# Expert analysis of different intramammary infection patterns

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**Background:** Intramammary infections with *Staphylococcus aureus* and *Streptococcus agalactiae* can reduce milk quality and production. Even though control of contagious mastitis in dairy herds has been a goal for many years, *Staph. aureus* is still widespread and the prevalence of *Strep. agalactiae* infected herds in Scandinavia has increased. The success of control programs depend on our ability to detect clinical as well as subclinical cases of mastitis caused by the contagious pathogens. Diagnostic test performance, cyclic shedding patterns and daily variation in somatic cell counts (SCC) may influence our accuracy in identifying an udder quarter as infected or non-infected. The purpose of this study was to improve the diagnostic recommendations for control of *Staph. aureus* and *Strep. agalactiae* using PCR, bacterial culture (BC) and SCC as diagnostic methods.

**Materials and Methods:** Quarters positive for *Staph. aureus* (n=24) or *Strep. agalactiae* (n=16) were selected based on a single PCR-positive milk sample. The quarters were followed with daily milk sampling during 21 days, and each sample was tested by PCR, BC and SCC. Results of the three tests were plotted in quarter-profiles. The quarter-profiles were presented to 30 participants ("mastitis experts") at the 2017 European Mastitis Research Workers' Conference. The experts were asked to group and diagnose the quarter profiles. The experts' diagnoses were then used to create infection typologies for which we calculated the sensitivity (Se) and specificity (Sp) of each test.

**Results:** For *Staph. aureus* we mainly identified consistent quarter-patterns, however, a few patterns were more dynamic. *Strep. agalactiae* quarter-patterns were either consistent or hard to diagnose due to disagreement between the test results of BC and PCR.

Use of the experts' diagnoses to estimate Se and Sp for an overall infection resulted in high Se of BC and PCR. Thus, Se of BC was 100% [83.5;100] for *Strep. agalactiae* and 95.9% [93.7;97.3] for *Staph. aureus*. The Sp of BC and PCR in detecting *Strep. agalactiae* were 99% [72.8;100] and 97.7% [62.1;99.9], respectively, whereas Se of SCC in detecting *Strep. agalactiae* was only 34.3% [26.4;43.3]. This indicated that positive test results of BC and PCR for *Strep. agalactiae* were important to the experts compared to SCC in diagnosing a quarter as infected. In contrast, the Se of SCC in detecting *Staph. aureus* was high (96.1% [94.0;97.5]), but the Sp estimates of all tests were lower, 74.5% [65.7;81.7], 66% [57.2;73.8] and 43.7% [36.2;51.5] for BC, PCR and SCC, respectively.

We conclude that both PCR and BC are highly sensitive for detection of infections as defined by the experts, although the Se is not always 100%. Also, the accepted lower specificity suggests that experts put less emphasis on a false-positive test results than a false-negative. We recommend that efforts are made to develop consistent terminology to characterize IMI over time so the course of infection can be taken into account when diagnosing IMI.