CNS in bovine mastitis: Rapid identification and molecular characterization of antibiotic resistance genes

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Key words
Bovine mastitis, coagulase-negative staphylococci, antibiotic resistance, methicillin-resistance, genotyping

Aim of the study
To establish a rapid identification method of coagulase-negative staphylococci (CNS) species, determine their occurrence in bovine mastitis milk, and characterize their antimicrobial resistance mechanisms.

Material and methods
CNS (n=417) were isolated from bovine mastitis milk samples, and from control milk samples in Switzerland. CNS were identified by MALDI-TOF and tested for antimicrobial resistance by broth dilution and microarray. Multiresistant and mecA-positive CNS were characterized by PFGE and SCCmec typing. S. epidermidis were examined by MLST, for biofilm operon, and for arginine catabolic mobile elements ACME (Frey et al. 2013). PCR/ESI-MS was evaluated for rapid molecular diagnosis of bovine mastitis (Perreten et al. 2013).

Results and significance
Nineteen different CNS species were identified with S. xylosus, S. chromogenes, S. haemolyticus and S. sciuri being the most frequent. Resistances to oxacillin (47.0%), fusidic acid (33.8%), tiamulin (31.9%), penicillin (36.3%), tetracycline (15.8%), streptomycin (9.6%), erythromycin (7.0%), sulfonamides (5%), trimethoprim (4.3%), clindamycin (3.4%), kanamycin (2.4%) and gentamicin (2.4%) were detected. Resistance to oxacillin was attributed to the mecA gene in 9.7% of the oxacillin-resistant isolates. Meca was detected in S. fleurettii, S. epidermidis, S. haemolyticus, and S. xylosus. Resistance to tetracycline was attributed to tet(K) and tet(L), penicillin resistance to mecA and blaZ, streptomycin resistance to str and ant(6)-la, erythromycin resistance to erm(C), erm(B), and msr. In total, 15.1% of the CNS isolates exhibited resistance to two or more antimicrobials. Otherwise, CNS were susceptible to antibiotics commonly used in mastitis treatment. High genetic diversity was observed among multiresistant CNS. ACME types 1 and 3 were detected in S. epidermidis (ST 59 and ST111). This study revealed the presence of multidrug-resistant CNS among a heterogeneous CNS population, recommending the consultation of an antibiogram prior treatment with antimicrobials for persisting infections (Frey et al. 2013). We also showed that PCR/ESI-MS has significant potential to serve as a rapid screening method in the diagnosis of mastitis and can be used to track resistance genes in milk (Perreten et al. 2013).

Publications, posters and presentations
Perreten V. Molecular diagnosis of bovine mastitis by PCR/ESI-MS (2012) Oral presentation, Joint annual meeting of the SSI, SSSH, SSM and SSTMP, St. Gallen, Switzerland.

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