Keeping up good udder health in automatic milking

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Automatic handling of the cow during milking requires successful completion of many different procedures. Besides that, we need to understand the complex nature of the interaction between the cow, environment, management and milking.

Why is udder health situation not the best in AMS and why?

According to several studies, udder health has deteriorated at the first year or longer after the introduction of AM. This has happened despite improvements to the milking process, like quarter based milking, more frequent milking, less waiting in front of the milking stall and analysis of milk in every milking.

After the introduction of AM herd size usually increases and cows move to a free-stall barn, with typical problems. These include high infection pressure, problems with hygiene and cow traffic, poor barn design, intense feeding and in cases of overstocking high stress level of cows. Time staff spends per cow decreases, which leads to a need to group cows according to age, state of lactation and health. Also detection methods for diseases change. Solutions for these are well-known. Barn design and cow comfort have a great impact, meaning for example that there are enough comfortable and clean stalls for every cow to lie down.

In addition, AMS poses challenges of its own. For example, lack of grouping of cows with no milking order may lead to transmission of infection through robot or stalls. It would be best to have at least the possibility of having a group of 60 cows per robot. Insufficient milking hygiene may cause invasion of the teat canal with teat skin bacteria or transmission of infection through liners or teat cleaning device. Infrequent and low number of milkings causes mastitis and high number of milkings leads to deteriorated teat condition and mastitis. Cow traffic should be fluid. Poor detection of mastitis may cause transmission of infection.

How do you keep up good udder health in AMS farms?

Some differences between the AMS brands exist, but what makes the difference in milk quality and health of cows is management.

1. Ensure reasonable number of milkings (2-3(4)) with regular intervals of (6)8-12h according to cows state of lactation and milk yield. When this fails, you should check cow traffic including reasons for fetching the cows to the robot and grounds for giving milking permission.

2. Ensure fluency of milking. If more than 3 percent of milkings are unsuccessful, find out whether this concerns many cows or only few cows. Reasons for unsuccessful milkings include dirty laser, failure in robot function, mastitis, restlessness of cows, dirty udders with long hair, unsuitable udder conformation or changes in it due to infrequent MIs, and too high switch level in relation to milk flow rate.

3. Ensure good milking hygiene-observe milking procedure. If less than 95 percent of teat cleanings fails check for the same explanations that cause unsuccessful milkings. Teats should be reasonable clean before teat cleaning (1-2 on the scale 1-4), because cleaning methods are not adequate for very dirty teats. In AM clean environment with no cows lying on the alleys is of utmost importance. Teat cleaning device should be clean and length of teat cleaning procedure adjusted properly. Teat tip and skin should be smooth.

4. Ensure good teat condition (<3 % class III teats) with monthly follow-up to help reducing mastitis incidence. AMU settings (vacuum, pulsation, switch-level, suitable liners) should be carefully monitored and adjusted to keep the teats in good condition and avoid unpleasant or painful milking.

5. Ensure that farmer understands mastitis detection system of the robot. Milk EC and colour are insufficient indicators especially for detection of subclinical, but also for clinical mastitis. Mastitis may not be detected or milk that is
suitable for consumption may be separated or falsely alerted. However, automatic analysis of cowSCC or quarterCMT seems promising in mastitis detection. It is important to help the farmer to find out what is measured, and which the alert thresholds are. Results of AMS and other examinations of herd udder health should be compared. If there is much contradiction between the two, the thresholds could be changed, but never without follow-up.

6. Ensure effective udder health follow-up at the farm. This includes daily checks of general condition, udder, cleanliness of cows and BTMSCC, and checking of cows on alert lists (milking, feed consumption, milk yield, unsuccessful milkings, mastitis alerts). Also cows should be screened for SCC monthly, and cows with SCC > 150 – 200 000 should be examined with CMT. Awareness of bacterial distribution on the farm is further increased by taking bacterial samples of highSCC cows particularly after calving and before drying-off, which is important for planning specific control measures. Teat condition and success of milkings and teat cleanings are also followed-up monthly by observing milking process of several cows.

7. Ensure mastitis is not transmitted by different parts of the robot. In AMS milking order is replaced by rinsing and steaming of the liners between cows, but there are observations of S. aureus found on liners after rinsing, which might pose an infection risk. Check whether liners and teat cleaning system are clean before milking. In case of S. aureus or Str. agalactiae, change, clean and disinfect teat cleaning brushes daily. Outer parts of the robot should be cleaned manually with soap and brush daily.

8. Ensure mastitis is not transmitted; use spraying of the teats after milking. Choose moisturizing teat spray that is effective against the mastitis bacteria in the farm. Always check suitability of the composition from the robot company, because some agents are detrimental to the hoses. Check whether teats are covered by the spray.

9. Ensure mastitis is not transmitted via cows and stalls. Preventing milk leakage is important, as well as grouping the cows according to udder health. Cows with ab-treatment would be best to milk in a treatment pen. If milked with the robot, this should be done under supervision 2 times/day and use system wash afterwards.

10. Ensure bookkeeping exists.

What to do at udder health consultation visit as advisor or vet?

Experts on animal health and welfare should be involved in the planning process when changing over to AM. Udder health work starts before introduction of AMS with checking of the suitability of cows (especially new purchased cows and heifers), culling of cows with chronic mastitis, survey of distribution of mastitis bacteria and teat condition. The aim is to have a healthy herd at introduction of AMS.

After introduction of AMS, udder health visit consists of gathering information from the robot (both cow and robot based data, and information of AMS settings). Observations concerning udder health of the cows include overview of SCC and mastitis bacteria on farm. Milkings of several cows are monitored to find out the efficacy of teat cleaning, fluency of milking and teat condition. Observations of feeding, hygiene and barn design are made and finally an analysis of the situation is made and recommendations suggested.

As we have learnt from experience, “automatic” does not indicate that the role of the herdsman is in any way diminished. With skilful management and careful observation of the cows, udder health can be maintained good or even improved in AM.

This presentation was based on:

Instructions of MTT’s (MTT Agrifood Research Finland) Milking Installations group.

Oral presentation also: “Grouping strategies in large free-stall barns in Finland”, 2010-2013. Department of production animal medicine, MTT, TTS (Work Efficiency Institute).
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Outline of the presentation

Why is udder health situation not the best in AMS and why?
Does it matter what robot you use?
How do you keep up good udder health in AMS farms?
What to do at udder health consultation visit as advisor or vet?

Why should udder health be better in AMS?

Why is udder health worse in AM? (Hovinen, Rasmussen, Pyörälä 2009 and many more)

Large free stall barns: infection pressure (overstocking), stress, function of cow traffic, barn design, feeding, hygiene
Lack of grouping of cows:
- no milking order – transmission of infection through robot
- milk leaking AMS > free-stall barn > tie-stall barn
(Persson Waller et al., 2003) – transmission through stalls
Insufficient milking hygiene:
- suboptimal milking conditions (overmilking) lead to invasion of teat canal with teat skin bacteria
- bacterial transmission through liners/teat cleaning device
Milking frequency:
- infrequent milking/ low number of milkings – mastitis
- high number of milkings – deteriorated teat condition - mastitis
Detection of mastitis (especially subclinical) challenging – transmission of mastitis

Some differences between brands

Lely Astronaut
- No handling of the cow at robot
- No free cow traffic
- Ready-made settings in the system, easy to use (switch-level, milking permission, dry-off schedule)
- Cleaning the teats with brushes
- Mastitis detection EC – MQC-C

DeLaval VMS
- Handling possible, manual use of the robot
- Mainly guided traffic
- User makes decisions, settings easy to adjust
- Cleaning the teats with cleaning cup
- Mastitis detection EC: blood, OCC

But….Management makes the difference!
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**Ensure reasonable number of milkings with regular intervals**

- Milk cows 2-3(4) times a day
- < 6 h milking intervals (MI) may be detrimental to teat tissue (recovery may take 6 hours) because milking time with low milk flow increases
- Too long MIs may cause bacteria to colonize teat causing mastitis
- MI should be 6-12 h (with expected milk amount 8-12 kg) and variation of MI less than ± 30 % (e.g. milking 3x/day, MI 8 h, variation 5.5-10.5 h)
- Check the lists by cow!
- If not OK, check:
  - Milking permission – if you make changes, follow the results
  - Cow traffic (queue in front of robot <2 cows, feeding, waiting area, overstocking)
  - Reasons for fetching the cows (<2 - 5% of the cows) – disease, hoofs, cows that need attention during milking (mastitis, udder conformation, unsuccessful milkings), first parity cows, lazy cows (maybe too intense feeding), shy cows, nearly dry cows (do not get food on the robot)

**Ensure fluency of milking**

- Unsuccessful/ incomplete milking: attachment fails or teat cup takes off too early
- Milking permission right after Leads to milk leakage (should be <10% of cows), discomfort, impaired milk ejection, disturbed milking routine
- Check lists twice a day: unsuccessful milkings, (milking times of cows) <3% of milkings should be unsuccessful:
  - If more in many cows: dirty laser, failure in robot function, changes in udder conformation due to infrequent MIs
  - If some cows/one cow has several: mastitis, restlessness of cow, dirty udder with long hair, unsuitable udder conformation, too high switch level in relation to milk flow

**Ensure good milking hygiene – follow-up of milking procedure**

- >95% of teat cleanings should be technically successful
- - check for restlessness of cows, long udder hair, unsuitable udder conformation, technical failures, cleanliness of laser
- - Teats should be clean before teat cleaning – and after (should be 1-2 on the scale 1-4)
  - - teat cleaning device settings: number of brushings, length of teat cleaning cycle
  - - cleanliness of teat cleaning device
  - - teat condition – teat tip, dryness of skin
  - - no cows that lay on the alleys
  - - clean environment

**Ensure good teat condition – follow-up of milkings**

**Finnish recommendation: teat condition**

class I (healthy) 70-80%, class III < 3%

**Suitable liners**

Switch level; VMS 250 g/min, delay 5 -10s (adjustable), Lely fast take-off

**Vacuum (43 – 46kPa) and pulsation (63 -65) (testing and service reports)**

**Check residual milk for overmilking**

**Check changing time of liners (2000 -10 000)**

**Check milk amount/milking (10 -12 kg)**

**Check milking time and milk flow**

**Testing of the robot during milking**

**Follow up teat condition after any changes made**

**Electrical conductivity (EC) in mastitis detection (Hovinen et al., 2006)**

**Subclinical mastitis:**
- Correlation of SCC and EC <0.4
- Of quarters with > 1 milj. cells/ml
- 9 ja 43 % were detected
- Of quarters with >400 000 cells/ml 9 and 32 % were detected
- False positive alerts 0/7 and 6/17
- Correlation of SCC and EC <0.4

**Clinical mastitis:**
- 4/7 and 10/17 quarters had an alert on the day mastitis was detected

**Milk colour in mastitis detection**

**Clinical mastitis (Hovinen et al., 2006):**
- 8/17 quarters with mastitis had an alert on the day of detection, milk of only 2 quarters was separated
- 5 quarters with bloody milk were all detected, but milk of only 2 quarters were separated (only one based on red colour blood)

**Rasmussen & Bjerring, 2005:** All milk with 0.1% continuous blood flow was detected
Automated SCC in mastitis detection

VMS: OCC counts cells for cowSCC of whole herd or individual cows; adjustable limits of alert. Not for separation of milk. Whole milk is used.
- Lely: MQC-C analyses quarter CMT-test (I-V) of whole herd or individual cows; adjustable limits of alert. Not for separation of milk. First milk is used.
- Hanna Poskiparta, HAMK University of Applied Sciences, Finland 2009: milk producers were mainly satisfied and adjusting possibilities were used
- Correlation between laboratory SCC and AMS SCC has been only 0.4-0.8 depending on the study

Herd Navigator™- herd management program

- LDH enzyme analysis
- Analyses, detects, recommends action
- Chagunda et al., 2006: SE for clinical mastitis detection was 85%, SP 99%

Ensure that farmer understands mastitis detection system of the robot

- EC and milk colour are insufficient indicators especially for detection of subclinical but also for clinical mastitis and milk separation (Rasmussen, 2004, Hovinen et al., 2006) – may lead to transmission of infection
- VOC/MQC-C seems promising
  - Problems:
    - mastitis may not be detected
    - milk that is suitable for consumption may be separated/ falsely alerted
- Help farmer to find out what is measured, and which are the alert thresholds
- Compare results of AMS and your own examinations of herd udder health. If there is much contradiction between the two, try changing the thresholds, but never without follow-up

Ensure effective udder health follow-up at the farm

- Daily:
  - check general condition and cleanliness of cows
  - check teat tramps and swelling of the udders
  - check cows on alert lists: milkings, feed consumption, milk amount, unsuccessful milkings, AMS mastitis detection
  - BTM SCC (later weekly)
- Monthly:
  - cowSCC follow-up: if cow SCC>150 – 200 000 take CMT and bacterial sample if needed (before introduction of AMS twice a month) – analyse situation (new infections, bacterial diversion of the herd)
  - teat condition (robot settings, barn hygiene)
  - follow-up of milking (see slide 23)
- When needed:
  - check post partum and dry off cows
  - cut udder hair regularly

Ensure mastitis is not transmitted by different parts of the robot

- S. agalactiae infections in AMS-farms in Finland, Sweden, Denmark
- CNS increased in 18 AMS farms in Denmark (Pedersen & Bennedsgaard, 2006), and in farm S. aureus spread to 2/3 of the cows (Zecconi et al., 2006)
- In AMS milking order is replaced by rinsing (25 - 40°C) and steaming (150°C) of the liners between cows
  - S. aureus as indicator of cleanliness of liners (Hovinen et al.2004, unpublished): bacteria was found on liners after rinsing – an infection risk?
- Use longer rinsing/system wash procedures after milk that is separated
- Check whether liners and teat cleaning system are clean before milking
- In case of S. aureus or Str. agalactiae, change, clean and disinfect teat cleaning brushes daily
- Clean outer parts of the robot manually with soap and brush daily

Ensure mastitis is not transmitted – teat spray

- Choose moisturizing teat spray especially if teat skin condition is bad
- Choose teatspray that is suitable for the distribution of mastitis bacteria in the farm
(http://www.mtt.fi/julkaisut/maitokoneet/Vedinkastoyhteenveto.pdf)
- Always check from the robot company – some compositions detrimental to the hoses etc.
- Check area of the udder that is covered by the spray
- Check whether the teat spray is used effectively in the robot
- Ask farmers to check the robot settings
- Sort spray in the container – remember to shake the container
Ensure mastitis is not transmitted via cows and stalls

- Cows with ab-treatment to treatment pen with:
  - a separate milking equipment
  - 2 times milking/day with robot (system wash afterwards)
  - (treatment pen with split-entry to the robot)
- If one robot/ group of cows – grouping according to udder health
- If possible give permission to milk the cow more often (4 times?) – check if it really happens
- Quarter dry off: In Denmark number of cows with one dry quarter was nearly doubled (from 7 to 12%) in AMS (Pedersen et al., 2006).

Ensure bookkeeping exists

- Bookkeeping confirms follow-up of cow health, AMS function and effects of any reconstructive action taken
- Udder health bookkeeping includes:
  - SCC, bacterial analyses, teat condition, mastitis treatments
  - function of mastitis detection and milk separation system (comparison to own observation/udder health visits)
  - function of teat cleaning system (follow-up of milkings)
  - function of milking machine: testing and service reports, changes made to settings of milking and consequences of them, follow-up of milkings

Ensure regular udder health work

- Average Finnish farm looses 350 €/cow/year because of bad udder health (Rajala-Schulz, 2007)
- Start udder health work before introduction of AMS:
  - Suitability of cows (especially new purchased cows and heifers), culling of cows with chronic mastitis, survey of distribution of mastitis bacteria, SCC, teat condition
  - Healthy herd at introduction of AMS!!!!
- In Finland dairy advisors offer two farm visit packages before and after introduction of AMS

Udder health visit – what to include

- Data from the robot:
  - per cow:
    - production, milk flow, milkings, MI and variation of MI, unsuccessful milkings, teats that are dried off, milking time, overmilking time, alert lists of milk quality (EC, colour, SCC), cows whose milk is separated
  - per robot:
    - production, amount of separated milk, milk flow, milkings, unsuccessful milking, passages through robot or smartgate without milking, utilization rate, milking time, overmilking time
  - AMS settings (robot/cow/quarter):
    - vacuum, pulsation, switch level, milking permission, thresholds for alerts indicating mastitis, cleansing and rinsing of the system, teat cleaning, how many times liners have been used
- Cow observations:
  - Overview of SCC and mastitis bacteria on farm
    - automatic milk sampler on farm before visit to get cowSCC (DCC, lab, CMT)
    - OCC, MQC-C?
    - CMT and bacterial sampling during visit or before
  - Follow-up of milking: efficacy of teat cleaning, attachment of teat cups, overmilking, teat condition, teat spray, teat tramps, cow behaviour at milking
  - Fill in special forms made for cases of udder health or milk quality problems
  - Analyse and solve the problem

Photo: Satu Pyörälä
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