GP

IR Biotyper®

- Microbial strain typing for real-time epidemiology

Innovation with Integrity

FT-IR

IR Biotyper

Supporting proactive infection control

Efficient microorganism strain typing is vital in healthcare settings for infection control, epidemiological studies, and to better understand the causes of infection. However, traditional strain typing technologies like pulsed-field gel electrophoresis (PFGE), multi-locus sequence typing (MLST) and whole-genome sequencing (WGS) are time-consuming and resource-intensive, and not commonly available in microbiological laboratories.

Fast, easy-to-use, and economical, the IR Biotyper addresses this challenge by using infrared spectroscopy to classify microorganism strains with high specificity. Its discriminatory power is comparable to routine molecular genetic methods, and its real-time strain typing capability and efficient software enables proactive infection control.

Benefits of using the IR Biotyper

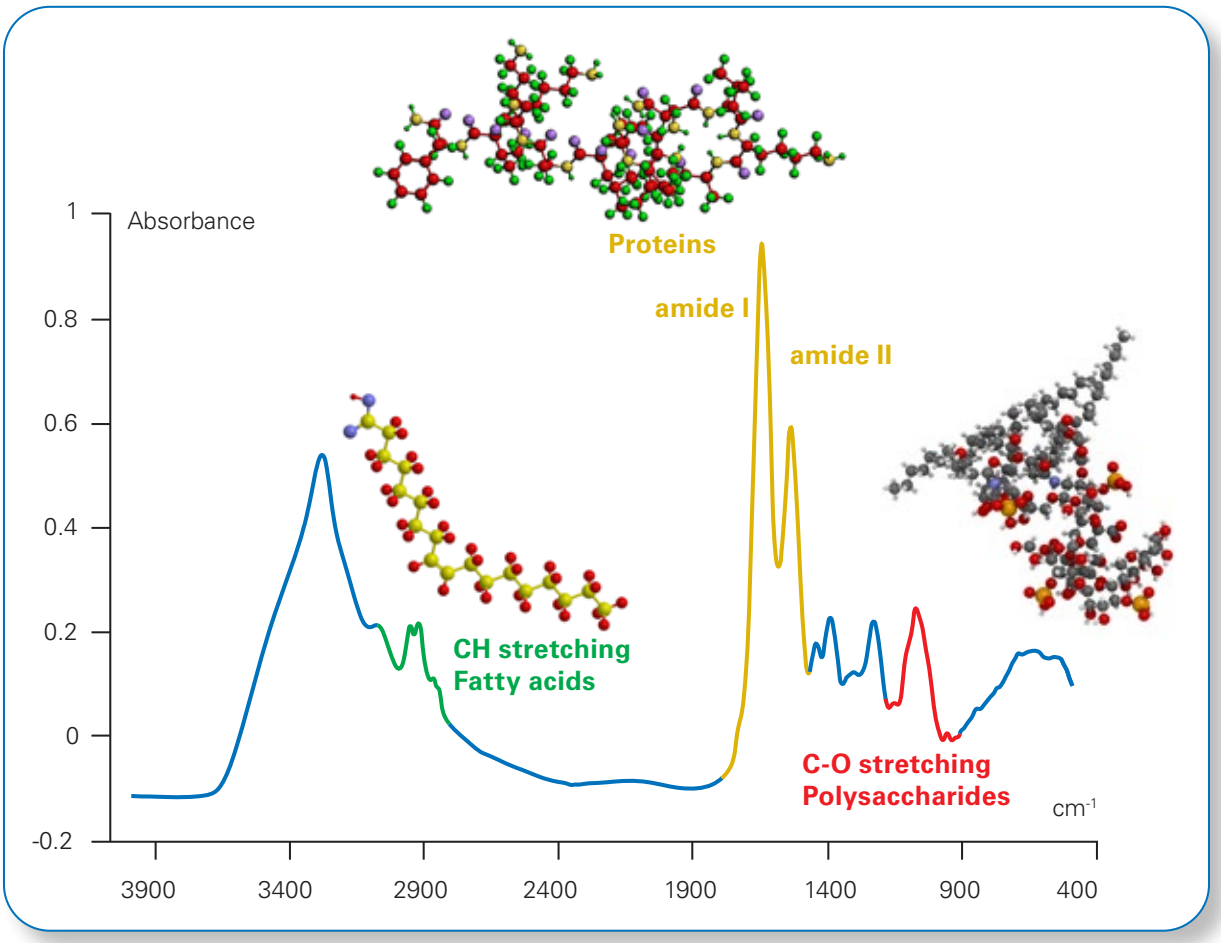
Implementing the IR Biotyper in your hospital hygiene management system will:

- Enable swift identification of bacterial outbreaks
- Allow investigation of unusual patterns in a set of samples
- Enable classification of isolates based on predefined classification models, e.g. allowing fast detection of known serotypes and strains
- Allow transmission routes to be monitored in real time
- Support preventive action through routine screening
- Enable improved data-based hygiene management through further analytical studies

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 frequencies – for example, the carboxyl unit in fatty acids (and lipids) vibrates at 2800–3000 cm^{-1}, the amide unit in proteins vibrates at 1500–1800 cm^{-1}, and the carboxy bond in polysaccharides vibrates at 900–1200 cm^{-1}.

The IR Biotyper offers the option to use data from all these ranges, 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, because 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 *Streptococcus pneumoniae* serotypes to be classified.

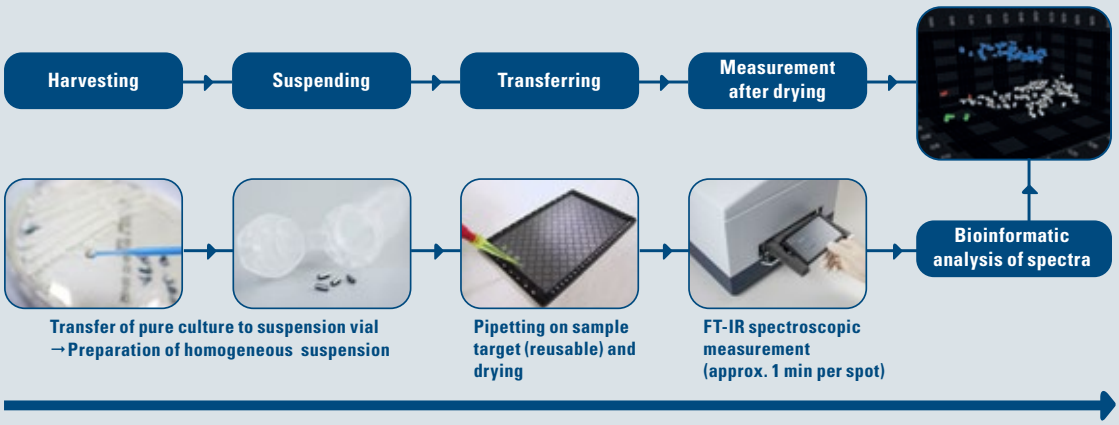


By default, the IR Biotyper analyzes IR spectra in the wavenumber range typical for carbohydrates (red), but other regions such as those indicating fatty acids (green) and proteins (yellow) can easily be selected for analysis in the software as well.

Simple workflow 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.



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.

Updated software for streamlined operation

IR Biotyper 3.1 features a major new software upgrade:

- Customizable isolate metadata, including biological, such as multi-locus sequence typing (MLST), pulsed-field gel electrophoresis (PFGE), virulence factors and resistances; and circumstantial, such as location, isolation date, and matrix
- Template-based workflow creation of measurement runs: data can be imported from MALDI Biotyper® into the IR Biotyper software, plus laboratory information management system (LIMS) export
- Simple building and automated application of classifiers based on artificial neural networks (ANN) for isolate classification
- 3D principal component analysis (PCA) plots and one simple color coded (traffic light) report

Integrated workflows for microorganism identification and strain typing

The IR Biotyper and Bruker's MALDI Biotyper can now 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.

Intuitive software aiding epidemiology

Clear data visualization through reliable and intuitive data analysis

Strain typing results achieved with FT-IR spectroscopy are equivalent to molecular methods, and this has been demonstrated by strain typing of over 240 clinical isolates of vancomycin-resistant *Enterococcus* (VRE) using genomic sequencing and the IR Biotyper (see dendrogram on the following page).

In addition, data obtained using the IR Biotyper are easy to interpret, with smart isolate classification complemented by convenient visualization tools.

Real-time isolate quality-checking and classification

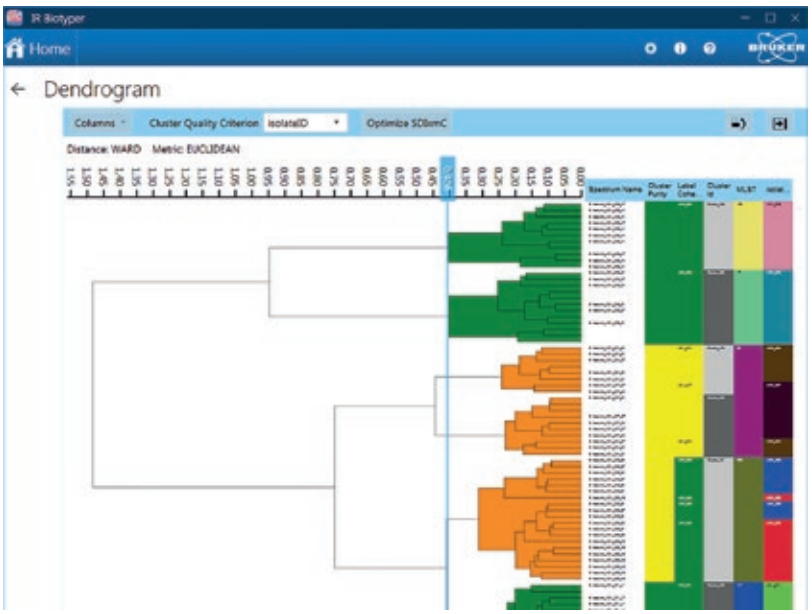
Isolate classification using the IR Biotyper software is based on an artificial neural networks (ANN). Classifications can be based on predefined or customized models, allowing fast identification of serotypes, serogroups or strains previously identified e.g. during an outbreak, and supporting fast preventive action. Classifications rely on a score value, which is rendered in real-time using a 'traffic light' system for at-a-glance understanding and streamlined workflows.

Fast and automated classification of pneumococci serotypes

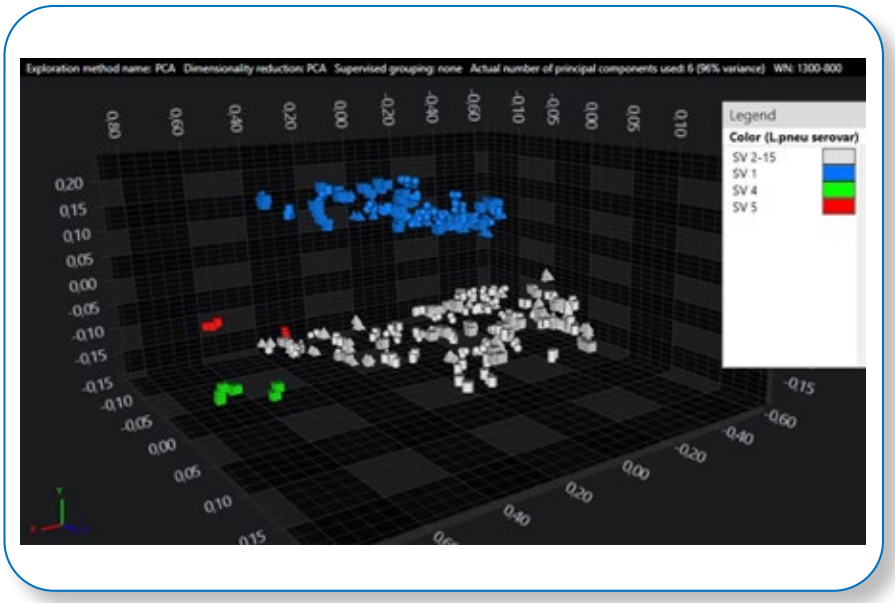
The results of the classification run are indicated using a 'traffic light' system: Correct (green), high similarity (yellow), and not classified (red). In the example above, *Streptococcus pneumoniae* isolates are matched to previously defined serotypes in a training set.

Versatile data exploration options

Using the IR Biotyper 3.1 software, results can be displayed in table format, or visualized graphically using distance matrices, dendrograms or scatter plots.



Isolate clustering can be assessed using distance matrix plots or dendrograms, as shown in this dendrogram example of the strain typing of over 240 vancomycin-resistant *Enterococcus* (VRE) isolates.



The results of dimensional reduction can be visualized using 2D or 3D scatter plots, as shown in the 3D plot for *Legionella pneumophila* serovars.

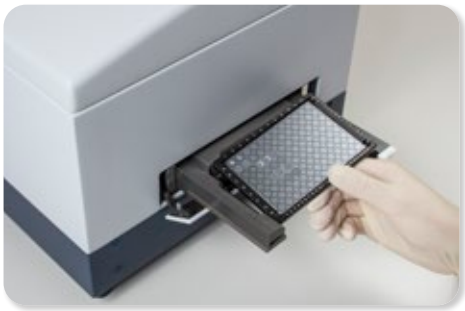
Order information

Part-No. 1845471
IR Biotyper

High-performance FT-IR spectrometer with capability for analyzing 96-spot silicon microtiter sample plates, and up-to-date software for sample setup and data analysis.

Part-No. I23258P
96-Spot silicon microtiter plates

Set of 5 reusable plates each with 96 positions designed for use with the IR Biotyper.



Part-No. 1851760
IR Biotyper Kit

Includes two bacterial IR test standards (IRTS 1 and IRTS 2) for five runs, and sample preparation vials for 50 isolates.

Part-No. 1888639
SW-Package IR Biotyper 3.1

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

As of May 2021, Bruker Daltonik GmbH is now Bruker Daltonics GmbH & Co. KG.

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