Characterization of Acidiphilium cryptum JF-5 by means of Raman spectroscopy

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Our analyses are focused on microorganisms which can play an important role in bioremediation of freshwater habitats affected by acid mine drainage (AMD). AMD affected sites usually contain high amounts of soluble Fe(III) and toxic heavy metals such as Cr(VI), Cd(II), Cu(II), Zn(II) or Ni(II). *Acidiphilium cryptum* JF-5 is an acidophilic bacterium which can reduce both Fe(III) and Cr(VI) to less toxic compounds[1]. For a better understanding of the role of this organism in the remediation process and their resistance mechanisms towards various toxic metals, a study focused on the changes induced by various heavy metals in chemical composition of the cells is required.

An elegant method for chemical composition analysis of single bacterial cells is the micro-Raman spectroscopy[2]. Compared with other spectroscopic techniques, the advantages of micro-Raman spectroscopy are the non-invasive character of this technique, spatial resolution in the same size range as bacterial cell dimension, the requirement of only one bacterial cell for one spectrum and the short time necessary for one spectrum acquisition.

The investigation performed on *A. cryptum* JF-5 indicates that bacteria form intracellular accumulations of energy storage material. Combining Raman spectroscopy with fluorescence imaging, the storage material was identified as polyhydroxybutyrate (PHB). In addition, the presence of different heavy metals in bacterial habitat induces changes in the biochemical composition of the cells. Various resistance patterns towards heavy metals are reported in the literature. Our enquiry indicates different resistance mechanisms utilized by *A. cryptum* JF-5, depending on the type and concentration of toxic metal present in the medium.

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References:

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