



news digest #008

Mastitis and rapid identification of bacteria

Identifying infectious strains of bovine mastitis with the MALDI Biotyper® sirius

Despite the increase in COVID-19 restrictions and lockdown measures, the dairy market saw levels of retail spend and volume remain elevated compared to the pre-pandemic picture. In 2021, milk volumes were up by 5.8% from 2019, meaning an additional 302 million litres of milk were sold.¹ This is likely to have been influenced by consumers spending more time – and therefore having more meals and snacks – at home. As a staple product, dairy is expected to continue to do well in 2022.¹

One of the biggest challenges for the dairy industry is mastitis, an inflammatory response of the udder tissue in the mammary gland caused by bacterial infections. The damage done to milk-secreting tissues in dairy livestock can lead to hardening of the udder and increased somatic cell count in raw milk.

This common disease can be detrimental to dairy farmers as cattle with mastitis produce a reduced yield and poor-quality milk. This results in losses of approximately € 1.5Bn in Europe each year with each case costing farmers around € 400.²

The disease can also be transmitted to humans and has been associated with the rapid emergence of multidrug resistant strains.³ The current antibiotic treatment of mastitis is thought to be ineffective because extensive use increases the likelihood of the emergence of antibiotic-resistant pathogens.⁴ There is also the possibility for drug residue to appear in the milk produced. Mastitis treatment and control has become one of the largest costs to the dairy industry and is a significant factor in dairy animal welfare. Therefore, being able to identify, treat and prevent mastitis is currently a key area of research.

The rapid identification solution

The Bruker MALDI Biotyper® (MBT) sirius system offers a rapid and effective solution for mastitis testing in bovine, ovine, caprine or camel samples. It provides reliable identification and understanding of the pathogenic bacteria associated with mastitis within minutes, which is essential for effective prevention and control. The MALDI Biotyper is the perfect tool for fast identification starting from colony material. The principle behind identification of microorganisms is the comparison of the mass spectral profile of an unknown organism with a library of reference mass spectra. Bruker has invested substantial resources to collect as many species as possible, to build up the most comprehensive library with broad strain coverage, for users in the dairy industry. The MBT reference library comprises spectra of all relevant strains causing mastitis, incl. *Staphylococcus* spp., *Streptococcus* spp., *E. coli*, *Enterococcus* spp., *Corynebacterium* spp., *Enterobacter* spp., *Klebsiella* spp., *Salmonella* spp., *Serratia* spp., *Corynebacterium* spp., *Mycoplasma* spp., *Trueperella* spp., *Prototheca* spp., *Bacillus* spp., *Aerococcus* spp., *Moraxella* spp. and many yeast species.

Resistance detection as an add-on

In addition to rapid identification, the MBT HT Subtyping Module combines the identification of important pathogens with subsequent detection of specific resistance markers in one automated workflow, without any additional work.

The MALDI Biotyper sirius provides two ion modes: positive and negative. The aforementioned microbial identification, based on peptide and protein mass spectra, requires the positive ion mode, whereas lipid analysis is performed in the negative ion mode. Both types of analysis start from colony material of fresh overnight cultures. It then has the potential to reach beyond species identification and enable further resistance

detection applications. For example, resistance of mastitis-causing gram-negative bacteria to colistin, a last resort antibiotic, is based on modifications of the bacterial lipopolysaccharides (LPS), which can be detected easily by the MALDI Biotyper sirius after performing the sample extraction protocol provided by the MBT Lipid Xtract™ Kit.

Example

A recently published study on the etiology of mastitis and antimicrobial resistance in dairy cattle farms in Romania highlighted the benefits of the MALDI Biotyper sirius in identifying infectious strains of bovine mastitis.² Using tailored software together with the MBT to build biochemical profiles from the strains, the study aimed to identify the bacteria isolated from bovine mastitis and their antimicrobial resistance.

Wrap up

The MALDI Biotyper sirius system does not only enable rapid identification of the infectious strains of bovine mastitis, additionally researchers will be able to determine the antimicrobial resistance of the bacteria and develop better treatments to cure and prevent mastitis in dairy cattle. This brings the potential to save the dairy industry billions of euros a year.

For more information, visit

<https://www.bruker.com/en/applications/microbiology-and-diagnostics/food-beverage-microbiology/maldi-biotyper-for-food-microbiology.html>

References

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2. Cordis EU research results <https://cordis.europa.eu/project/id/826673>
3. Pascu C., Herman V., Iancu I., Costinar L., Etiology of Mastitis and Antimicrobial Resistance in Dairy Cattle Farms in the Western Part of Romania. *Antibiotics (Basel)*. 2022 <https://doi.org/10.3390/antibiotics11010057>
4. Cheng W.N., Han S.G., Bovine mastitis: risk factors, therapeutic strategies, and alternative treatments — A review <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7649072/>

Not for use in clinical diagnostic procedures.

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