Application of MALDI-TOF MS as an innovative tool in clinical virology

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Virus detection and/or identification is traditionally performed using methods based on cell culture, electron microscopy and antigen or nucleic acid detection. In this study, Matrix-Assisted Laser Desorption/Ionization Time-of-Flight Mass Spectrometry (MALDI-TOF MS), commonly used in clinical microbiology, was developed and tested as an innovative tool to be applied to virus identification by using two different approaches. In the first approach, human polioviruses were selected as a model to evaluate the ability of MALDI-TOF MS to identify specific viral protein to be used as biomarkers of purified virus particles, followed by the serotypes identification. To this aim the Sabin reference strains were firstly analysed revealing, after a proper statistical investigation, VP4 as a potential biomarker to identify poliovirus strains at the serotype level. The results were then corroborated by a blind application of the assay to clinically isolated strains. In the second approach, a protein profiles library was newly created to discriminate between uninfected and respiratory virus infected cell cultures after a viral proteins enrichment method. The library was built using different reference strains after an extensive modification of the MALDI-TOF MS pre-processing, MSP creation, subtyping MSP creation and identification default parameters setting. The spectra obtained by 58 additional cultured strains correctly match with the new database demonstrating its reliability.

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