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Treatment of mild to moderate clinical mastitis in dairy cows: local or combined administration of penicillin?

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Background

Clinical mastitis is the most common cause of antibiotic treatment in dairy cows worldwide. Due to the risk of antimicrobial resistance, **antimicrobial usage should be reduced**. In the Nordic countries non-severe clinical mastitis is often treated with penicillin given systemically or as a **combination of systemic and local treatment**. The amount of penicillin (active compound) is 16 times higher in a combination treatment (IMM+IM) compared to a local treatment (IMM).

The **aim** of this study was to **determine if the effect on bacteriological cure of local treatment was non-inferior to the effect of combined treatment for mild to moderate clinical mastitis**.

Methods

Mild to moderate clinical mastitis cases from cows on 12 farms were selected using an **on-farm test** to differentiate between mastitis cases with no growth, Gram positive or Gram negative bacteria. Mastitis caused by **Gram positive bacteria** were treated either local (IMM) for 3 days or local and systemic (IMM + IM) for 3 days. All cows were treated with NSAID while waiting for the result of the on-farm test. **Bacteriological cure** was assessed based on a sample from the clinical case and 2 follow-up samples. Bacterial culture and MALDI-TOF was used for identification of bacteria on species level. **Cure was defined** as up to 2 species identified in the clinical sample not being detected in any of the follow-up samples.

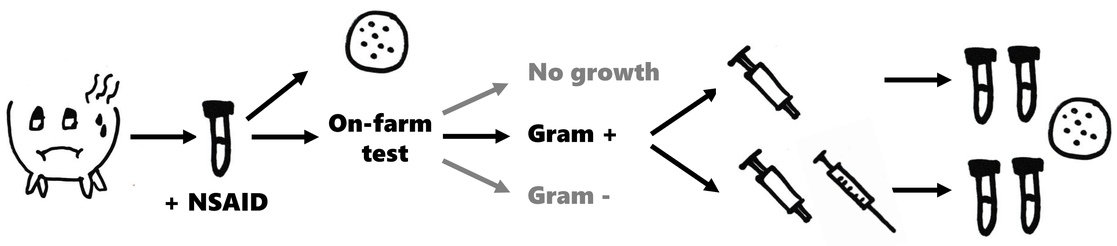

Figure 1. Selection of cases for treatment and follow-up.

We used a **multivariable mixed effects logistic regression model** with a random effect of herd to assess the **effect of treatment on bacteriological cure**. Pathogen, clinical grade of mastitis and cow-level register data such as parity, DIM and SCC were included as additional explanatory variables with potential effect on bacteriological cure.

A **non-inferiority analysis with a pre-specified non-inferiority margin of 15%** was performed based on the output from the model.

Results

1,831 mild to moderate clinical mastitis cases detected → 828 Gram positive on-farm tests → 265 cases with complete data included in analysis

- We found a **less than 15% difference in bacteriological cure rate between local and combination treatment.**
- **High SCC** (> 200,000 cells/mL) at the milk recording prior to the clinical mastitis case resulted in **odds 0.41** [0.20;0.83] of bacteriological cure compared to low SCC.
- *Staphylococcus aureus* had a significantly lower cure rate (**odds ratio 0.13** [0.04;0.41]) compared to *Streptococci* but there was no statistical significant interaction between treatment and pathogen.

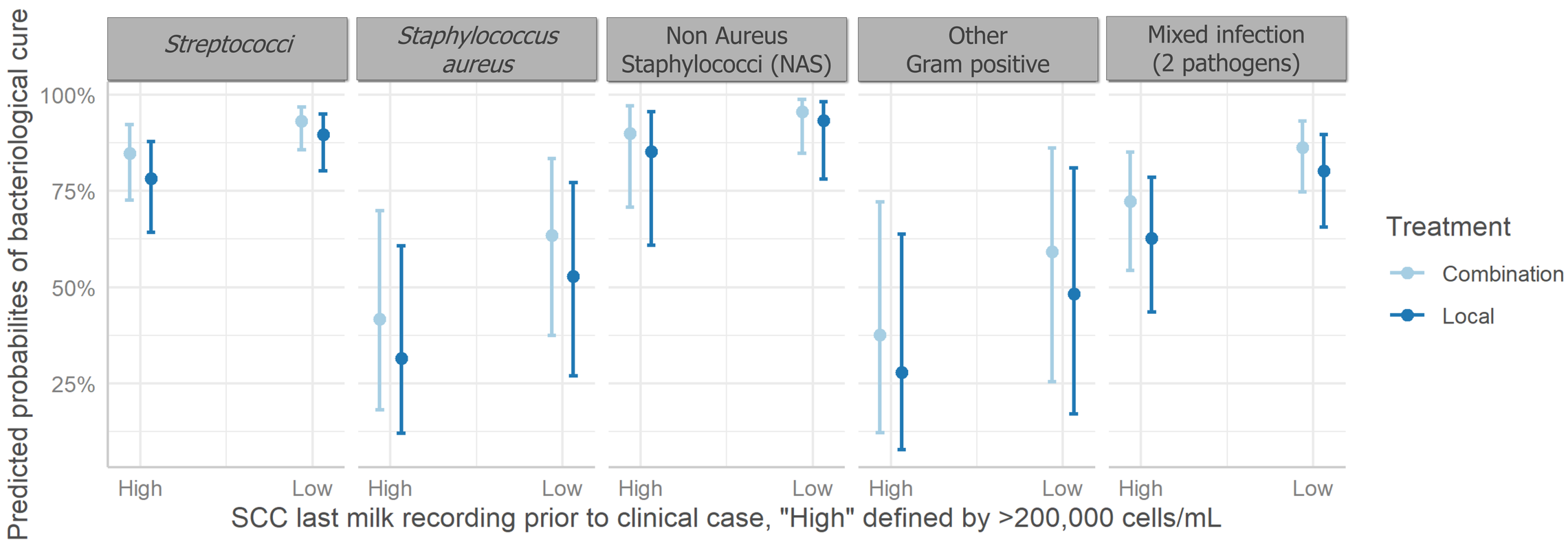

Figure 2. Predicted probabilities of bacteriological cure, stratified on pathogen group, treatment and SCC prior to the clinical case.

Take-home messages

The advantage on bacteriological cure of using combined treatment is too limited to compensate the 16 times higher antimicrobial use. Therefore, we recommend using local treatment. This strategy will decrease antimicrobial use for clinical mastitis substantially.

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