

SALSA Lecture
Dr. Peter Lasch
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„Characterization of Pathogenic Microorganisms Using Vibrational Spectroscopy and Mass Spectrometry“

Vibrational spectroscopic techniques like Raman or infrared (IR) spectroscopy and mass spectrometry-based techniques such as matrix-assisted laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF MS) are emerging generic technologies for the characterization of pathogenic microorganisms. All these techniques have in common that they can be used to obtain taxon-specific biomarker profiles suitable for bacterial identification at the genus, species, or even at the subspecies level holding the potential to serve as rapid and sensitive identification techniques in clinical or food microbiology and for the detection of biosafety level (BSL)-3 microorganisms. Whilst mass spectrometry applications always require cultivation of the pathogens, vibrational microspectroscopic techniques (confocal Raman microspectroscopy) are also capable of characterizing individual microbial cells. The combination of vibrational and mass spectrometries allows thus for the rapid, sensitive and reliable identification of microorganisms without the need for tagging, labeling or staining the samples.

The development of vibrational spectroscopy, or mass spectrometry-based identification techniques for BSL-3 level microorganisms was hampered by the fact, that no evaluated and spectroscopy-compatible procedures for reliable inactivation of the microorganisms were available. In the presentation we will exemplarily describe a MALDI-TOF MS compatible methodology for inactivation of microorganisms that is based on sample treatment with 80% trifluoroacetic acid (TFA). The TFA inactivation protocol is simple and rapid and assures reliable inactivation of vegetative cells and spores of BSL-3 level microorganisms and can be applied to reproducibly collect mass spectra from a large variety of microorganisms. We will present selected data from MALDI-TOF MS studies of the genera *Bacillus*, *Burkholderia*, and *Yersinia* demonstrating the great potential of MALDI-TOF MS as a rapid, reliable, and objective identification technique for highly pathogenic microorganisms.

In the second part of the presentation we will introduce confocal Raman microspectroscopy as an evolving technique for studying genetically homogeneous microbiological samples, which may exhibit heterogeneous multi-component systems. Because of the capability to study individual microbial cells, Raman microspectroscopy and Raman imaging offer possibilities to new shed light on the role of the cell's divisional or metabolic state in creating heterogeneity on the phenotypic level.

Wednesday, June 10th 2015

11:00 a. m., s. t.

Room 0'07, IRIS-Building
Zum Großen Windkanal 6, Berlin Adlershof