news digest #022

Outbreak prevention by rapid *Mycobacteria* detection in the veterinary and food market

Author: Matteo Viganó, Food & Industry Microbiology, Bruker Microbiology & Infection Diagnostics

In recent years, food safety has become a global priority, with growing concern over microbiological food contamination. Among the various pathogens, mycobacteria pose a sometimes neglected, but significant risk. Matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) has emerged as a promising technique for the rapid and accurate identification of mycobacteria in food. This article highlights the role of MALDI-TOF MS in detecting mycobacteria, emphasizing its benefits and the associated challenges in this market.

Foodborne diseases continue to be a global issue, affecting millions of people annually. While bacteria like *Salmonella* spp. and *Escherichia coli* are well known to be associated with food poisoning, mycobacteria are more recently becoming an increasing concern due to the health problems they can cause. Mycobacteria are a diverse group of bacteria with waxy and hydrophobic cell walls, enabling them to survive in various environments, including water, soil and even foods that underwent inadequate cooking procedures. Although most mycobacteria are harmless, certain species can cause serious infections in humans. Notable examples include *Mycobacterium tuberculosis*, responsible for causing tuberculosis, and *Mycobacterium leprae*, the causative agent of leprosy. Additionally, many other species, known as non-tuberculous mycobacteria (NTM), can cause infections, especially in immunocompromised individuals.[1]

The most commonly found mycobacteria in food are *Mycobacterium marinum* and *Mycobacterium avium*. *M. marinum*, typically found in aquatic environments, can contaminate undercooked fish, shellfish, and seafood, potentially leading to skin infections in humans. Meanwhile, *Mycobacterium avium* subspecies *paratuberculosis* (MAP) is primarily linked to Johne's disease in animals, but there is growing concern about its potential connection to human diseases like Crohn's disease.[2,3] Recent studies have highlighted that pasteurized milk and some dairy products are not always completely free of MAP, and there is additional concern about possible contaminations of meat and meat products.[4] Preliminary studies have detected other pathogenic mycobacteria in non-animal food products, such as ready-to-eat fruits and vegetables, both raw and frozen, underscoring the risk these bacteria pose.[5]

Preventing foodborne diseases caused by mycobacteria requires a multi-faceted approach, as these bacteria are challenging to detect due to their slow growth. The risk of contamination depends not only on the presence of the pathogen in the source animal but also on various points along the production chain, as these bacteria can spread and adapt to different environments. Therefore, it is crucial to develop a method that allows for rapid, easy, and cost-effective identification of mycobacteria to test not only the final product but also to monitor the entire food supply chain. As reported recently, MALDI-TOF MS is a rapid, sensitive, and cost-effective method that can help laboratories to tackle this challenge.[6]

To meet this need, Bruker offers the optional MBT HT Mycobacteria Module for its MALDI Biotyper® system. This module automatically compares the mass spectrum of an unknown organism with a specialized reference library of mass spectra, covering 182 of the 201 currently known mycobacteria species. Sample preparation is simplified and made safe by the dedicated MBT Mycobacteria Kit, which includes a chemical inactivation step using an all-in-one-tube approach.

These products together provide a solution for mycobacteria identification and confirmation that significantly reduces both identification times and costs per sample. The rapid and easy sample preparation and data acquisition allow for testing along the entire supply and production chain, saving time and money compared to molecular and biochemical assays, or only testing the final products.[6]

References

1 Tucker S (2023) Mycobacteria and Food Poisoning: Causes, Symptoms and Prevention. Mycobact Dis. 13:399. https://www.longdom.org/open-access/mycobacteria-and-food-poisoning-causes-symptoms-and-prevention-104543.html

2 Chamberlin et al., 2001; *Mycobacterium avium* subsp. *paratuberculosis* as one cause of Crohn's disease. Aliment Pharmacol Ther. 2001 Mar;15(3):337-46. https://doi.org/10.1046/j.1365-2036.2001.00933.x

3 Bull et al., 2003; Detection and verification of *Mycobacterium avium* subsp. *paratuberculosis* in fresh ileocolonic mucosal biopsy specimens from individuals with and without Crohn's disease. J Clin Microbiol. 2003 Jul;41(7):2915-23. https://doi.org/10.1128%2FJCM.41.7.2915-2923.2003

4 Eltholth et al., 2009; Contamination of food products with *Mycobacterium avium paratuberculosis*: a systematic review. Journal of Applied Microbiology, 107: 1061-1071. https://doi.org/10.1111/j.1365-2672.2009.04286.x

5 Dziedzinska et al., 2016; Nontuberculous *Mycobacteria* on Ready-to-Eat, Raw and Frozen Fruits and Vegetables, Journal of Food Protection, Volume 79, Issue 8, 2016, Pages 1452-1456 ,ISSN 0362-028X, https://doi.org/10.4315/0362-028X.JFP-16-030.

6 https://www.aphl.org/aboutAPHL/publications/Documents/ID-2019Aug-MALDI-TOF-TB-Fact-Sheet.pdf

No. 1914016 © 08-2024 Bruker Daltonics

Not for use in clinical diagnostic procedures.
Please contact your local representative for availability in your country.

Online information
bruker.com/microbiology

Bruker Daltonics GmbH and Co. KG
Bremen · Germany
Phone +49 (0)421-2205-0

info.md@bruker.com

Bruker Scientific LLC
Billerica, MA · USA
Phone +1 (978) 663-3660