Application of *Matrix-assisted Laser Desorption Ionization Time-of-Flight Mass Spectrometry* (MALDI- TOF MS) in Rapid Identification of Clinical Isolates in a Super Specialty Neurocare Centre

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Introduction

MALDI- TOF was developed in the 1980's and was used for detection of large molecules using TOF. It has wide application in identification of proteins in biochemistry, high molecular weight substances in organic chemistry and bacteria & viruses in microbiology. MALDI-TOF is based on the principle that proteins are ionised and vaporised when high energy ionising laser is focused on them. The Time of flight and mass to charge ratio are calculated and matched. The aim of this study was to validate the reliability of Biotyper as an identification system in a clinical set up and to reduce turn around time, improve identification and reliability.

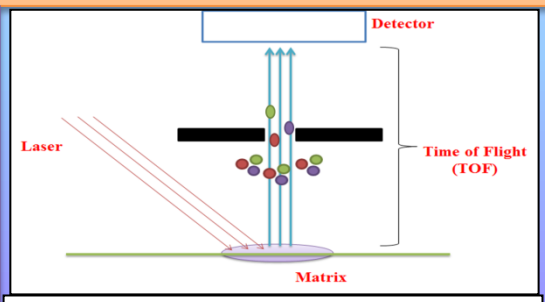
Material & Methods

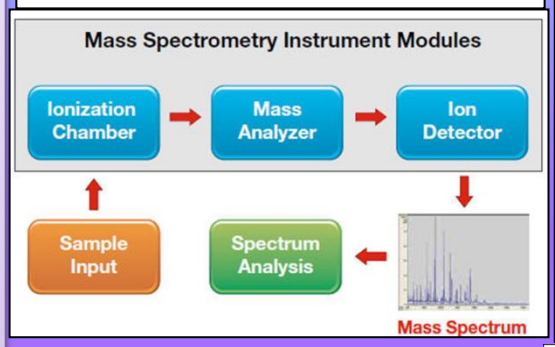
Selection of study organisms

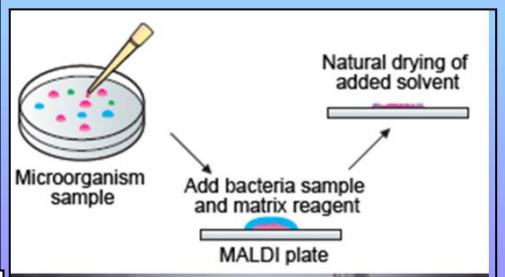
- Mycobacterium culture and smear confirmed isolates & control strains
- Cryptococci genotyped strains, unidentified clinical isolates and control strains
- Gram positive and negative clinical isolates & controls

Analysis in Microflex LT Biotyper

The machine was run in automatic mode to obtain a score. In case of low score or poor peaks the reading was also repeated using a manual firing mode and the best score was used as the z score.







Bacterial colony from a pure culture plate

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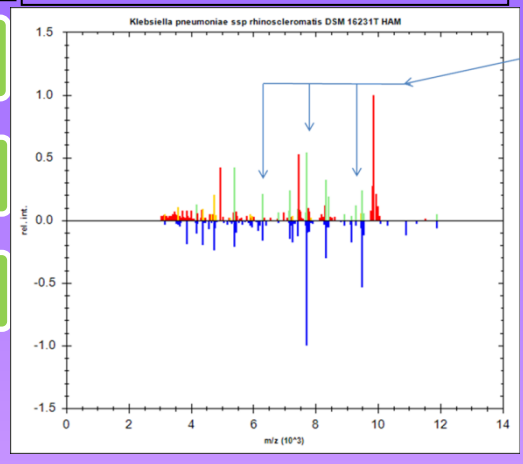
Thin film of organism in the MALDI plate

↓

Add formic acid and Matrix. Allow it to dry

↓

Load the plate into Biotyper



Meaning of Score Values

Range	Description
2.300 ... 3.000	highly probable species identification
1.900 ... 2.299	secure genus identification, probable species identification
1.600 ... 1.899	probable genus identification
0.000 ... 1.599	not reliable identification

Results

Number of reliable Identification made

Organism	Number
Gram Negative Bacteria	15
Gram Positive Bacteria	3
Cryptococcus neoformans	14
Cryptococcus gattii	2
Candida tropicalis	1
Mycobacterium tuberculosis	2
Mycobacterium smegmatis	2

Positive outcomes

- Score level is an indicator of confidence in the identification.
- Identification of bacterial isolate was highly reliable.
- Identification of yeast isolate was highly reliable.
- Less turn around time (TAT) compared to routine analysis.
- Control strains gave good correlation

Negative outcomes

Mycobacterium isolates did not give a reliable identification, though high biomass gave better peaks.

Conclusion: Maldi ToF is ideal for identification of Gram negative & Gram positive bacteria and also for Fungi. Mycobacterial identification is limited to some extent. Further larger study is required for identification.