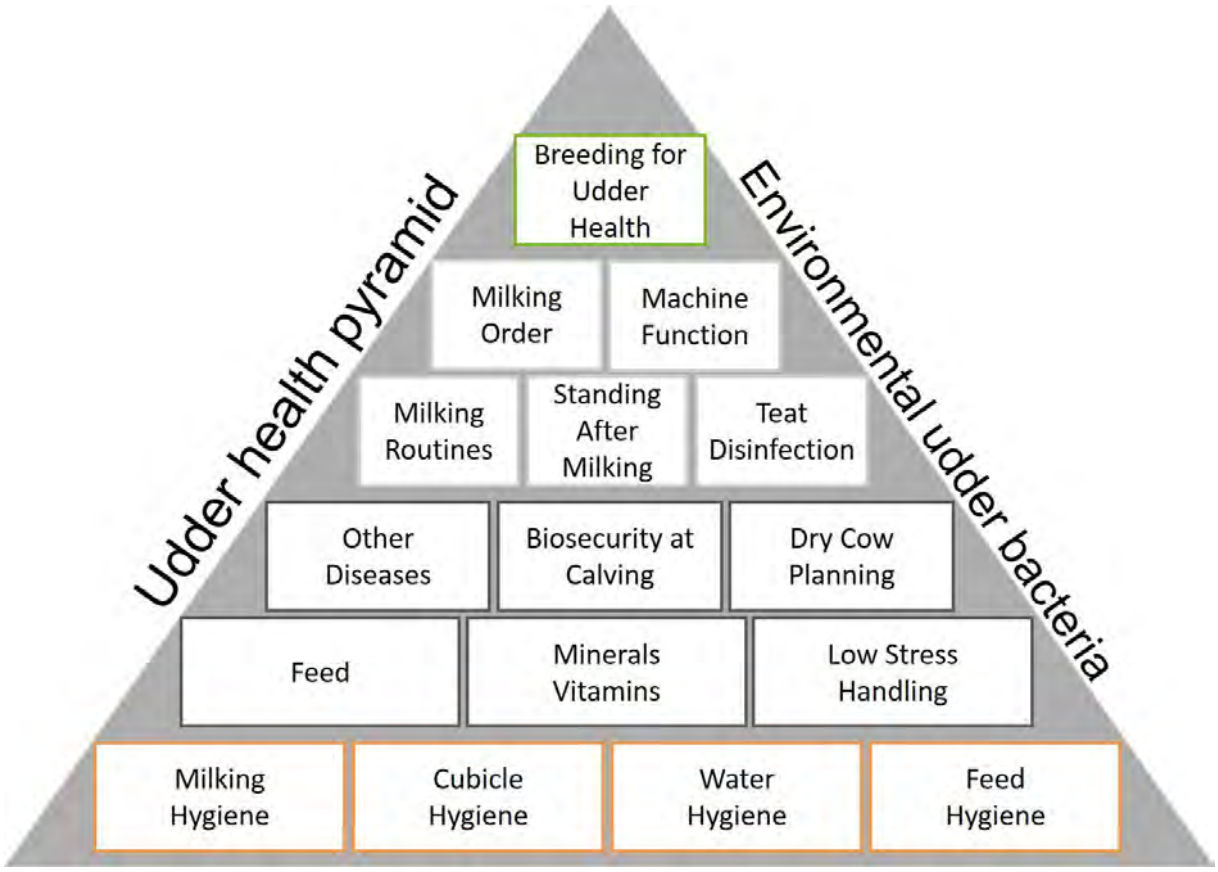
* Use breeding values from Interbull to compare bulls

Common mistakes

- Cow's potential for udder health and milk flow has not been evaluated
- Cows are bred for high milk flow, but not for better udder health
- Cows are not systematically bred for improved udder health

Evaluation

Parameter	Target	OK	Alarm
Test milkings per year	12	11	< 10
Use cow control scheme	Yes	Yes	No
Choice of bull	Planned	Chosen at the time of AI	Untested bull
Monitor cows breeding scores	Always	Often	Rarely to never
Use evaluated breeding scores	> Once/year	Once/year	< Once/year



Environmental bacteria are present in the cow's environment but can enter the udder and infect it, causing mastitis. Cows are usually infected by environmental bacteria in the time between milkings.

There are 16 different management areas to focus on. The areas are distributed on 4 levels depending on their effect on udder health and somatic cell count, as per the pyramid above. Management actions can affect udder health both on the cow and at herd level.

Start from the base and work upwards towards the goal of ≤ 150,000 in herd average BTSCC.

Environmental udder bacteria

Action area 1

Milking Hygiene

How to succeed

1. Use gloves and clean clothes at every milking
2. Use one pre-moisturized cloth per cow
3. Multi-use cloths should be washed at 95° C
4. Wash the milking plant at ≥ 65° C for at least 5 minutes (requires hot water at ≥ 80° C)
5. Wash bucket milking units for newly calved cows between every milking
6. Clean the outside of the milking clusters every day

Common mistakes

- Temperature at washing is too low
- Not enough hot water at ≥ 80° C
- Washing solution stored at temperatures too high or too low
- Incorrect dose of washing solution
- Milking machine for newly calved cows of lower standard than the regular one

Evaluation

Parameter	Target	OK	Alarm
Individual bacterial count (IBC)	< 20,000	≤ 30,000	> 60,000
Bulk tank SCC	150,000	200,000	> 250,000
Washing solution, storage temperature	10°C	10°C	< 5°C
Winter spores (clostridia)	< 200	< 400	1,000
Enterococcus, PCR of milk tank	0	Few	Moderate/heavy
Thermo-resistant bacteria	< 100	< 300	1,000
Temperature wash water,°C	55	45	< 40

Environmental udder bacteria

Action area 2

Cubicle Hygiene

How to succeed

1. Clean the cubicles/lying areas twice a day
2. Replace all bedding material within 48 hours
3. Store bedding material in an area separate from where animals are housed
4. Adjust cubicles according to size of your cows
5. Good ventilation for drier air in barn
6. Use disinfecting additives in bedding material

Common mistakes

- Lying areas are not clean and dry
- Milk leakage from cows in lying areas
- Bedding material is stored in barn in front of cows
- Wet sawdust creates heat in bedding

Evaluation

Parameter	Target	OK	Alarm
Cleaning of lying areas /day	3-4	2	< 2
Dry bedding under udders	At every cleaning	Every day	> 2 days
Replacement of bedding	24 hours	48 hours	> 3 days
Cubicles with milk	None	< 10%	> 20%
Bedding, properties	Clean and dry	Damp but unsoiled	Mixed with dirt
Bedding, storage	Cool and dry	Not dry, in barn	Wet and damp

Environmental udder bacteria

Action area 3

Water Hygiene

How to succeed:

1. Drinking-quality water to cows
2. Water troughs cleaned twice a day
3. Water cups cleaned twice a week
4. Water troughs on pastures cleaned at least twice a week
5. Fence off lakes, brooks and fields with stagnant water
6. Take water samples regularly

Common mistakes

- Water source has water of inferior quality
- Bacterial growth in water troughs and cups
- Well – dug or drilled, is contaminated by surface water
- UV-filter is not working properly

Evaluation

Parameter	Target	OK	Alarm
Result of water analysis	Good	Good	Remark on quality
Water troughs, surface	No remark	Slime on surface	Visible contamination
Water cups, surface	No remark	Slime on surface	Visible contamination
Water source	Public	Drilled well	Dug well
Nitrate, mg per liter	20	40	> 200
pH	7	6–9	> 9 or < 6

Environmental udder bacteria

Action area 4

Feed Hygiene

How to succeed:

Forage – especially silage

1. Fill silage containers quickly, pack well
2. Adjust conservation method according to DM*
3. Check for heat in silage every day
4. Discard bad silage

Concentrates

1. Good quality, store in dry place
2. Protect from rats and other vermin
3. Fill cold in bunk/sack/silo
4. Check for heat in silage weekly

Equipment

1. Sweep the feeding table/alley daily
2. Mix a new ration every day
3. Empty the mixer wagon after feeding
4. Include leftovers from last filling in next batch of mixed feed
5. Clean concentrate dispensers every week

Common mistakes

- Insufficient conservation – pH too high
- Silage is not removed from storage fast enough
- Mold in silage/grain/concentrate
- Mixer wagon not cleaned properly
- Feeding table not swept properly

Evaluation

Parameter, silage	Target	OK	Alarm
Heat in silo	None	Lukewarm	Hot
NH3, % of N	< 4	< 8	≥ 12
pH silage, < 25% DM	< 4.2	< 4.2	> 4.5
pH silage, > 25% DM	Under critical level	Under critical level	Above level
Butyric acid	< 0.1%	0.1 - 0.2%	> 0.3%
Lactic acid	> 5%	> 4%	< 3%

Parameter, concentrates	Target	OK	Alarm
Aspergillus fumigatus	< 10 CFU/g	< 100 CFU/g	> 500 CFU/g
Percent infected kernels	< 25%	< 35%	> 40%
Water activity (aw)	< 0.75	< 0.75	> 0.75

pH is dependent on DM content. Formula for DM correction: (0.0257* DM % in silage) + 3.71 = critical pH-level

*DM=Dry matter

Environmental udder bacteria

Action area 5

Feed

How to succeed

1. Feed a high proportion of forage (silage or hay) in total ration
2. Adapt cows to lactation feeding 3 weeks prior to calving
3. Feed adequate amounts of energy at calving
4. Target less than 1-unit loss in body condition score in first month after calving
5. Analyze content of nutrients when using home produced feeds
6. Adjust feeding regime according to milk production and stage of lactation

Common mistakes

- Feed bunkers/alley empty for more than 1 hour per 24 hours
- Not enough feeding slots – leads to competition and stress
- No adaptation of feeding period in last weeks before calving

Evaluation

Parameter	Target	OK	Alarm
Percent forage in total ration	> 50%	≥ 40%	< 40%
NDF in total ration, g/kg DM*[1]	320–450	320–360	< 320
Chewing time index min/kg DM[1]	> 32	> 32	< 32
Total DM-intake kg/cow*	> 22	> 21	< 20
Adaptation period before calving	3 weeks	2 weeks	< 1 week
UREA per cow, average	4–5	3–6	< 3 or > 6
% cows BHBA FPM[2] > 1.2**	≤ 5%	≤ 10%	> 20%

*Depends on stage of lactation, total feed ration and cows, **Measured with Freestyle Precision Unit 5-15 days after calving

[1]According to NORFOR [2]FPM=First Test Milking

Environmental udder bacteria

Action area 6

Minerals & Vitamins

How to succeed:

1. Check the total feed ration's contents of minerals and vitamins
2. Give pregnant cows minerals and vitamin E during the last trimester
3. Provide one feed slot per cow in feed alley
4. Give minerals and vitamins that taste good so that the cows eat them
5. Permanent and well fertilized pastures may be low in minerals and vitamins

Common mistakes

- Low levels of minerals and vitamins in the feed, including pastures
- Pregnant cows do not receive minerals and vitamins
- Low ranking cows do not get enough minerals and vitamins due to too few feed slots or empty feed bunkers/alley
- Potassium content in silage is too high

Evaluation

Parameter	Target	OK	Alarm
Paresis and muscle spasms	< 2%	< 3%	≥ 5%
Potassium level in silage, g/kg DM	< 20	< 25	≥ 25
Magnesium in forage, g/kg DM	≥ 1.8	≥ 1.7	< 1.7
Cows per feed slot	≤ 1.5	≤ 2	> 2

Environmental udder bacteria

Action area 7

Other Diseases

How to succeed

1. Separate entrance for visitors. Visitors change into visitors' clothing and footwear
2. The room should have facilities for washing hands, clothes, boots and equipment
3. Ensure your farm is free of BVDV, salmonella, RS- and coronaviruses
4. Do not buy animals from other herds - maintain a closed herd
5. Keep a high level of general biosecurity on your farm
6. Hire a claw trimmer that can register and treat claw diseases in your cows

Common mistakes

- No separate entrance and no on-farm visitor clothing/footwear
- Live animals are bought from herds with unclear health status
- Live animals are bought from herds with contagious diseases such as salmonella, RS- and coronaviruses or *Str. agalactiae*.

Evaluation

Parameter	Target	OK	Alarm
Recruitment by buying animals	Never	Heifers some years	Every year
Pneumonia in calves	None	Low level	Every month
Diarrhea in calves	None	Low level	Every month
Calf mortality 1-90 days	None	< 8%	> 10%
On-farm protective clothing	Boots and coat	Coat only	None
Claw trimming	All cows ≥ 2 times/year	2 times / year	At increased claw length
Claw diseases, registration	Database egistration	Leaves a written report	No

Environmental udder bacteria

Action area 8

Low Stress Handling

How to succeed

1. One cubicle/lying place for every cow
2. One cow per feeding slot
3. Forage or total mixed ration (TMR) available 23 hours per day
4. Designated days and times of day for moving animals
5. Always move at least 2 cows together
6. Make sure that the calf attaches to the handler in the first 10 days of life

Common mistakes

- Too many cows in resting area
- Too many cows in eating area
- Too much time spent in holding pen before milking
- Access to feed less than 22 hours per day
- Aggressive and loud handling of animals

Evaluation

Parameter	Target	OK	Alarm
Stocking density resting area	< 1 cow/cubicle	1 cow/cubicle	> 1 cow/cubicle
Stocking density, cows / feed slot	≤ 1.5	≤ 2 cows	> 2
Time spent waiting before milking	≤ 45 min	≤ 60 min	≥ 80 min
Access to feed	≥ 23 hours	≥ 22 hours	<20 hours
Defecation during milking	Never	≤ 10% of cows	> 10% of cows
Oxytocin to heifers	Never	≤ 10%	≥ 10%
Oxytocin to cows	Never	Never	Sometimes

Environmental udder bacteria

Action area 9

Biosecurity at Calving

How to succeed:

1. Group according to udder health at calving
2. Use individual pens for calving
3. Clean the calving pens between each calving
4. Separate heifers from older cows 3 weeks before calving
5. Dry cow treatment according to guidelines
6. Perform CMT on fresh cows and culture if CMT ≥ 3

Common mistakes

- Cows calve in a group pen
- Infected cows are housed with healthy cows before calving
- Udder health status of newly calved cows is not evaluated

Evaluation

Parameter	Target	OK	Alarm
New infection rates in newly calved cows	< 5%	< 10%	> 15%
Incidence of mastitis treatments	5%	10%	≥ 20%
Calculated BTSCC	< 150,000	< 200,000	> 250,000
Cleared infections during dry period	70%	50%	< 30%
Proportion *S. aureus* infected cows in herd	< 5%	10%	20%
***Str. agalactiae;* BT* PCR**	0	0	Detected
***Mycoplasma bovis;* BT* PCR**	0	0	Detected

*Bulk Tank analysis

Environmental udder bacteria

Action area 10

Dry Cow Routines

How to succeed

1. Adjust feeding to reach daily production of 15–25 kg before initiation of dry off
2. Exclude concentrates and move cows to separate pen at the start of dry off
3. Milk at intervals of 36–48 hours
4. Only use dry cow treatment on cows with good prognosis of clearing infections

Common mistakes

- Dry period is more than 10 weeks
- Insufficient feed distribution to cows
- Insufficient hygiene when treating dry cows

Which cows should I treat with long-acting dry cow therapy?

Check the cows' cell count series and use dry-cow preparations selectively:

- Do not treat cows in udder health class (UHC) 0-2 at dry off, corresponding to SCC < 200,000 in the last 3 months prior to dry off
- Treat cows in UHC 3-8, corresponding to cows with SCC 200,000-500,000 in the last 3 months prior to dry off, according to mastitis during lactation, SCC dynamics and bacterial findings
- Do not treat cows in UHC 9, corresponding to cows with SCC consistently >500,000

Never treat:

- Cows with penicillin-resistant staphs

Evaluation

Parameter	Target	OK	Alarm
New infections - calving cows	< 5%	< 10%	≥ 15%
Cleared infections during dry period	> 70%	> 50%	< 30%
Length of dry period	7 wks.	6 - 9 wks.	< 5 or >10 wks.
Housing of dry cows	Separate barn	Part of milk barn	With lactating cows
Type of housing	Cubicles	Clean, dry deep litter bed	Wet and dirty

Environmental udder bacteria

Action area 11

Milking Routines

How to succeed:

1. Use the same routine at every milking
2. Ensure enough contact time with teats when preparing cows for milking
3. Foremilk all teats in a test cup
4. Perform a pre-milking routine of a minimum of 60 seconds
5. Attach cluster after milk let down
6. Do not let air in at any stage of milking

Common mistakes

- Teat contact-time is too short
- No waiting time (lag-time) to allow for milk let-down
- Milking routine varies
- Cows are stressed during milking

Evaluation

Parameter	Target	OK	Alarm
Preparation time, total	60-90 sec	45-60 sec	< 45 sec
Teat contact time 2/d milking	15 sec	10 sec	< 10 sec
Teat contact time 3/d milking	30 sec	20 sec	< 20 sec
Bimodal milk let-down	None	≤ 10%	> 10%
Defecation during milking	Never	≤ 10%	> 10%
Time spent in waiting pen	≤ 45 min	≤ 60 min	> 60 min
Vacuum drop in milk line*	< 2	< 5	5 or more
Teat-end vacuum* kPa	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Mouth-piece vacuum* % OK	> 75%	> 60%	≤ 50%

*Milking Time Test with a vacuum logger

Environmental udder bacteria

Action area 12

Standing After Milking

How to succeed

1. Fresh feed and water should be available to all cows after milking
2. One feed slot per cow
3. Access to forage for at least 23 hours per day
4. Keep waiting time in holding pen before milking to less than an hour
5. One cubicle per cow in resting area

Common mistakes

- Feed older than 24 hours on feeding table/alley troughs
- Competition for feed - not enough feed slots or not enough feed
- Cows spend too much time waiting in holding pen before milking
- Cows enter resting area directly after milking

Evaluation

Parameter	Target	OK	Alarm
Stocking density, cows/feed slot	< 1.5	2	> 2
Stocking density, resting area	< 1	1	> 1
Forage; kg DM* / cow / 24 hours	12	10	< 8
Time spent waiting, min	25	35	70
Cows milked per hour	> 70	> 50	< 30
Access to feed, hours/day	23	22	< 20
Percent forage in diet	60 %	55 %	< 50%
Water, flow at feed slot	20 l/min	10 l/min	< 10 l/min

*DM – dry matter content

Environmental udder bacteria

Action area 13

Post-milking Teat Disinfection

How to succeed

1. Use a teat dip rather than a teat spray
2. Use a disinfectant with iodine if you have problems with streptococci and staphylococci
3. Use a skin conditioning disinfectant if you have problems with environmental bacteria such as *E. coli* or klebsiella
4. Dip or spray immediately after removal of the cluster unit
5. Wash/rinse the bottle/equipment daily
6. Make sure the teat disinfectant does not freeze
7. Use a teat dip with UV-protection during summertime

Common mistakes

- The teats are not completely dipped or sprayed
- The teat disinfectant is too diluted
- The teat disinfectant has been stored incorrectly
- The teat disinfectant equipment is not properly cleaned between milkings

Evaluation

Parameter	Target	OK	Alarm
Method	Dip	Spray	None
Teat coverage	Complete	Average	Incomplete
Storage	Cool, < +10°C	Around 0°C	Risk of freezing
Function check	Weekly	Sporadic	Never
Choice – *E. coli* and klebsiella	Skin conditioning formula	Does not chap skin	Teat skin chaps
Choice – staphs and strepts	Iodine, ≥ 1,500 ppm	Iodine	Other

Environmental udder bacteria

Action area 14

Milking Order

How to succeed

1. Milk healthy cows before less healthy cows
2. Milk newly calved cows after healthy cows
3. Conduct test milkings every month
4. CMT and sampling for bacteriology of high cell count cows after every test milking
5. CMT and sampling for bacteriology of cows that appear unhealthy

Common mistakes

- No consistent and well-designed milking order
- Newly calved cows are milked before healthy ones
- No knowledge or markup of cows with high cell counts
- No grouping of cows in barn

Evaluation

Parameter	Target	OK	Alarm
Grouping of cows	12 times/year	6 times/year	Never
New infections during lactation /month	< 2%	< 5%	> 10%
CMT equipment available	At milking	On farm	No
Milk sampling equipment available	At milking	On farm	No
Culture at high CMT values	Laboratory	Clinic or on farm	Never
Test milkings per year	12	11	< 11

Environmental udder bacteria

Action area 15

Milk Machine Function

How to succeed:

1. Service the machine at least annually
2. Change liners at recommended intervals
3. Use liners that fit the cows in your herd
4. Use the same type of liner in the milking machine as used for your newly calved cows
5. Milking equipment is compatible with the ISO-norm
6. Perform a Milking time test with a vacuum logger
7.

Common mistakes

- Under-dimensioned milk pipes
- Too many cluster units
- Lack of service of vacuum-valve on claw piece

Evaluation

Parameter	Target	OK	Alarm
Machine service, accord. ISO	Every year	Every year	< Yearly
Liner change after number of milkings (nitrile/silicone)	2,000/8,000	2,500/10,000	> 2,500/10,000
Machine-on-time	5 min	6 min	> 8 min
Vacuum drop milk line*	< 2	< 5	≥ 5
Vacuum at teat end*	36–38 kPa	32–40 kPa	<32 or> 40 kPa
Vacuum in mouthpiece*	10–15 kPa	8–25 kPa	<8 or> 25 kPa

*Milking Time Test with a vacuum logger

Environmental udder bacteria

Action area 16

Breeding for Udder Health

How to succeed

1. Monitor breeding parameters for milk flow, mastitis & high cell counts
2. Do not recruit heifers from cows with low milk flow or poor udder health
3. Inseminate cows with low breeding scores for milk flow with beef semen
4. Use bulls with high breeding scores for udder health
5. Do not use untested bulls for your recruitment animals
6. Check udder health scores of import semen bulls*

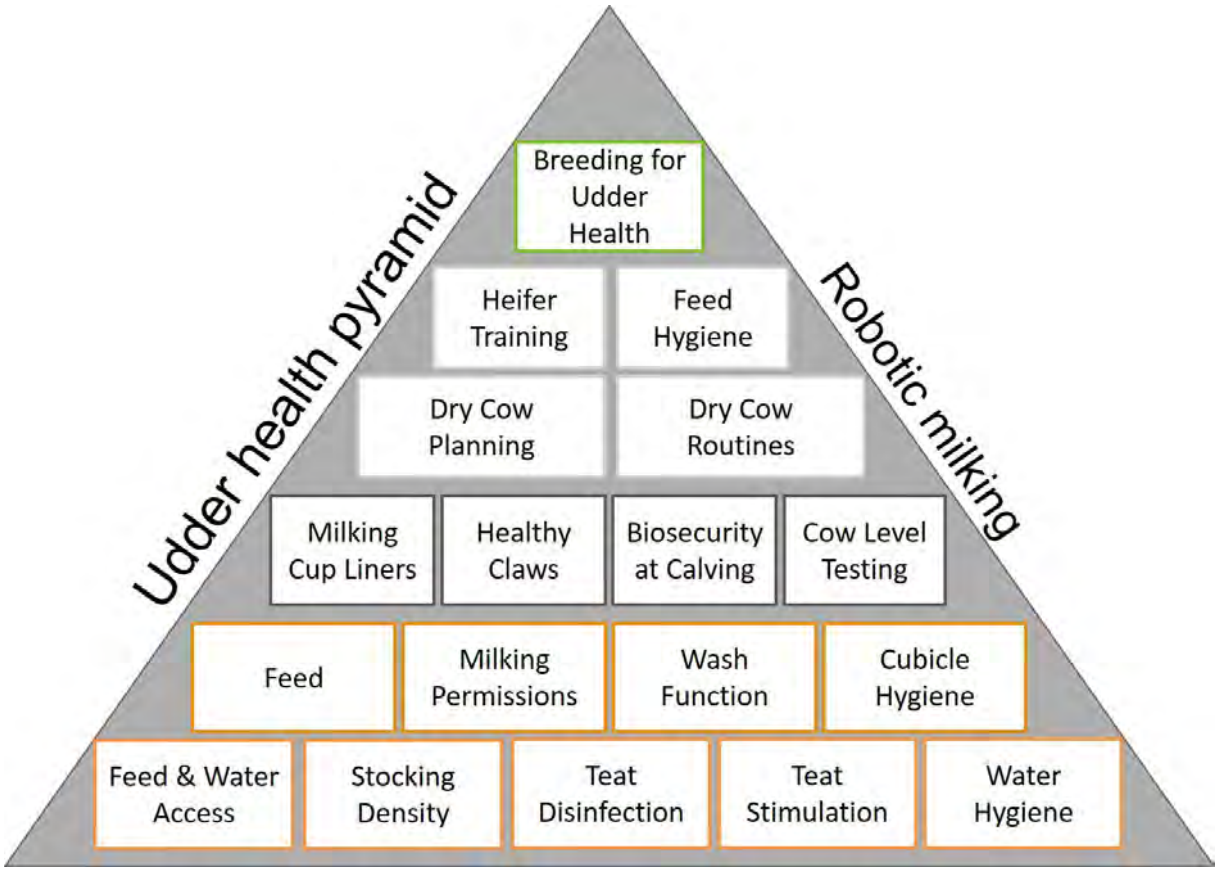
* Use breeding values from Interbull to compare bulls

Common mistakes

- Potential for udder health and milk flow has not been evaluated
- Breeding for high milk flow but not for better udder health
- No systematical breeding for improved udder health

Evaluation

Parameter	Target	OK	Alarm
Test milkings per year	12	11	< 10
Use cow control scheme	Yes	Yes	No
Choice of bull	Planned	Chosen at time of AI	Untested bull
Monitor cows breeding scores	Always	Often	Rarely to never
Use evaluated breeding scores	> Once/year	Once/year	< Once/year



When milking automatically, many management routines are replaced by algorithms and well-functioning techniques. Research and case studies have identified the 18 most important risk areas for poor udder health in automatic milking systems.

The 18 areas are distributed on 4 levels depending on their effect on udder health.

Start from the base and work upwards towards the goal of ≤ 150,000 in herd average BTSCC.

Robotic milking

Action area 1

Feed & Water Access

How to succeed:

1. Make sure that there is always feed available on the feeding table/alley/bunkers
2. Keep the correct stocking density
3. Monitor the dry matter content of your silage/forage
4. Adjust the amount of feed according to consumption
5. Make sure that the silage is tasty and fresh and free from contaminants

Common mistakes

- Out of feed at night
- Feed is not available during parts of the day
- Not enough feed slots
- Not enough places to drink or water flow too low

Evaluation

Parameter	Target	OK	Alarm
Stocking density, cows/ feed slot	≤ 1.5	≤ 2	> 2
Access to feed	≥ 23 hours	≥ 22 hours	< 20 hours
Cows per drinking place	1	1.5	> 2
Water, placement	All parts of barn	Feed table, exit from AMS, waiting pen	Just the resting area
Water, flow at feed table	20 l/min	10 l/min	< 10 l/min

Robotic milking

Action area 2

Stocking Density

How to succeed:

1. 55 - 65 milking cows per milking unit*
2. Calving's are evenly distributed over the year
3. House dry cows separately, out of sight and sound of milking robot
4. Introduce new recruits successively
5. Introduce first parity cows to robot unit after calving

*The highest number is possible with optimal stall design, good cow traffic, evenly distributed calvings and conventional (not ecological) production.

Common mistakes

- Too many cows in barn
- Dry cows among the lactating cows
- Low lactating cows are not dried off in time

Evaluation

Parameter	Target	OK	Alarm
Lactating cows per robot	55-65	55-65	< 50 or > 70
Milking interval	9 – 12 hours	7–8 and 12–13 hours	<7 or > 13 hours
Cows per feed slot	≤ 1.5	≤ 2	> 2
Concentration of forage. kg DM* per cow day	12	10	< 8
Stocking density, resting area	< 1	1	> 1
Cows per drinking place	1	1.5	> 2

* DM=Dry matter

Robotic milking

Action area 3

Post-milking Teat Disinfection

How to succeed:

1. Always use teat disinfection
2. Use teat disinfectant with iodine if you have problems with staphs and strepts
3. Use a skin conditioning teat disinfectant if you have problems with *E. coli* and *Klebsiella*
4. Apply excessive amounts of teat disinfection
5. Make sure the teat disinfection does not freeze
6. Use a teat disinfection with UV-protection when cows are at grass

Common mistakes

- The teats are not completely sprayed
- The teat disinfection is too diluted
- The teat disinfection has been stored incorrectly
- The teat disinfection container is empty

Evaluation

Parameter	Target	OK	Alarm
Teat coverage	Complete	Moderate	Incomplete
Storage	Cool, < +10°C	Around 0°C	Risk of freezing
Function check	Weekly	Sporadic	Never
Choice – staphs and strepts	Iodine, ≥ 1,500 ppm	Iodine	Other
Choice – *E. coli* and *Klebsiella*	Skin softening formula	Does not chap skin	Teat skin chaps

Robotic milking

Action area 4

Teat Stimulation

How to succeed:

1. Use manufacturer's default settings
2. Change cleaning brushes every day and service the wash teat-cup regularly
3. Even distribution of stage of lactation (days in milk) among lactating cows (plan for an even distribution of calvings over the year)
4. First parity cows may need longer preparation time
5. Monitor one entire preparation cycle at least once a day

Common mistakes

- Preparation cycle is too short
- Brushes have not been changed; wash cup has not been cleaned
- The robot unit cannot find the teats

Evaluation

Parameter	Target	OK	Alarm
Total prep-time	60-90 sec	45 – 60 sec	< 45 seconds
Defecation in AMS	Never	≤ 10 %	> 10 %
Vacuum drop milk line*	< 2	< 5	≥ 5
Teat end vacuum* kPa	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Mouthpiece vacuum* % OK	> 75 %	> 60 %	≤ 50 %

*Milking Time Test with a vacuum logger

Robotic milking

Action area 5

Water Hygiene

How to succeed:

1. Drinking-quality water to cows
2. Water troughs cleaned twice a day
3. Water cups cleaned twice a week
4. Water troughs on pastures cleaned at least twice a week
5. Fence off lakes, brooks and fields with stagnant water
6. Take water samples regularly

Common mistakes

- Water source has water of inferior quality
- Bacterial growth in water troughs and cups
- Well is contaminated by surface water
- UV-filter is not working properly

Evaluation

Parameter	Target	OK	Alarm
Result of water analysis	Good	Good	Remark on quality
Water troughs, surface	No remark	Slime on surface	Visible contamination
Water cups, surface	No remark	Slime on surface	Visible contamination
Water source	Public	Drilled well	Dug well
Nitrate, mg/litre	20	40	> 200
pH	7	6–9	> 9 or < 6

Robotic milking

Action area 6

Feed

How to succeed

1. Feed a high proportion of forage (silage or hay) in total ration
2. Adapt cows to lactation feeding 3 weeks prior to calving
3. Feed adequate amounts of energy at calving
4. Target less than 1-unit loss in body condition score in first month after calving
5. Analyze content of nutrients when using home produced feeds
6. Adjust feeding regime according to milk production and stage of lactation

Common mistakes

- Feed bunkers/alley empty for more than 1 hour per 24 hours
- Not enough feeding slots – leads to competition and stress
- No adaptation of feeding period in last weeks before calving

Evaluation

Parameter	Target	OK	Alarm
Percent forage in total ration	> 50 %	≥ 40 %	< 40 %
NDF in total ration, g/kg DM*[1]	320–450	320–360	< 320
Chewing time index min/kg DM[1]	> 32	> 32	< 32
Total DM-intake kg/cow*	> 22	> 21	< 20
Adaptation period before calving	3 weeks	2 weeks	< 1 week
UREA per cow, average	4–5	3–6	< 3 or> 6
% cows BHBA FPM[2] > 1.2**	≤ 5 %	≤ 10 %	> 20 %

*Depends on stage of lactation, total feed ration and cows, **Measured with Freestyle Precision Unit 5-15 days after calving

[1]According to NORFOR [2]FPM=First Test Milking

Robotic milking

Action area 7

Milking Permissions

How to succeed

1. Do not allow more than 4 milkings per 24 hours
2. Ensure all cows are milked with an interval of between 7 and 12 hours
3. Milking targets according to days in lactation:
    - Day 0-90 — 360 minutes or 12 kg — max 5 times / 24 hours
    - Day 90-150 — 390 minutes or 12 kg — max 4 times / 24 hours
    - Day 150- — 390 minutes or 10 kg — max 3 times / 24 hours

Common mistakes

- Permissions too generous for low lactating cows
- Too many milkings with yields less than 5 kg
- Too many cows with low flow rates

Evaluation

Parameter	Target	OK	Alarm
Milking interval, hours	9 – 12	7–8 or 12–13	< 7 or > 13
Machine-on-time, minutes	5 min	6 min	> 8 min
Milk flow, the whole milking	≥ 2 l/min	≥ 1.6 l/min	< 1.5 l/min
Vacuum drop milk line*	< 2	< 5	≥ 5
Teat end vacuum*	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Mouthpiece vacuum*	10-15 kPa	8-25 kPa	< 8 or > 25 kPa

*Milking Time Test with a vacuum logger

Robotic milking

Action area 8

Wash Function

How to succeed

1. Wash whole system 3 times per 24 hours
2. Use a generous amount of teat spray
3. Service and clean the brushes/teat cup wash unit regularly
4. Wash system at not less than 65° C every 5 minutes
5. Clean the outside of your AMS daily

Common mistakes

- AMS is washed less than 3 times per 24 hours
- The cows are dirty when entering the AMS
- The temperature of the wash solution is too low
- There is not enough hot water at > 80° C in your water heater

Evaluation

Parameter	Target	OK	Alarm
Individual Bacterial Count (IBC)	≤ 20,000	≤ 30,000	> 60,000
BT* somatic cell count	150,000	200,000	> 250,000
Fluid wash solution, storage	10°C	10°C	< 5°C
Winter spores (clostridia)	< 200	< 400	1,000
Enterococci; BT* PCR	0	Low	Moderate/high
Thermo-resistant bacteria	< 100	< 300	1,000

*Bulk Tank analysis

Robotic milking

Action area 9

Cubicle Hygiene

How to succeed

1. Clean the cubicles/lying areas twice a day
2. Replace all bedding material within 48 hours
3. Store bedding material in an area separate from where animals are housed
4.
5. Adjust cubicles according to size of your cows
6. Good ventilation for drier air
7. Use disinfecting additives in bedding material

Common mistakes

- Lying areas are not sufficiently clean and dry
- Leaking milk from cows in lying areas
- Bedding material is stored in barn in front of cows
- Wet sawdust creates heat in bedding

Evaluation

Parameter	Target	OK	Alarm
Number of cleanings of cubicles/free stalls per day	3–4	2	< 2
Dry bedding under udders	Every cleaning	Every day	> 2 days
Turn-over of bedding	24 hours	48 hours	> 3 days
Proportion of cubicles/free stalls with leaked milk	None	< 10 %	> 20 %
Bedding, properties	Clean and dry	Damp but unsoiled	Mixed with dirt
Bedding, storage	Cool and dry	Not dry in barn	Wet and damp

Robotic milking

Action area 10

Milking Cup Liners

How to succeed

1. Change liners on time
2. Use teat cup liners that fit the cows in your herd
3. Breed for dairy cows with similar looking teats – size and conformation
4. Perform a Milking Time Test with a vacuum logger

Common mistakes

- Arbitrary choice of liners – cows' teats not measured
- Many cows have short and/or narrow teats
- Compensation of low flow rates with higher vacuum settings

Evaluation

Parameter	Target	OK	Alarm
Liner change at number of milkings nitrile/silicone	2,000/8,000	2,500/10,000	> 2,500/10,000
Machine-on-time	5 min	6 min	> 8 min
Milk flow, all of milking	≥ 2 l/min	≥ 1.6 l/min	< 1.5 l/min
Vacuum drop in milk line*	< 2	< 5	≥ 5
Vacuum at teat end*	36-38 kPa	32-40 kPa	< 32 or > 40 kPa
Vacuum in mouthpiece*	10-15 kPa	8-25 kPa	< 8 or > 25 kPa
Checked size and shape of teats	Every 2 years	Done once	Never

*Milking Time Test with a vacuum logger

Robotic milking

Action area 11

Healthy Claws

How to succeed

1. Bathe cows' feet with an effective agent on a regular basis
2. Provide good cow comfort in laying areas
3. Clean and dry conditions for walking and standing areas
4. Trim cows' feet 2 months before and 2 months after calving
5. Trim cows with claw problems once again in the middle of lactation
6. Elevation plate attached immediately on cows with sole ulcers
7. Attach bandage on cows with salicylic acid or cows with digital dermatitis and/or mild foot rot (panarithium)

Common mistakes

- Claw diseases are not dealt with until cows are lame
- Cows that appear healthy are not regularly trimmed
- Cows are trimmed but diseases are not discovered or treated
- No registration of claw health status is done at trimming

Evaluation

Parameter	Target	OK	Alarm
Cows get feet trimmed	All, ≥ 2 /year	Twice/year	When needed
Claw health registration	Database registration	Only written report	No
Sole ulcers	≤ 2%	< 4%	> 8%
Digital dermatitis	0	The odd one	> 3%
Claw diseases are dealt with	Directly	Next trimming	Never
Foot bath – interval	Every 14 days	Monthly	When needed
Foot bath – placing	AMS exit	In barn	AMS entrance
Foot bath, change of fluid	100 cows	150 cows	Daily
Cows culled claw and leg problems	0	≤ 2%	> 2%

Robotic milking

Action area 12

Biosecurity Calving

How to succeed:

1. Group according to udder health at calving
2. Use individual pens for calving
3. Clean the calving pens between each calving
4. Separate heifers from older cows 3 weeks before calving
5. Dry cow treatment according to guidelines
6. CMT of cows at calving, sample for culturing if CMT ≥ 3

Common mistakes

- Cows calve in a common calving pen
- Infected cows are housed with healthy ones before calving
- No diagnosis or knowledge of udder health of newly calved cows

Evaluation

Parameter	Target	OK	Alarm
New infections – calving cows	< 5%	< 10%	> 15%
Mastitis treatments	5%	10%	≥ 20%
Calculated BTSCC	< 150,000	< 200,000	> 250,000
Cured during dry period	70%	50%	< 30%
Proportion *S. aureus*	< 5%	10%	20%
***Str. agalactiae*; BT* PCR**	0	0	Detected
***Mycoplasma bovis*; BT* PCR**	0	0	Detected

*Bulk Tank analysis

Robotic milking

Action area 13

CMT & Bacteriology

How to succeed

1. Note the behavior of your cows every morning and evening
2. Check the body temperature of cows with peculiar behaviour
3. CMT on cows with body temperature > 38,5 ^{o}C
4. Check cell count history before treatment
5. Call your veterinarian directly regardless of day of the week or time of day
6. Use only antibiotic preparations of penicillin

Common mistakes

- Udder diseases are not detected
- Body temperature and CMT are not checked
- The veterinarian is not called on nights and weekends
- The veterinarian is called when the milk “looks like porridge”

Do not use antibiotics on

- Cows with a bad prognosis, such as:
  - Cows with clinical mastitis for the third time in the same lactation
  - Cows with clinical mastitis that have had high cell counts the last 3 months
- Cows with no other symptoms other than high cell counts

Evaluation

Parameter	Target	OK	Alarm
Telephone number of your vet	Available at milking	Yes	No
CMT equipment available	At milking	On farm	No
Sample equipment available	At milking	On farm	No
Notes for peculiar behavior	Yes, in specific spot	Yes	No
Percent use of penicillin for mastitis	> 90%	> 85%	< 80%

Robotic milking

Action area 14

Dry Cow Planning

How to succeed:

1. Clean and dry laying areas for all dry cows and heifers
2. Structured drying-off process in a separate pen or part of the barn
3. Keep pregnant heifers in a separate pen for last 3 weeks before calving
4. Keep dry cows with low cell counts separate from other cows
5. Keep dry cows with high cell counts separate from healthy cows

Common mistakes

- Dry cows are kept in the milk barn
- Pregnant heifers are kept with the dry cows
- Calvings occur in the group of dry cows
- The deep-litter bed is dirty and damp – bad for cows and good for bacteria!

Evaluation

Parameter	Target	OK	Alarm
Housing of dry cows	Separate barn	Part of milk barn	With lactating cows
Length of dry period	7 wks.	6 - 9 wks.	< 5 or >10 wks.
Transition in a few days	4–5	6–8	> 8
Test milkings per lactation	12	11	< 11
Cleared infections during dry period	> 70%	> 50%	< 30%
New infection rate at calving	< 4%	< 8%	> 12%
Which cows get treated?	SCC, culture	CMT	Haphazard
Proportion of treated dry cows	20–30%	10–40%	< 10 or > 80%

Robotic milking

Action area 15

Dry Cow Routines

How to succeed

1. Adjust feeding to reach daily production of 15–25 kg before initiation of dry off
2. Exclude concentrates and move cows to separate pen at the start of dry off
3. Milking interval 36–48 hours
4. Only use dry cow treatment on cows with good prognosis of healing

Common mistakes

- Dry period is longer than 10 weeks
- Insufficient feed distribution to cows
- Insufficient hygiene when treating dry cows

Which cows should I treat with long-acting dry cow preparations?

Check the cows' cell count series and use dry-cow preparations selectively:

- Do not treat cows in udder health class (UHC) 0-2 at dry off, corresponding to SCC < 200,000 in last 3 months prior to dry off
- Treat cows in UHC 3-8, corresponding to SCC 200,000-500,000 in the last 3 months prior to dry off, according to mastitis during lactation, SCC dynamics and bacterial findings
- Do not treat cows in UHC 9, corresponding to SCC consistently above 500,000

Never treat:

- Cows with penicillin-resistant staphs

Evaluation

Parameter	Target	OK	Alarm
New infections - calving cows	< 5%	< 10%	> 20%
Cured during in dry period	> 70%	> 50%	< 30%
Length of dry period	7 wks.	5 – 9 wks.	< 5 or > 10 wks.
Housing of dry cows	Separate barn	Part of milk barn	With lactating cows
Type of housing	Cubicles	Clean, dry deep litter bed	Wet and dirty

Robotic milking

Action area 16

Heifers Training

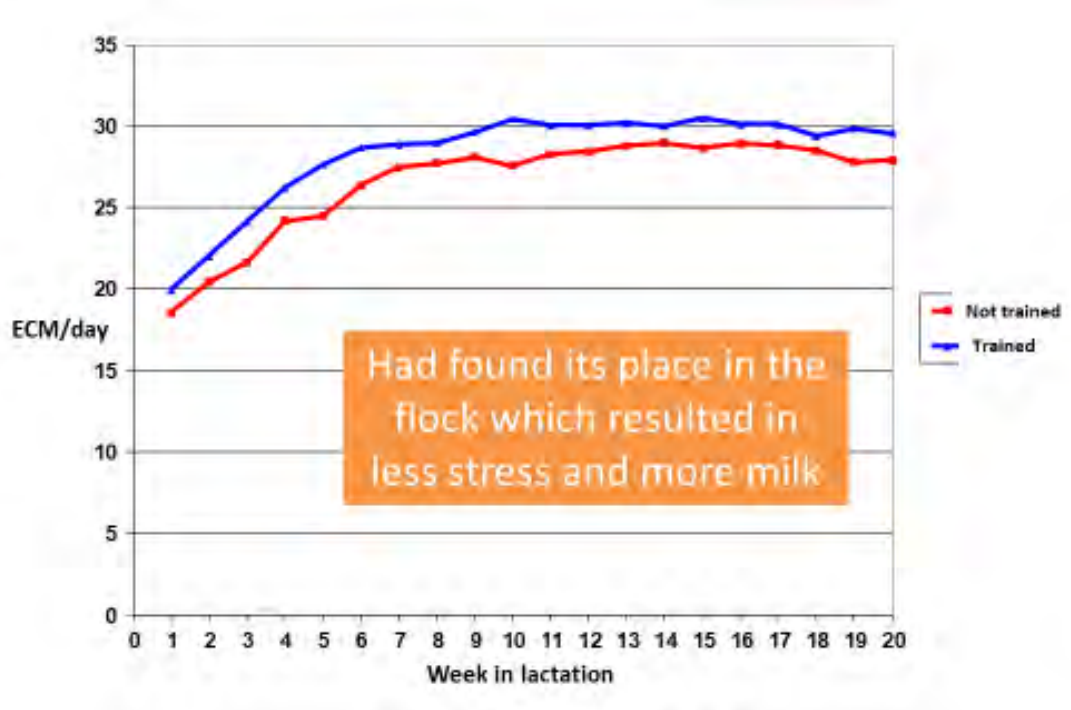
How to succeed:

1. Introduce the heifers to milk-barn in groups of 2-4
2. Keep them with lactating cows for 2-3 wks. not closer than 3 wks. before calving
3. Give them access to the AMS and walk through it but do not feed concentrate there
4. Move the heifers into the calving pen 3 weeks before calving
5. Train the heifers to the AMS after calving

Common mistakes

- Heifers go with the cows in the last 3 weeks before calving
- No training of heifers
- Heifers are forced into the AMS before calving

This heifer management gives you more milk during the entire lactation:



Robotic milking

Action area 17

Feed Hygiene

How to succeed

Forage – especially silage

1. Fill silage containers quickly, pack well
2. Adjust conservation method according to DM*
3. Check for heat in silage every day
4. Discard bad silage

Concentrates

1. Good quality, store in dry place
2. Protect from rats and other vermin
3. Fill cold in bunk/sack/silo
4. Check for heat in silage weekly

Equipment

1. Sweep the feeding table/alley daily
2. Mix a new ration every day
3. Empty the mixer wagon after feeding
4. Include leftovers from last filling in next batch of mixed feed
5. Clean concentrate dispensers every week

Common mistakes

- Insufficient conservation
- Silage is not removed from storage fast enough
- Mold in silage/grain/concentrate
- Mixer wagon not cleaned properly
- Feeding table not swept properly

Evaluation

Parameter, silage	Target	OK	Alarm
Heat in silo	None	Lukewarm	Hot
NH3, % of N	< 4	< 8	≥ 12
pH silage, < 25% DM	< 4.2	< 4.2	> 4.5
pH silage, > 25% DM	Under critical level	Under critical level	Above level
Butyric acid	< 0.1%	0.1 – 0.2%	> 0.3%
Lactic acid	> 5%	> 4%	< 3%

Parameter, concentrates	Target	OK	Alarm
Aspergillus fumigatus	< 10 CFU/g	< 100 CFU/g	> 500 CFU/g
Percent infected kernels	< 25%	< 35%	> 40%
Water activity (aw)	< 0.75	< 0.75	> 0.75

pH is dependent on DM content. Formula for DM correction: (0,0257* DM % in silage) + 3,71 = critical pH-level

*DM=dry matter

Robotic milking

Action area 18

Breeding for Milk Flow

How to succeed:

1. Monitor breeding parameters for milk flow, mastitis & high cell counts
2. Do not recruit heifers from cows with low milk flow or bad udder health
3. Inseminate cows with low breeding scores for milk flow with beef breeds
4. Use bulls with high breeding scores for udder health
5. Do not use untested bulls for your recruitment animals
6. Check udder health scores of foreign bulls*

* Use breeding values from Interbull to compare bulls

Common mistakes

- Your cow's potential for udder health and milk flow has not been evaluated
- Cows are bred for high milk flow but not for better udder health
- Cows are not systematically bred for improved udder health

Evaluation

Parameter	Target	OK	Alarm
Test milkings per year	12	11	< 10
Use cow control scheme	Yes	Yes	No
Choice of bull	Planned ahead	Chosen at time of AI	Untested bull
Monitor cows breeding scores	Always	Often	Rarely - Never
Use evaluated breeding scores	> Once/year	Once/year	< Once/year