Shaping Tomorrow's Microbiology Solutions

# IR Biotyper®

Microbial differentiation for real-time quality control and source tracking

Innovation with Integrity

GP

# Aiding quality control and source tracking in food, water and veterinary microbiology

Identifying microorganisms is a vital aspect of minimizing the risk of pathogens in water supplies, ensuring product quality in the food industry, and understanding the transmission routes of bacterial strains in veterinary samples.

Until now, the identification of bacterial outbreaks or analysis of transmission routes has required subculturing the suspect followed by monoclonal antibody techniques, pulsed-field gel electrophoresis (PFGE), multi-locus sequence typing (MLST) or whole genome sequencing (WGS). All of these approaches are associated with lengthy delays in obtaining results.

The IR Biotyper addresses this challenge by using infrared spectroscopy to classify microorganisms based on their 'molecular fingerprint', starting with colony material.
This approach is fast, easy to use and economical, making it ideal for sample prescreening, strain classification, and cluster analysis.

## Benefits of using the IR Biotyper

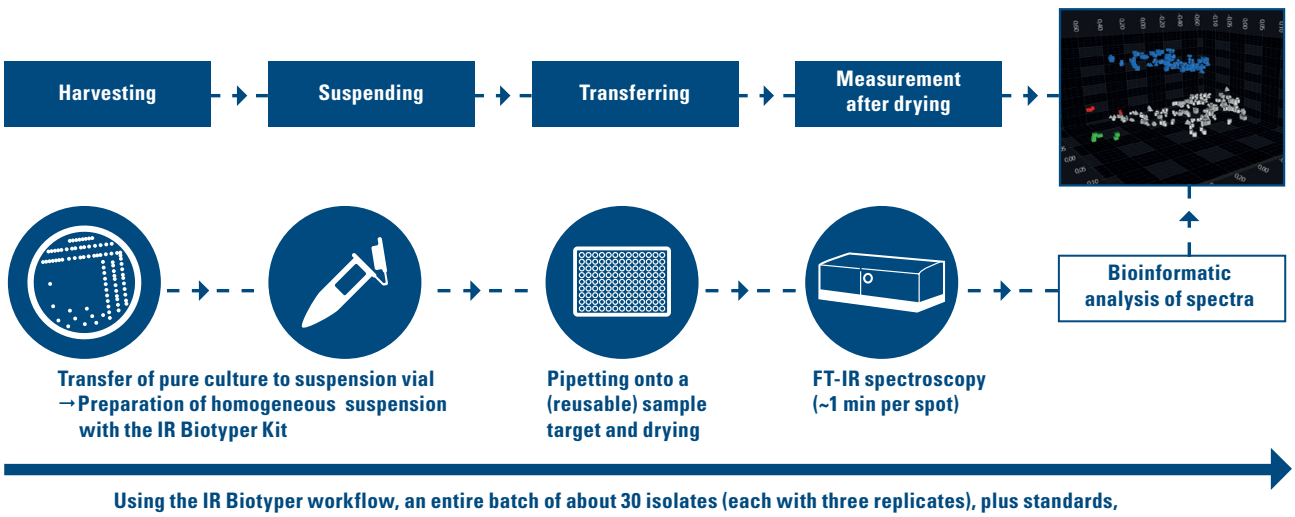
- Delivers rapid cluster analysis and differentiation of microbes from food, water, veterinary and environmental samples
- Speeds up microbial classification by enabling in-house screening, with same-day results directly from colony material
- Accelerates targeted microbial screening with ready-to-use classifiers
- Supports the development of customized classifiers
- Combined with the MALDI Biotyper®, enabling comprehensive characterization of microorganisms at the genus, species, and serogroup levels
- Enables a tiered microbial characterization workflow by rapidly screening isolates in-house and reflexing to NGS/WGS methods

# Simple workflows for rapid processing

The IR Biotyper is quick and easy to use. Following harvesting, preparation of a suspension, spotting on a 96-well silicon microtiter sample plate and drying, the plate is simply inserted into the instrument, and analysis begins.

The instrument processes an individual spot in about a minute, meaning that an entire plate can be analyzed in about 90 minutes. Across the whole workflow, and using three replicates per isolate, this means that up to 30 isolates can be analyzed in 3 hours.

96-Spot silicon microtiter plate and IR Biotyper Kit




**Using the IR Biotyper workflow, an entire batch of about 30 isolates (each with three replicates), plus standards, can be harvested, prepared and analyzed in about 3 hours.**

## Integrated workflows for microorganism identification and strain typing

The IR Biotyper and Bruker's MALDI Biotyper can be combined into a single seamless workflow. Data from the MALDI Biotyper – which uses MALDI-TOF MS to identify microorganisms to species or genus level within a few minutes – can be imported into the IR Biotyper software, and once analyzed, the entire set of results can be exported to the laboratory's LIMS in CSV format.

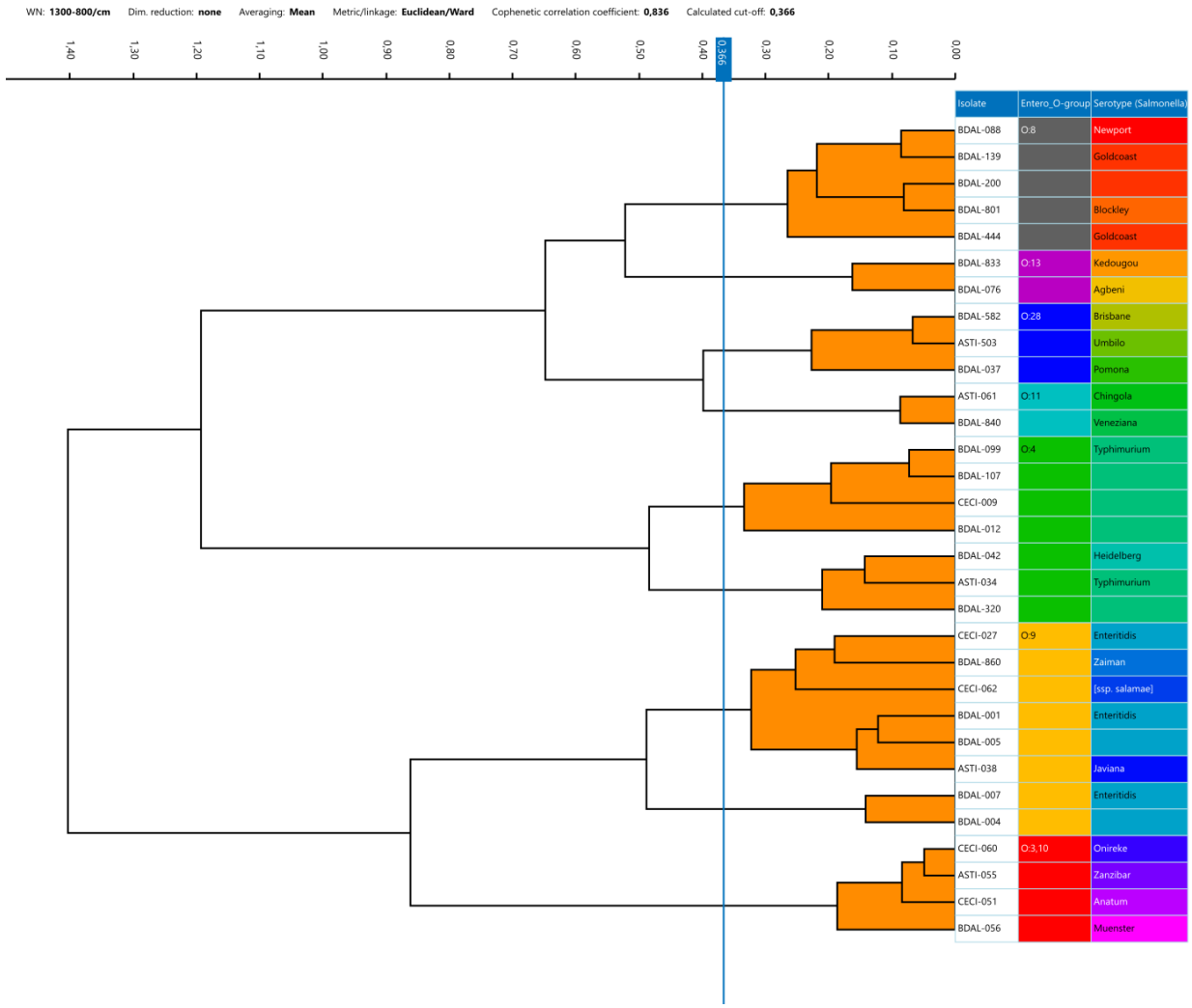
To deepen your analysis, IR Biotyper results can be reflexed to WGS for confirmation of strain identity.

# Cluster analysis and strain discrimination

The IR Biotyper allows customers to perform cluster analysis and strain discrimination for a wide range of different species. Same-day results are obtained, starting from colony material.

In food, veterinary, and environmental testing, the IR Biotyper is used to analyze *E. coli*, *Salmonella*, *Citrobacter*, *Listeria monocytogenes*, *Acinetobacter baumannii*, *Haemophilus parasuis*, and other species. With this powerful tool, isolates can be compared in the event of outbreaks or contamination of strains of a wide variety of species.

The results can be displayed in table format, or visualized graphically using distance matrices, dendrograms, or 2D/3D scatterplots.




Dendrogram for clear visualization of strain discrimination for *Salmonella* O-groups and serotypes

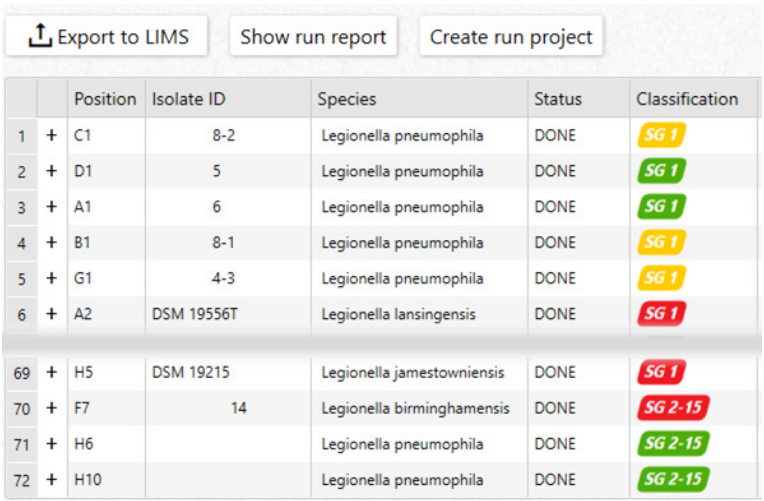
# Make tedious tasks a breeze

## Easy-to-use software for streamlined operation

Designed for ease of use, the IR Biotyper combines smart isolate classification with intuitive data visualization, including 2D and 3D scatter plots, and straightforward integration with LIMS workflows.

## Real-time, intelligent isolate classification

The IR Biotyper software enables rapid isolate classification using preconfigured or custom machine learning (ML) models. Based on artificial neural networks (ANNs), support vector machines (SVMs), and other ML algorithms, these models can support applications such as serogroup classification and other targeted screening workflows. Laboratories can further enhance performance by building application-specific models using their own datasets.




| | | Position | Isolate ID | Species | Status | Classification |
|---|---|---|---|---|---|---|
| 1 | + | C1 | 8-2 | Legionella pneumophila | DONE | SG 1 |
| 2 | + | D1 | 5 | Legionella pneumophila | DONE | SG 1 |
| 3 | + | A1 | 6 | Legionella pneumophila | DONE | SG 1 |
| 4 | + | B1 | 8-1 | Legionella pneumophila | DONE | SG 1 |
| 5 | + | G1 | 4-3 | Legionella pneumophila | DONE | SG 1 |
| 6 | + | A2 | DSM 19556T | Legionella lansingensis | DONE | SG 1 |
| 69 | + | H5 | DSM 19215 | Legionella jamestowniensis | DONE | SG 1 |
| 70 | + | F7 | 14 | Legionella birminghamensis | DONE | SG 2-15 |
| 71 | + | H6 | | Legionella pneumophila | DONE | SG 2-15 |
| 72 | + | H10 | | Legionella pneumophila | DONE | SG 2-15 |

Software screenshot of classification of *Legionella* samples, distinguishing serogroup (SG) 1 of *L. pneumophila* from other serogroups.
Classifications rely on a score value, which is rendered in real-time using a simple 'traffic light' system for at-a-glance understanding and streamlined workflows. Finally, these results are combined in a summary report.

## Ready-to-use classifiers for targeted applications

Developed using advanced machine learning algorithms, the preconfigured IR Biotyper classifiers enable rapid and standardized differentiation of selected microbial groups. The list of available classifiers is subject to regular updates.

Current applications include:

- Differentiation of 36 *Salmonella* O-serogroups
- Differentiation of Typhi vs. non-Typhi *Salmonella* serovars within serogroup O:9
- Differentiation of *Listeria monocytogenes* O-serogroups 1/2, 3, 4x, 7
- Identification of the prominent O-serogroups of Shiga toxin-producing *Escherichia coli* (STEC)
- Differentiation of *Legionella pneumophila* serogroup 1 from serogroups 2–15
- Differentiation of 36 different *Streptococcus pneumoniae* serotypes in 25 serogroups, and sub-serogroup 6 classifier

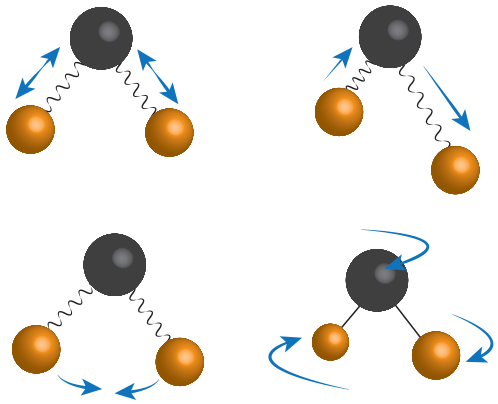
Results are generated automatically and displayed using the intuitive traffic-light reporting system, supporting fast interpretation and confident decision-making.

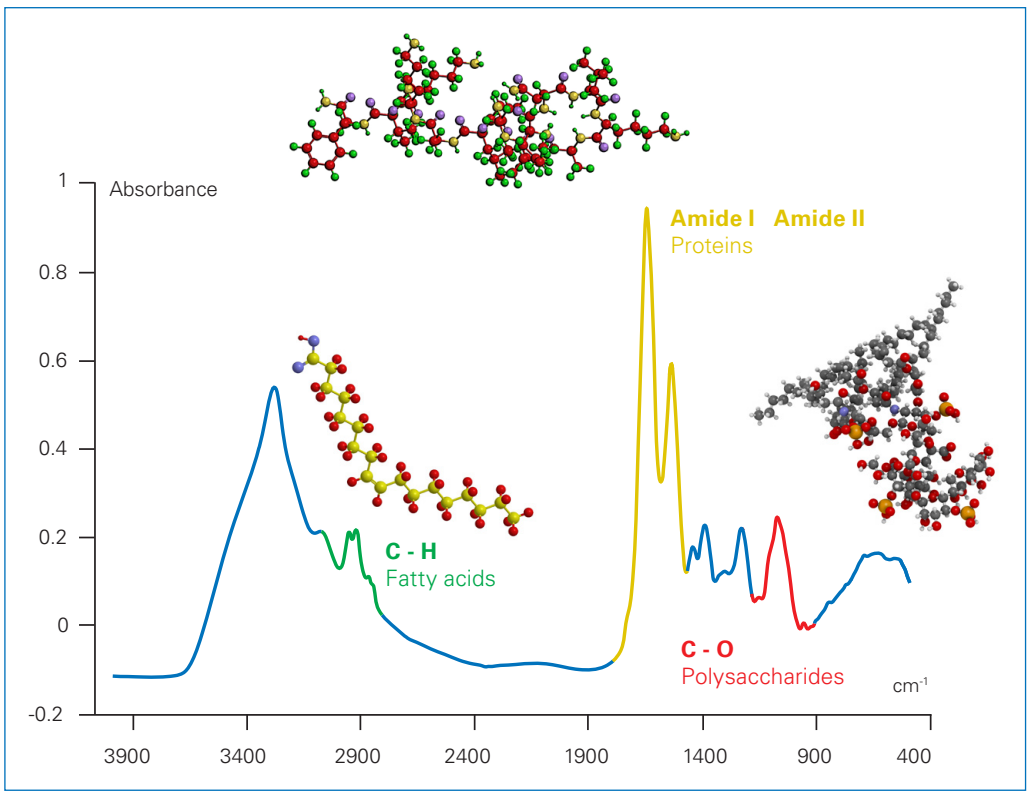
Dedicated application flyers are available.

# The principle of FT-IR

The IR Biotyper uses Fourier Transform Infrared (FT-IR) spectroscopy to analyze the molecular vibrations caused by absorption of infrared light. Different chemical structures vibrate at different wavenumber regions – for example, the carboxyl group in fatty acids (and lipids) vibrates at 2800–3000 $cm^{-1}$, the amide group in proteins vibrates at 1500–1800 $cm^{-1}$, and the carboxy group in polysaccharides vibrates at 900–1200 $cm^{-1}$.

The IR Biotyper offers the option to use data from all these regions, to provide information about the full range of diagnostic molecules present in the sample. In routine use, the polysaccharide region (900–1200 $cm^{-1}$) is the most useful one, as this part of the spectrum is like a 'fingerprint', providing information about the carbohydrates present in many molecules such as glycoproteins, and allowing microorganisms such as *Legionella pneumophila* serogroup 1, *Salmonella* O-serogroups and selected serotypes of *Listeria monocytogenes* to be classified.

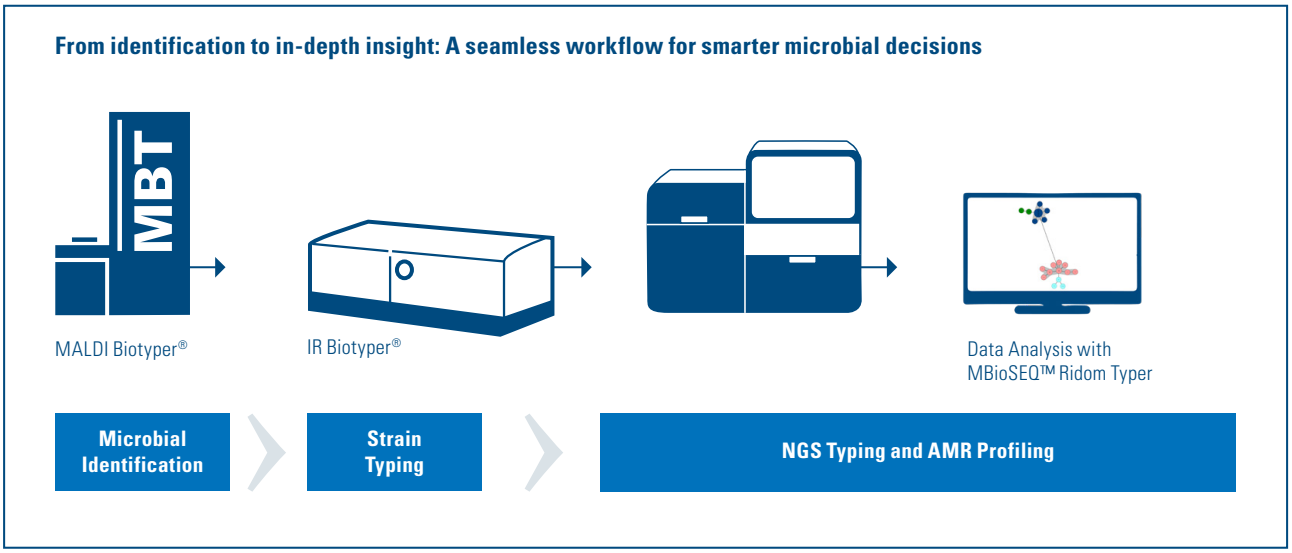





By default, the IR Biotyper analyzes IR spectra in the wavenumber range typical for carbohydrates (red), but other regions such as those indicating fatty acids (green) and proteins (yellow) can easily be selected for analysis in the software as well.

# In need for deeper analysis?

From routine identification to advanced strain characterization, Bruker offers a scalable workflow for food, water and veterinary microbiology. The MALDI Biotyper provides rapid species identification, followed by IR Biotyper strain typing to assess relatedness between isolates and support contamination or outbreak investigations. Only selected isolates need to be advanced to WGS, helping laboratories optimize time and resources. Bruker's MBioSEQ™ Ridom Typer software supports the analysis and interpretation of sequencing data, enabling deeper microbial characterization when required.




## Order information

**IR Biotyper**
Part No. 1845471
High-performance FT-IR spectrometer with capability for analyzing 96-spot silicon microtiter sample plates, and software for sample setup and data analysis.

**96-Spot silicon microtiter plates**
Part No. I23258P
Set of five reusable plates with 96 positions each designed for use with the IR Biotyper.

**IR Biotyper Kit**
Part No. 1851760
Includes two bacterial IR test standards (IRTS 1 and IRTS 2) for five runs, and sample preparation vials for 50 isolates.

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

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