Mastitis Epidemiology

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OVERVIEW

Mastitis epidemiology

- Multifactorial disease
- Multifactorial approach
- Conclusions
OVERVIEW

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Risk of mastitis

Generally speaking: risk of mastitis is determined by an equilibrium between

- **Exposure to mastitis pathogens**
- **Bovine defence mechanisms**

= Basis for prevention
Multiple players

Bacteria
Cow
Farmer
Quarter

Risk

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Multiple players - stratification

Based on the structure of the cell wall:
- Gram-positive (e.g. Staphs, Streps)
- Gram-negative (e.g. *E. coli*)
- Pathogens without cell wall (e.g. Mycoplasma)

Based on ecology:
- Cow-/udder-adapted pathogens (e.g. *Strep. agalactiae*)
- Environmental pathogens (e.g. *Klebsiella*)
Multiple players - stratification

- Based on the virulence characteristics:
  - Major pathogens (e.g. *Staph. aureus*)
  - Minor pathogens (e.g. *Corynebacterium bovis*)

- Based on the epidemiology:
  - “Contagious pathogens” (*Staph. aureus*)
  - “Opportunistic pathogens” (*Pseudomonas*)
“Contagious pathogens”

- Mammary gland and/or teat skin = predominant reservoirs of infection
- Need the cow/udder to survive and multiply
- Transmitted from the infected cow or quarter to the teats of non-infected cows/quarters during the milking process via hands, cloths, teat liners ...
- Colonies become established at the teat end and slowly grow through the canal over 1-3 days
“Environmental pathogens”

- Environment = reservoir of infection
- Do not need the cow/udder to survive and multiply
- Transferred from the environment to teats between milkings
- Penetration teat canal occurs either between 2 milkings when teats are in close contact with stall floor or by propulsion on a reverse flow of milk
- Many new IMI occur during the dry period
Multiple players

- Age
- Breed
- Lactation stage
- Genotype
- Milk yield level

Cow

- Position
- Lesion
- Colonised
- SCC
- Hyperkeratosis
- ...

Quarter

Multiple factors
... Differences between cows ... 

... Clinical mastitis incidence in Flanders ... 

Quarter cases per 10,000 cow-days at risk

Week after calving

Heifers

Cows

Verbeke et al, 2015
... Differences between quarters ...
Multiple players Farmer

- “Quick and not-so-clean” vs “clean and accurate”
- Motivated vs non-motivated
- Hard-to-reach vs easily-reached farmers
- ...

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... Differences between farmers ...
Hypothetical quarter with the lowest probability of having/getting IMI

left front quarter with a teat-end of impeccable quality, colonized with CNS, a SCC of $50 \times 10^3$ cells/mL, high proportion of viable milk PMN, no history of IMI ...

belonging to a late lactating, healthy, unstressed heifer, with a clean udder, without nutritional deficiencies, and not too high producing ...

managed by a clean, accurate, motivated, easily-reached farmer in a spotless, well-ventilated stable ...
Hypothetical quarter with the highest probability of having/getting IMI

Quarter
right hind quarter with a teat-end with severe hyperkeratosis and a lesion, colonized with *S. dysgalactiae*, a SCC of 1000x10³ cells/mL, lots of apoptotic milk PMN, and a history of CM ...

Cow
belonging to an early lactating, BVDV-infected, lame, stressed cow in 8ᵗʰ lactation, with a dirty udder, deficient in vit E and se, and very high producing ...

Farmer
managed by a quick and not-so-clean, non-motivated, difficult-to-reach farmer in a messy, dark, non-ventilated stable ...
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Mastitis: multifactorial approach

- Mastitis is a complex disease
  - Multiple players (bacteria - cow/quarters - farmer)
  - Multiple factors explaining variability in susceptibility

- General strategy
  - Based on 2 simple principles
  - Application of (adapted) NMC 10-point prevention and control program
General strategy

- 2 Simple principles of mastitis prevention and control program:

1. Appropriate action for **Existing infections (E)**
   - *Treatment* of cows likely to cure
   - *Culling* (segregation) of cows unlikely to cure

2. Prevention of **New infections (N)**
   - ↓ *Exposure* of animals to bacteria
   - ↑ *Susceptibility/resistance* of animals against infections
10 POINT PROGRAM

1. Excellent milking technique

Appropriate action for Existing infections (E)
Prevention of New infections (N)
10 POINT PROGRAM

1. Excellent milking technique  N
2. Well-functioning milking machine  N
10 POINT PROGRAM

1. Excellent milking technique  
2. Well-functioning milking machine  
3. Excellent comfort and hygiene  

Appropriate action for Existing infections (E)

Prevention of New infections (N)
10 POINT PROGRAM

1. Excellent milking technique  \[N\]
2. Well-functioning milking machine  \[N\]
3. Excellent comfort and hygiene  \[N\]
4. Correct treatment of subclinical and clinical mastitis  \[E + N\]
10 POINT PROGRAM

1. Excellent milking technique
2. Well-functioning milking machine
3. Excellent comfort and hygiene
4. Correct treatment of subclinical and clinical mastitis
5. Culling of chronic cases

Appropriate action for Existing infections (E)
Prevention of New infections (N)

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10 POINT PROGRAM

1. Excellent milking technique
2. Well-functioning milking machine
3. Excellent comfort and hygiene
4. Correct treatment of subclinical and clinical mastitis
5. Culling of chronic cases
6. Optimal dry-cow management

Appropriate action for Existing infections (E)
Prevention of New infections (N)
10 POINT PROGRAM

1. Excellent milking technique
2. Well-functioning milking machine
3. Excellent comfort and hygiene
4. Correct treatment of subclinical and clinical mastitis
5. Culling of chronic cases
6. Optimal dry-cow management
7. Excellent heifers management

Appropriate action for Existing infections (E)
Prevention of New infections (N)
10 POINT PROGRAM

1. Excellent milking technique
   N
2. Well-functioning milking machine
   N
3. Excellent comfort and hygiene
   N
4. Correct treatment of subclinical and clinical mastitis
   E + N
5. Culling of chronic cases
   E + N
6. Optimal dry-cow management
   E + N
7. Excellent heifers management
   N
8. Excellent animal health / immunity
   E + N
10 POINT PROGRAM

1. Excellent milking technique
2. Well-functioning milking machine
3. Excellent comfort and hygiene
4. Correct treatment of subclinical and clinical mastitis
5. Culling of chronic cases
6. Optimal dry-cow management
7. Excellent heifers management
8. Excellent animal health / immunity
9. Improved breeding policy

Appropriate action for Existing infections (E)  Prevention of New infections (N)
10 POINT PROGRAM

1. Excellent milking technique
2. Well-functioning milking machine
3. Excellent comfort and hygiene
4. Correct treatment of subclinical and clinical mastitis
5. Culling of chronic cases
6. Optimal dry-cow management
7. Excellent heifers management
8. Excellent animal health / immunity
9. Improved breeding policy
10. Monitoring/evaluation

Appropriate action for Existing infections (E)
Prevention of New infections (N)
Step 1: Somatic cell count analysis + clinical mastitis cases

Step 2: Milk sampling high SCC cows + clinical mastitis cases

Step 3: Bacteriological culturing
- Gram-pos. versus gram-neg.
- Major and minor
- Contagious versus environmental

Step 4: Making decisions SCM
- SCM 
  → treating
  → re-sampling
  → waiting
  → culling
- Treatment plan CM

- Adjust prevention and control
- SCM
- Revise the aims

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Appropriate action for Existing infections (E)
Prevention of New infections (N)

Farmers’ motivation
Advisors’ communication
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Conclusions

- Mastitis is a multifactorial disease with multiple players
- Implementation of the 2 basic principles (existing cases and new cases) via the (adapted) NMC 10 point program = basis for excellent udder health
Thank you