Clinical mastitis in cows is bad enough. Knowing what causes it is certainly helpful in choosing the most appropriate therapy. Hence, we take a milk sample and culture the milk for the presence of bacteria, which often have distinctive characteristics.

We wanted to know if additional tests to differentiate one kind of “strep species” bacteria from another are worth the extra time and cost. A field study we conducted showed that strep differentiation is indeed valuable. More precise culture results led to a more economical antibiotic use on the farms while at the same time maximizing treatment success.

Different bacteria; different treatments

Bacteria in milk often have specific characteristics that make them more or less aggressive and more or less likely to cure. For example, Escherichia coli bacteria often cause severe mastitis but may cure relatively easy. On the other hand, Staphylococcus aureus causes less severe mastitis but is very difficult to cure. These bacteria have been studied extensively and we have relatively good knowledge about the potential treatment programs and the likelihood of success.

Another diagnosis that is often made from a mastitis milk sample is “strep species.” Close to 25% of mastitis cases are caused by so-called “strep species.” In the case of this bacterial diagnosis we are not so sure about the precise cause of the mastitis case. The diagnosis “strep species” indicates a broad family of bacteria or, in fact, several families of bacteria.

The group is named after the family of streptococci, and each of these streptococcal bacteria may have different characteristics, just as different as Staphylococcus aureus and Escherichia coli. The main bacterial species that are grouped together in the “strep species” denomination are:

- Streptococcus dysgalactiae and Streptococcus uberis from the Streptococcus family
- Lactococcus lactis from the Lactococcus family
- A number of species from the Enterococcus family (for example, E. faecalis and E. faecium)
- A large number of other bacteria from these three families and other related families

To get a better idea of these “strep species,” a set of further diagnostic tests are necessary to differentiate one species from the next. These additional tests take some extra time and come with additional cost. Thus our question: to differentiate or not to differentiate?

Added value of streptococcus differentiation

The treatment protocols advised for S. dysgalactiae and S. uberis are different. Trials on these two organisms indicate that two or three days of treatment of S. dysgalactiae with beta-lactam antibiotics in registered intramammary tubes such as penicillin, hetacillin or amoxicillin have shown to be successful in 70% to 80% of the cases. Treatment of S. uberis with similar antibiotics would need to be extended to five days to obtain similar results.

Also, antimicrobial resistance patterns for S. dysgalactiae typically show very little resistance against common antibiotics, whereas S. uberis isolates may show much higher antimicrobial resistance.

Hence, the early diagnosis of S. dysgalactiae vs. S. uberis provides an important distinction in treatment duration and prognosis for cure.

In the case of Lactococcus lactis infection, little is know about the optimal treatment duration and the probability of success. In the case of Enterococcus infection, the chance of resistance goes up and the chance of cure goes down.

How does streptococcus differentiation work?

Conventional culture techniques differentiate bacteria into several groups. These include staphylococci, streptococci and gram-negatives. Usually, subsequent tests further differentiate between several
To evaluate the success of these additional tests, we used a gold standard to provide the correct classification for each identified organism. Using molecular typing techniques, such a gold standard is now readily available. (An example of the molecular typing method using a PCR test is shown in figure 2.) The identified bands for each bacteria provide the final answer for correct streptococcus differentiation.

Field study

The field study to evaluate the success percentage of this new differentiation protocol was performed in collaboration among four large New York dairy farms, Keseca Veterinary Clinic and QMPS. This part of the study was also funded by the New York Farm Viability Institute. Approximately 200 cases of clinical mastitis with an initial diagnosis as “strep species” were included in the study.

Using the new differentiation protocol, we correctly identified almost 100% of the S. dysgalactiae isolates and over 80% of the S. uberis isolates. Overall, almost 90% of isolates were correctly identified.

For the dairy farmers involved in the study it meant that all S. dysgalactiae infections were treated with a relatively short duration of antibiotic therapy while the S. uberis and other streptococci (Enterococcus and Lactococcus) were treated with an extended therapy. This resulted in high cure rates for both S. dysgalactiae and S. uberis. The study showed the value of strep differentiation to the producers, the veterinarians and the QMPS laboratory staff.

So, differentiate or not differentiate?

The conclusion of this field study supported by the New York Farm Viability Institute was that strep differentiation results in better use of antibiotics, shorter average treatment duration and higher treatment success. We concluded that differentiation of streptococci is advisable. QMPS and Keseca Veterinary Clinic have incorporated the new methodology into routine diagnostics for clinical samples. Further information on implementation of these techniques in your on-farm or in-clinic culture methodology may be obtained from any of the QMPS regional laboratories.