

Accuracy of Bruker MALDI-TOF for Identification of Bacteria with Lower Biotyper Scores

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Introduction

Bacterial identification may be made based on the spectra of cellular peptides obtained by matrix-assisted laser desorption ionization time-of-flight (MALDI-TOF) mass spectrometry. This method is rapid (identification possible within minutes), inexpensive, and accurate for identifying bacterial isolates. The MALDI Biotyper® (Bruker Corporation) method uses Biotyper scores to determine the level of identification confidence. Biotyper identification scores ≥ 2.000 are considered accurate and confirmatory for bacterial genus and species, while scores of 1.700-1.999 are reliable only to the genus level, Table 1.

Table 1. Bruker Biotyper Score and Identification Level

Score Range	Identification Level
≥ 2.000	Genus and species
1.700-1.999	Genus only
< 1.700	No reliable identification

Accurate genus and species identification at lower Biotyper scores would not only aid in more rapid identifications, but would also decrease the number of full extraction procedures needed to obtain confirmatory species identification.

We evaluated the accuracy of genus- and species-level identification for isolates with lower Biotyper scores (1.700-1.999) in a reference laboratory setting.

Methods

Bacterial isolates (n=742) were freshly grown on agar media under atmospheric and temperature conditions that were appropriate for growth of the particular organism. All direct-spot testing was performed in duplicate according to manufacturer's instructions.

Briefly, pure isolated colonies of the fresh growth were picked and spotted in duplicate onto the MALDI target plate to obtain a thin layer of organism. Extraction matrix (1 μ L) was added to each organism spot and allowed to air dry. A Bruker Bacterial Test Standard was included with each run for calibration and quality control.

Methods (cont)

The inoculated target was placed into the Biotyper instrument and the MALDI-TOF assay was performed to obtain the organism profiles.

The accuracy of genus and species identification was evaluated for isolates with at least 1 Biotyper score of 1.700-1.999; the second spot could be either >2.000 , <1.700 , or 1.700-1.999. Isolate identification was compared with the reference identification obtained using ATCC strains, commercial automated systems, conventional phenotypic testing, or molecular methods.

Results

Analysis of the 742 bacterial identification tests resulted in 212 isolate identifications with at least 1 Biotyper score of 1.700-1.999. These isolates included 151 Gram-positive and 61 Gram-negative bacteria.

Relative to the reference identification, the MALDI-TOF assay correctly identified 202 (95.3%) of the 212 isolates. Of the 10 errors, 3 were *S. mitis* isolates misidentified as *S. pneumoniae*; this is a known system limitation, and the report includes a cautionary comment. The other 7 incorrect identifications are listed in Table 2.

Table 2. Isolate Misidentifications with at Least 1 Biotyper Score of 1.700-1.999

Genus and Species	Biotyper Scores	MALDI Identification
<i>Streptococcus mitis</i>	1.825, 1.834	<i>Streptococcus oralis</i>
<i>Eggerthella lenta</i>	1.71, 1.15	<i>Propionibacterium acnes</i> /no ID
<i>Gordonia</i> sp.	1.928, 2.028	<i>Arthrobacter castelli</i>
<i>Gordonia</i> sp.	1.898, 1.694	<i>Arthrobacter castelli</i> /no ID
<i>Microbacterium</i> sp.	1.819, 1.669	<i>Arthrobacter castelli</i> /no ID
<i>Bacillus pumilus</i>	1.911, 2.049	<i>Anaerococcus</i> sp.
<i>Brevibacter</i> sp.	1.755, <1.700	<i>Corynebacterium afermentans</i>

Conclusions

- This MALDI-TOF assay yields accurate genus and species results, even when Biotyper scores are in the genus-only range.
- Using lower scores for accurate identification could require fewer tube extraction procedures, reduce expenses and hands-on time, and shorten the time to identification.

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