

Liquor investigation by means of Raman spectroscopy

Petra Rösch¹⁾, Michaela Harz¹⁾, Michael Kiehntopf²⁾, Eberhard Straube³⁾,
Thomas Deufel²⁾, Jürgen Popp^{1), 4)*}

¹⁾ Institute of Physical Chemistry, Friedrich-Schiller-Universität Jena, Helmholtzweg 4,
D-07743 Jena, Germany.

²⁾ Institute of Clinical Chemistry and Laboratory Diagnostics, Friedrich-Schiller-Universität
Jena, Erlanger Allee 101, D-07747 Jena, Germany

³⁾ Institute of Medical Microbiology, Friedrich-Schiller-Universität Jena, Semmelweisstraße 4,
D-07743 Jena, Germany.

⁴⁾ Institute of Photonic Technology Jena, Albert-Einstein-Straße 9, D-07745 Jena, Germany

Cerebrospinal fluid diagnostics bases on microscopic analysis of cells and particles. Cell counting as well as a fast and specific differentiation after enrichment of living single cell populations and staining is accomplished. Here in general automated haematological systems or flow cytometer are applied [1]. However, samples with small volume and a limited cell number have hampered the analysis in routine clinical practise since it is inaccurate, has wide inter-observer variability and is labor-intensive and time-consuming. In case of bacterial detection Gram staining and cultivation is performed that takes more than 48 hours. Thus an immediate antimicrobial treatment is not possible.

Previous research work has shown that micro-Raman spectroscopy provides a facile method for analyzing single cells such as blood cells and due to the high spatial resolution even individual bacteria in their native state may be rapidly investigated without culturing. [2]

The localization of both bacteria and bloods cells can be performed using fluorescence imaging. [3]

The aim of our research is focused on the analysis of cellular components of cerebrospinal fluid samples by means of Raman spectroscopy for medical diagnosis. For this purpose in order to guarantee fast analysis without the necessity for bacterial cultivation single bacterial cells were investigated. Our intension comprises the cell characterization and differentiation of single bacteria and blood cells in liquor cerebrospinalis of bacterial induced meningitis. The combination of Raman spectroscopy with chemometrical methods allows the identification of bacteria by means of their specific vibrational fingerprint signature. Furthermore several cell constituents were investigated to clarify the molecular origin for characteristic bands in the Raman spectrum of bacteria and body cells in order to elucidate doubtless cell identification.

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References

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