Changing Food Microbiology

MALDI Biotyper®

AOAC-OMA & ISO 16140-part 6 validated

Innovation with Integrity

GP

Fast, easy and accurate microbial confirmation

At your fingertips

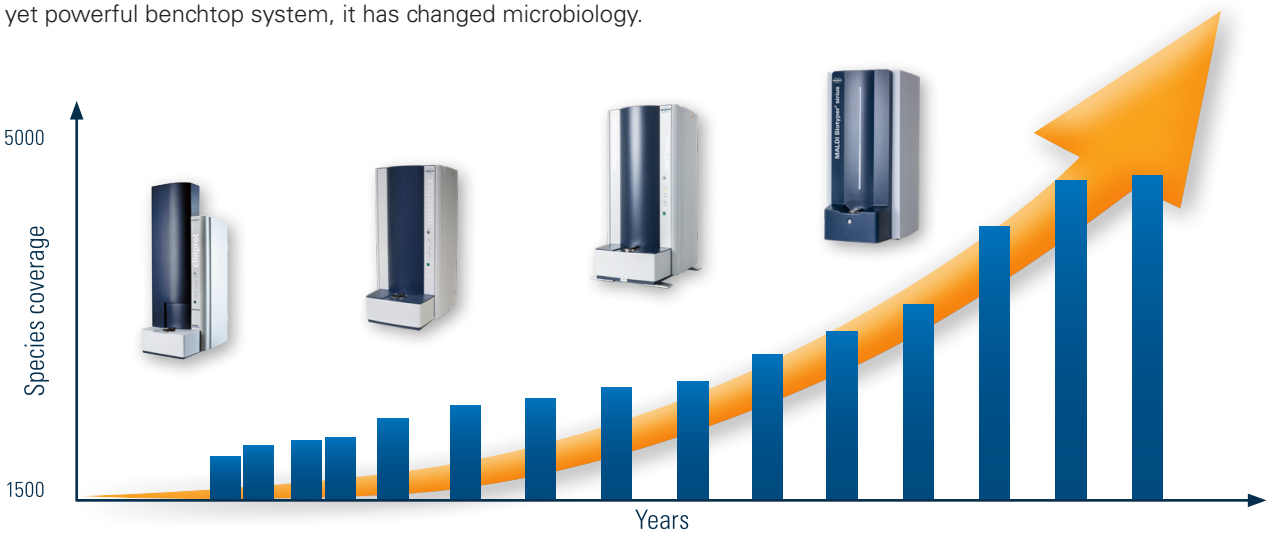
The MALDI Biotyper story: a journey of innovation leading to a paradigm shift

Over two decades ago, it all started with a visionary dream - one with the audacious goal of revolutionizing the microbiology landscape. This dream ignited a journey of relentless innovation, pushing boundaries and reimagining the possibilities within reach. At the core of this transformative quest lies the MALDI Biotyper.

Bruker leveraged its extensive experience to bring forth the groundbreaking MALDI Biotyper System. This revolutionary technology stands as a testament to our commitment to pushing the limits of what's achievable. The MALDI Biotyper empowers microbiology laboratories globally, offering a seamless, reliable, and expeditious microbial identification solution for a diverse array of gram-negative and gram-positive bacteria, yeasts, and molds. Operating as a user-friendly yet powerful benchtop system, it has changed microbiology.

Accurate fingerprint matching to identify the unknown

The MALDI Biotyper operates based on Matrix-Assisted Laser Desorption/Ionization Time-of-Flight (MALDI-TOF) mass spectrometry. The principle involves creating a proteomic fingerprint spectrum of the unknown microorganism starting from colony material. The unique pattern of this fingerprint is then matched to reference spectra of thousands of microorganisms, stored in the heart of the system, the reference library.



Meeting your microbial confirmation and identification demands

Typical food industry bacteria, yeast and molds, covered by the MALDI Biotyper

Milk & Dairy
Lactococcus, Lactobacillus, Staphylococcus, Listeria, Salmonella, Cronobacter, Brucella

Meat & Egg
Salmonella, Campylobacter, E. coli, Listeria, Staphylococcus, Yersinia

Fruits & Vegetables
E. coli, Listeria, Leuconostoc, Salmonella, Enterobacter, Klebsiella

Cocoa & Confectionary
Salmonella, E. coli, Staphylococcus, Aspergillus, Penicillium

Beverages
Alicyclobacillus, Lactobacillus, Pediococcus, Zymomonas, Candida, Saccharomyces

Drinking Water
Legionella, E.coli, Pseudomonas, Enterococcus, Alcaligenes, Lelliottia, Campylobacter

Probiotics and Starter Cultures
Lactobacillus, Bifidobacterium, Streptococcus, Saccharomyces, Propionibacterium

Veterinary
Salmonella, Staphylococcus, Streptococcus, Candida, E. coli, Campylobacter

Flour & Milling
Salmonella, E. coli, Bacillus, Aspergillus, Penicillium

Seafood
Listeria, Vibrio, Salmonella, Streptococcus, Aeromonas

AOAC-OMA & ISO 16140-part 6 validated for food microbiology

The AOAC-OMA (Official Method of Analysis by AOAC International) and ISO 16140-part 6 (MicroVal) validation studies have clearly shown the reliability and reproducibility of the MALDI Biotyper.

The MicroVal certificates, issued in 2018 and renewed in 2022, have recently been expanded by the certification body to include now as well the newest MALDI Biotyper sirius systems and the latest MBT Compass HT software version.

The certificates and the reports of the ISO 16140-part 6 validation studies are available on www.microval.org.

The AOAC-OMA #2017.09 and AOAC-OMA #2017.10 protocols are available on www.eoma.aoac.org.

The MALDI Biotyper is the US FSIS recommended system for confirmation of presumptive positive *Salmonella* and *Listeria*.

Analyte	Certification Body	Claim	Agars used in evaluation (selective and non-selective)
Cronobacter	MicroVal Certificate N° 2017LR72	Confirmation of *Cronobacter* from various agar plates	TSA, ESIA, CCI
Salmonella	MicroVal Certificate N° 2017LR73	Confirmation of *Salmonella* from various agar plates	TSA, XLD, BGA, RAPID'Salmonella, Brilliance Salmonella, ASAP, CASE Agar
Campylobacter	MicroVal Certificate N° 2017LR74	Confirmation of *Campylobacter* from various agar plates	CBA, mCCDA, RCA, CCA, CampyFood, RAPID'Campylobacter
Listeria* spp. & *Listeria monocytogenes	MicroVal Certificate N° 2017LR75	Confirmation *of Listeria* spp. & *Listeria monocytogenes* from various agar plates	TSYEA, Oxford and modified Oxford, OAA, PALCAM, RAPID'L. mono
Gram-negative organisms	AOAC OMA #2017.09	Confirmation and Identification of *Salmonella* spp., *Cronobacter* spp., *Campylobacter* spp., and other gram-negative organisms	Equivalent to the Microval list
Gram-positive organisms	AOAC OMA #2017.10	Confirmation and Identification of *Listeria monocytogenes* and *Listeria* spp., and other gram-positive organisms	Equivalent to the Microval list

The original
Often imitated, never duplicated

Unequaled speed for fast and actionable results

- Analyze 95 isolates + 1 QC sample in ~5 minutes
- Get instant results at a glance, no need to wait for the end of the run
- Get your confirmation results within minutes, starting from agar plates

Unmatched efficiency with a large reference library coverage

- Identify more than 4,700 gram-positive and gram-negative bacteria, yeasts and molds
- Analyze filamentous fungi directly from agar with the easy MyT method and a dedicated library
- Enable high-confidence mycobacteria identification with a dedicated library and workflow including safe sample handling
- Increase the identification power with our regular updates of reference libraries to meet expanding needs
- Create your own library entries for special in-house analysis projects
- Confirm *Listeria monocytogenes* reliably down to the species level

Validations & Certificates for confirmation of foodborne pathogens

- AOAC-OMA (Official Method of Analysis by AOAC International)
- ISO 16140-part 6 MicroVal Certificates
- US FSIS recommended system

The right fit for your lab

- Benefit from low training efforts, with a user-friendly software-guided workflow
- Focus on results while relying on the hands-free IDealTune™ autotuning feature - no extra cost, effort or user intervention required
- Minimize maintenance with the integrated source cleaning, activated with a few mouse clicks

Workflow solutions

- Streamline your workflow with the MBT FAST™ Shuttle, MBT Pilot® System, MBT Galaxy® GP System , MBT Pathfinder® GP and Feeder GP

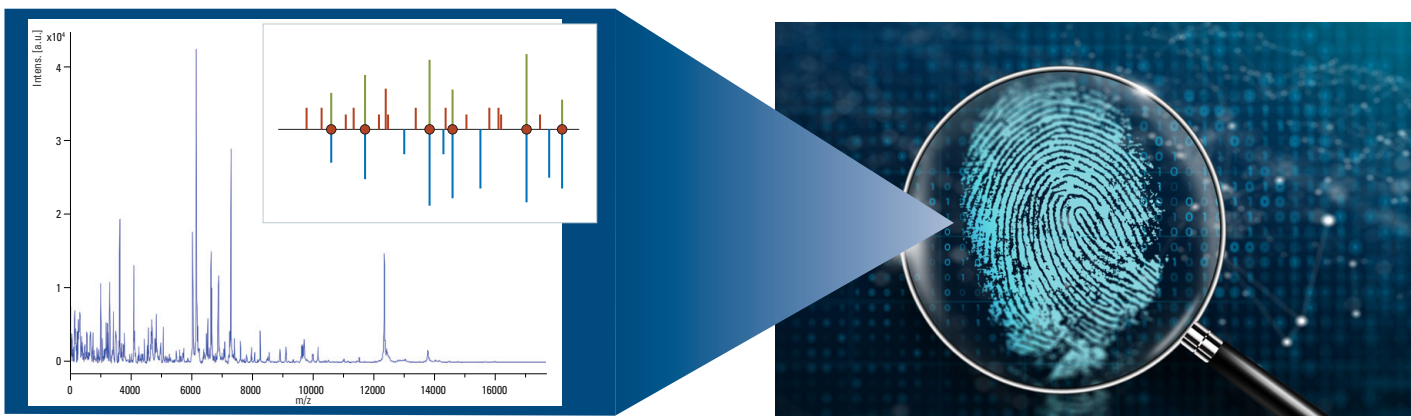
The beating heart of the system

Accurate fingerprint matching providing identification results you need to "stay ahead of the game"

- Identification is based on matching the unique proteomic fingerprint spectrum of the unknown microorganism to a huge collection of reference spectra
- Our continuously evolving library that keeps pace with emerging microorganisms helps you to stay ahead
- We listen to and empower our customers with regular updates of relevant organisms into our powerful "fingerprint" library

A reference library covering thousands of bacteria and yeast

- Access a library covering thousands of gram-positive/negative bacteria and yeast
- Each reference library entry is based on multiple measurements of a single defined strain, safeguarding true biological variability
- This library structure and powerful algorithms simplify expansion and validation of the library



A mighty solution for molds

- The MBT HT Filamentous Fungi Module includes a dedicated reference spectrum library, facilitating the identification of hundreds of filamentous fungi species/species groups
- The easy yet powerful Mycelium Transfer (MyT) sample preparation procedure enables a high identification success rate
- The workflow cleverly uses the surface structure of the MBT Biotarget 96 to break the rigid cells walls, contributing to accurate identification

High confidence mycobacteria identification

- A dedicated MBT Mycobacteria Kit enables a safe and standardized sample preparation workflow for *Mycobacterium* spp. cultivated in liquid as well as on solid media
- Combined with the kit, the MBT HT Mycobacteria Module provides a comprehensive solution covering the majority of the currently known mycobacteria species

The key to differentiation of closely related *Listeria* species

The integrated MBT HT Subtyping Module automatically enables the differentiation of *L. monocytogenes* from the other closely related *Listeria* species, by looking for certain typical marker peaks.

This enables food microbiology laboratories to implement routine confirmation of *Listeria* spp. and *L. monocytogenes* in the daily workflow, directly from culture, without any major effort. Additionally, the identification of other *Listeria* species is provided: *L. grayi*, *L. innocua*, *L. ivanovii*, *L. seeligeri* and *L. welshimeri*.

Create custom libraries

Laboratories that need to create their own libraries can make use of software tools to easily compile customized reference library entries.

Easy workflow: simplicity meets speed

Bacteria, yeast or mold: an easy workflow for all

- Efficient and user-friendly
- Fully traceable streamlined workflow with a few simple steps
- Typically starting from an isolated single colony from a culture plate
- Minimal hands-on time per isolate (only 20 seconds for most microorganisms)

Dedicated microbiology software

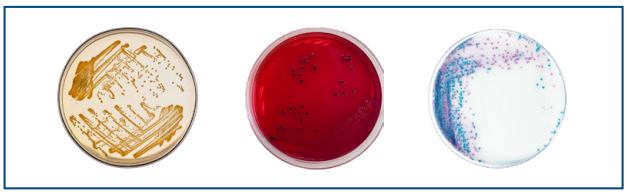
- Software-guided workflows provided by the MBT Compass HT Industry software deliver clear and fast results
- Rapid analysis of 95 isolates and 1 QC sample yields a complete identification report in ~5 minutes
- Identification results are presented in an easy-to-interpret 'traffic light' color scheme
- Instant result display on the screen, no need even to wait for the final report

Faster than ever

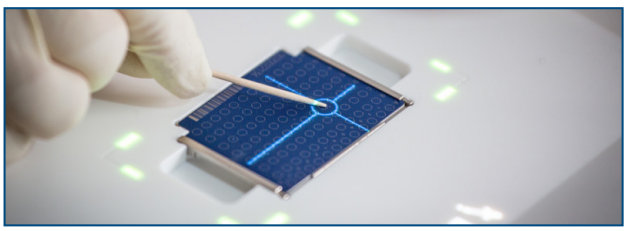
Sample preparation hands-on time:
- 1 isolate ~20 seconds
- 95 isolates < 20 min

System analysis time to ID result:
- 95 isolates + 1 QC sample ~ 5 min

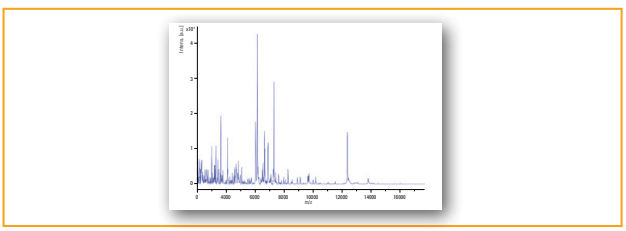
Add target plate to a MALDI Biotyper project list



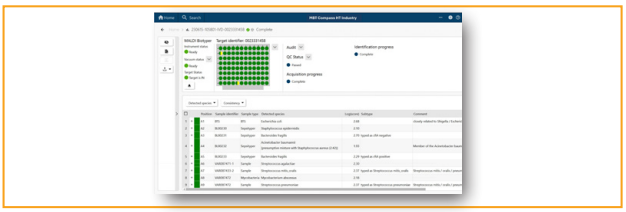
Select an isolated colony



Transfer sample onto the target plate and add matrix



MALDI-TOF spectrum automatically generated by the software



Spectrum instantly matched against the reference library to give identification

Range	Interpretation
2.00 - 3.00	High Confidence Identification
1.70 - 1.99	Low Confidence Identification
0.00 - 1.69	No Organism Identification Possible

Easy result reporting with "traffic light" color scheme

Hands-on time:
1 isolate ~20 seconds, 95 isolates + 1 QC sample < 20 min

95 isolates + 1 QC sample ~5 min

One system - countless answers

Food Quality

Fast identification of microbial contaminants or spoilage organisms, technological strains and good bacteria during quality control

Accurate quality controls along the fermentation and ripening processes, or during storage, are fundamental to guarantee the stability of starters and the absence of unexpected microbial contaminants. This is crucial to ensure the organoleptic qualities or the probiotic benefits of your fermented products.

Reliable identification of microbial spoilers reveals their heat resistance and growth parameters. This helps in optimizing food formulations, production processes and storage conditions to prevent microbial growth. In addition, a relevant screening plan of raw materials and other ingredients can easily be developed.

Environment & Hygiene monitoring

Fast identification of microbes in food and veterinary processing environments, and efficacy-control of general cleaning and sanitation

Surface sampling and related colony counts help in controlling potential biofilm development. However, identifying the involved bacteria is usually key to establishing appropriate corrective plans.

Processing plant personnel or small animals (e.g. rodent pests, or insects) are also potential contamination sources in the food processing facility in many respects.

Environmental swabbing involves the microbiological testing of food preparation surfaces, water tanks, storage facilities, soils and ceilings of breeding facilities, equipment and utensils, using various swab techniques to find out if pathogens are present. It is also used to verify whether a food business' cleaning and sanitation programs are effective (known as cleaning verification).

Decision-making driven by real-time results

Food Safety

Fast confirmation of pathogens

Using the same workflow and the same consumables, confirmation of *Salmonella* spp., *Cronobacter* spp., *Campylobacter* spp., *Listeria* spp. and *Listeria monocytogenes* can reliably be performed in no time, from various agar plates. The flexible and low-cost workflow encourages convenient testing of multiple colonies in one run, gaining crucial time for confirmation.

The AOAC-OMA and ISO 16140-part 6 validation allows confirmation of the above-mentioned pathogens and quality indicators from validated culture media. Furthermore, the AOAC-OMA allows identification of bacterial isolates from any of the validated culture media mentioned for isolation of foodborne pathogens and quality indicators.

Confirmation and identification available within minutes

A fast confirmation result allows for timely actions, such as food batch withdrawal or release of safe food batches.

Implementing the system in the laboratory workflow can directly translate to significant cost savings by accelerated testing along the entire process chain.

One system – countless answers

The MALDI Biotyper system can be employed in all of these different application fields with one single easy workflow for bacteria, yeasts and molds, providing rapid and reliable identification of positive microflora and microbial contaminants. The results can then automatically be transferred to the LIMS.

In addition to using the standard MALDI Biotyper Reference Library, the open concept of the system offers the flexibility to build your own reference library with your starter cultures or site-specific contaminants.

The magic behind hassle-free operation

Years of experience condensed in a benchtop system

The high performance and tailored design of the MALDI Biotyper are rooted in over 30 years of Bruker's in-house MALDI-TOF experience, applied to filling a gap in microbial analysis.
Crafting a state-of-the-art and groundbreaking system demands extensive expertise and a commitment to innovation. Unlike merely copying existing systems, the development of the MALDI Biotyper reflects a dedication to pioneering advancements in technology, ensuring that it stands as a must-have in the field of microbiology. Explore the magic behind the system's speed, resolution and performance.

Optimal performance secured by zero-effort IDealTune™

Experience peak performance without the hassle - thanks to automated tuning!

- No extra tuning samples
- No extra time
- No extra costs
- Focus on results!

Unequaled Time-to-Result

With Smart Spectra Acquisition™, data generation is accelerated by minimizing the number of laser shots per sample needed to acquire a meaningful spectrum. Besides saving time, this also allows an optimal exploitation of the laser lifetime.

The analysis speed is further dramatically boosted by the power of the MBT Compass HT Industry software, resulting in identification results popping up simultaneously with spectra acquisition, one by one, without delay.

Resolution optimized for reliable profile matching

Thanks to Bruker's patented PAN™ resolution, the compact MALDI Biotyper achieves an optimal resolution over the relevant mass range of the mass spectral profile acquired from the unknown microorganisms.
This accuracy is crucial when it comes to profile matching with thousands of reference spectra, for reliable identification of micro-organisms.

Continuous operation

The integrated ion source cleaning permits continuous high performance with minimized maintenance requirements. Cleaning the source using the separate IR-laser is perfor-med easily by a few clicks in the software, without breaking vacuum.

MALDI Biotyper GP System overview

Benchtop MALDI-TOF system

- **MALDI Biotyper® sirius GP System**

Identification of gram +/- bacteria, yeasts

Software
- MBT Compass HT Industry software, including the MBT Library
- MBT Library Extension, covering highly pathogenic species
- MBT HT Subtyping Module

Consumables
- Matrix HCCA, portioned
- Bacterial Test Standard
- MBT Biotarget 96

Mycobacteria identification (optional)

Integrated software module
- MBT HT Mycobacteria Module

Consumables
- MBT Mycobacteria Kit

Filamentous fungi identification (optional)

Integrated software module
- MBT HT Filamentous Fungi Module

Workflow optimization & automation (optional)

- MBT Shuttle ergonomic target holder
- MBT FAST™ Shuttle for standardized and accelerated drying of matrix and other liquids
- MBT Pilot® System for guided sample transfer
- MBT Galaxy® System for contactless and automated reagent deposition
- MBT Pathfinder® GP with Feeder GP option for standardized, documented and fully transparent MALDI target preparation

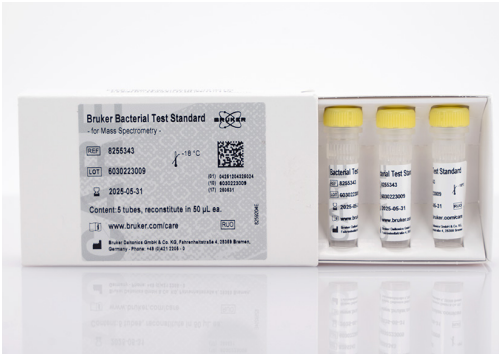
Please contact your local Bruker sales representative for availability of the optional MBT system components in your country.

Consumables

Bacterial Test Standard (BTS)

BTS is an essential component of the MALDI Biotyper workflow enabling constant high accuracy and optimal operation. This mass calibration standard covers the complete mass range necessary for precise microbial identifications. It furthermore serves as integrated quality control for each run and enables the automated IDealTune™ function ensuring optimal performance of the MALDI Biotyper.

Content: One box consisting of 5 tubes providing
50 µL per tube / Part No. 8255343



Matrix HCCA, portioned

The HCCA matrix is tailored for microbial identification on the MALDI Biotyper. It is provided in stable dried portions to ensure it is always fresh when needed. The HCCA is subjected to a rigorous purification process and quality control to deliver highly sensitive measurements. Its outstanding purity minimizes the deposition of debris in the system's ion source and thus helps avoiding unnecessary downtime.

Content: One box consisting of 10 tubes providing
250 µL per tube / Part No. 8255344

Disposable MBT Biotargets

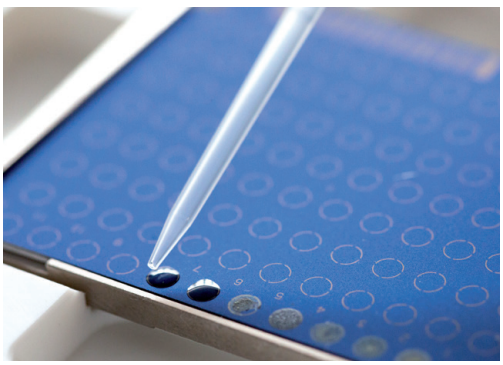
The ready-to-use disposable MBT Biotargets offer 96 positions and a unique barcode for full traceability in paperless workflows. The AnchorChip™ effect makes it easy for users to achieve consistent preparation of the target and obtain reproducible results.

MBT Biotarget 96

Pack of 20 individually barcoded MALDI Biotyper target plates, 96 positions each / Part No. 1840375

MSP adapter for MBT Biotarget 96

Adapter required to use MBT Biotargets with MALDI Biotyper instruments / Part No. 8267615



Workflow optimization & automation (optional)

MBT FAST™ Shuttle

Standardized and accelerated drying of MALDI Biotyper matrix and other liquid reagents, increasing the matrix crystallization quality, improving the microorganism identification success rate.

Part No. 1872847

MBT Pilot® System

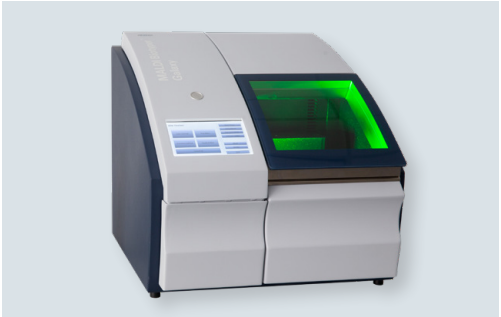
The MBT Pilot System facilitates correct sample positioning through patented microprojection technology by clearly highlighting the next free MALDI target plate position.

Part No. 1822041

MBT Galaxy® System

The MBT Galaxy, for automated application of HCCA matrix and formic acid, frees laboratory personnel from cumbersome pipetting while ensuring the highest preparation quality under controlled conditions and complete traceability in a paperless workflow.

Part No. 1821269



MBT Pathfinder® GP and Feeder GP

The MBT Pathfinder is a semi-automated system for MALDI target preparation, assisting in selection, transfer and preparation of samples taken from microbiological colonies on culture plates. The Feeder places culture plates by a robotic hand from the carousel into the specified position in the MBT Pathfinder.

MBT Pathfinder GP / Part No. 1890100
Feeder GP / Part No. 1890355

Enabling smarter food microbiology

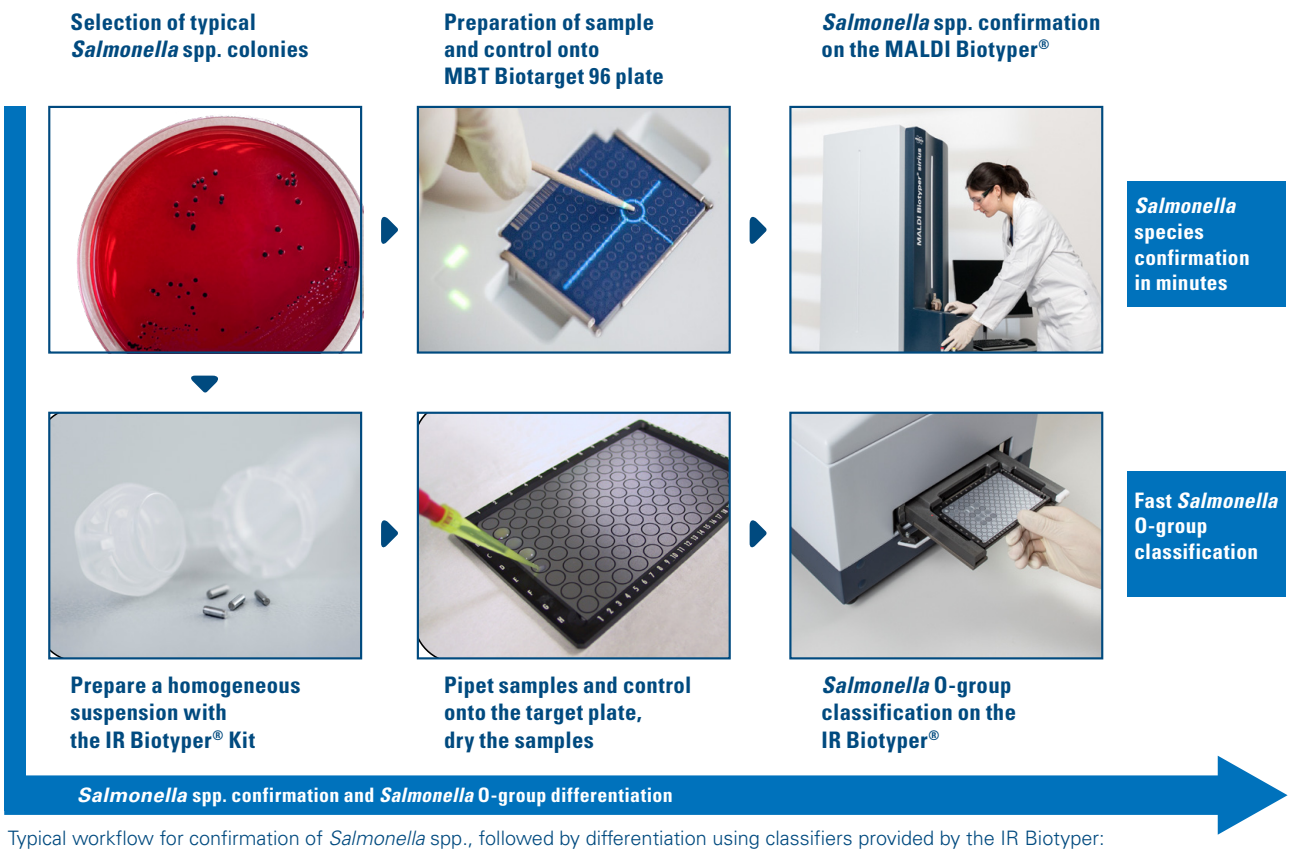
In need for a rapid strain discrimination method, for real-time quality control and source tracking?

Bruker's complementary IR Biotyper® system allows same-day strain discrimination of colonies, based on FT-IR spectroscopy. The easy-to-use benchtop system enables fast and cost-effective microbial typing with high discriminatory power. With the IR Biotyper, the complete workflow including data analysis can be performed in less than 3 hours, allowing real-time monitoring of technological processes and source tracking.

The IR Biotyper allows customers to analyze their own sample sets and perform cluster analysis and strain discrimination for a wide range of different species, or make use of predefined classifiers provided by the software for targeted and fast analyses.

Summarized, it takes only little benchtop space to host the MALDI Biotyper, complemented by the IR Biotyper, to have a dedicated and complete food microbiology solution for confirmation/identification and strain discrimination of microorganisms, in just 3 hours.

Software connectivity with the MALDI Biotyper enables easy upload of sample data from MALDI Biotyper to IR Biotyper, nevertheless both can also be used as stand-alone solutions.



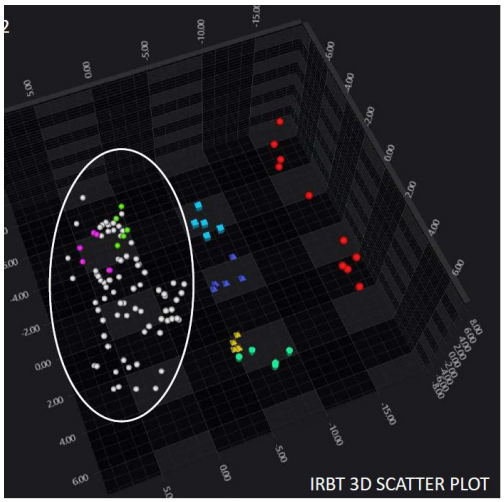
Typical workflow for confirmation of *Salmonella* spp., followed by differentiation using classifiers provided by the IR Biotyper: Starting from colony material and using both instruments in parallel or sequential, *Salmonella* spp. confirmation and differentiation of O-serogroups can be achieved very fast, starting from colony material.

Root cause analysis examples

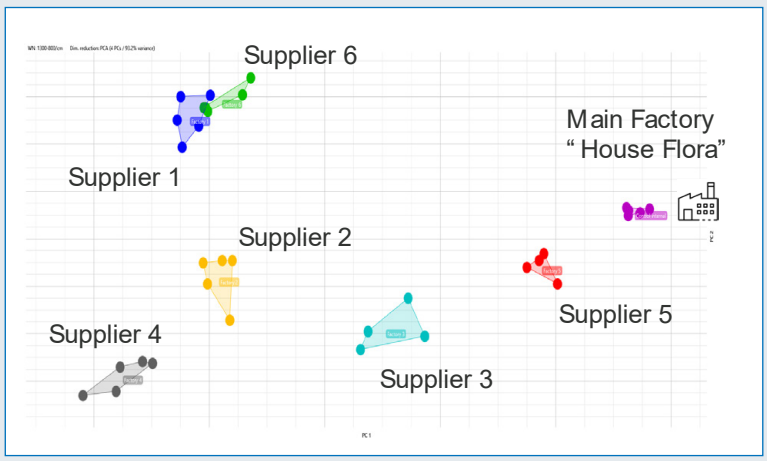
S. aureus contamination tracking by FT-IR

Food poisoning by *Staphylococcus aureus* is one of the most frequent causes of foodborne intoxication worldwide. The ability to subtype *S. aureus* is therefore crucial for epidemiological investigations, to pinpoint the root cause and initiate counter measures. Most molecular technologies are costly, but - more importantly – suffering from a long time-to-result (TTR), hence offering only retrospective analysis. The IR Biotyper provides a cost-effective solution with a quick turnaround time, delivering same-day results and immediate responses.

Figure on the right: Samples from an *S. aureus* outbreak were analyzed alongside samples from various food handlers and the IR Biotyper was able to determine two individuals (pink and green) to be associated with the outbreak samples (white).



3D scatter plot of *S. aureus* outbreak isolates.



PCA 2D scatter plot of *Cronobacter* isolates.

Source tracking of milk powder contaminations

Cronobacter spp., though rare, pose serious risks to infants, if present in baby formula. Providing the highest product safety is crucial, hence accurate, fast and cost-efficient screening technologies are needed. Combining the MALDI Biotyper and the IR Biotyper enables advanced microbial identification with effective contamination tracking.

Analyzing *Cronobacter* contaminations together with in-house samples as well as supplier samples with the IR Biotyper ruled out an in-house contamination source and pinpointed to a contamination derived from a sub-supplier of both suppliers 1 and 6.

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

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