Staphaurex test-negative bovine Staphylococcus aureus mastitis strains and their impact on clinical mastitis

Roger Stephan¹, Sophia Johler¹, Olga Wellnitz², Rupert Bruckmair²
¹Institute for food safety and hygiene, Vetsuisse Faculty, University of Zurich, ²Departement Clinical Research and Veterinary Public Health, Veterinary Physiology, Vetsuisse Faculty, University of Bern

Key words
Staphaurex test-negative bovine Staphylococcus aureus, mastitis, clinical impact

Aim of the study
Testing Staphaurex test-negative and Staphaurex test-positive S. aureus strains isolated from bovine mastitis in an udder cell model for their i) adhesion and invasion capacity and ii) corresponding cellular immune response induced.

Material and methods
A strain collection of bovine S. aureus strains with documented anamnestic data (single cow problem, herd level problem, acute mastitis, mastitis, subclinical mastitis, chronic mastitis) was further characterized by a DNA microarray, by resistance typing, by genotyping according to Fournier et al. (2008), by spa typing and by the Staphaurex test. For selected representatives of the Staphaurex test-negative and Staphaurex test-positive group adhesion and invasion experiments as well as their corresponding cellular immune response induced on a bovine udder cell infection model were evaluated.

Results and significance
In the Staphaurex test, 49% of the tested isolates were positive and 51% negative. All test-negative strains were assigned to CC151, whereas test-positive strains were assigned to various clonal complexes (CC97, CC8, CC479, CC20, CC7, CC9, CC45). Microarray profiles of test-negative isolates were highly similar, but differed largely from those of test-positive isolates. While the test-negative group lacked several enterotoxin genes and sak, it exhibited significantly higher prevalence rates of genes encoding enterotoxin C, toxic shock syndrome toxin, and leukocidins (lukM/lukF-P83, lukD). The findings suggest Staphaurex test-negative isolates to represent a group of closely related strains with specific resistance and virulence gene patterns.

Representatives of the Staphaurex test-positive and test-negative groups were then tested for their corresponding cellular immune response induced on bovine udder cells. Results for mRNA expression of the following factors are available: Interleukin (IL)- 8, IL-1, Tumor Nekrose Faktor-alpha (TNF), RANTES, serum amyloid, lactoferrin, GM-CSF, COX-2 and toll like receptor-2. The results clearly show, that the immune response of the representatives of the Staphaurex test-positive group is much higher compared to the immune response of representatives of the test-negative group.

It seems likely that the difference in the immune reaction against these two S. aureus groups may also reflect a difference in the clinical outcome of the mastitis. This, however, needs to be clarified in vivo in further studies.

Publications, posters and presentations

Project 1.11.23

Project duration January 2012 – December 2012