Raman acoustic levitation spectroscopy (RALS) of living cells: Applications to malaria diagnosis and phytoplankton research

B. R. Wood[1], P. Heraud[1], S. Stojkovic[2], D. Morrison[1], J. Beardall[1,2], L. Pushka[1], T. Frosch[1,4], R. Tuckerman[3], J. Popp[4], V. Lee[1], and Don McNaughton[1]

1. Centre for Biospectroscopy and School of Chemistry, Monash University, 3800, Victoria, Australia
2. School of Biological Sciences, Monash University, 3800, Victoria, Australia
3. Universität Göttingen, Institut für Physikalische Chemie, Tammannstr. 6 D-37077 Göttingen, Germany
4. Institut für Physikalische Chemie, Friedrich-Schiller-Universität Jena, Helmholtzweg 5 D-07743 Jena, Germany

Methods to probe the molecular nature of living cells are of paramount importance in understanding drug interactions and environmental influences in these complex dynamical systems. The coupling of an acoustic levitation device with a micro-Raman spectrometer or a portable Raman spectrometer with a fibre optic provides a direct molecular probe of cellular chemistry in a container-less environment minimizing signal attenuation and eliminating the affects of adhesion to walls and interfaces. Recently we demonstrated that coupling a portable Raman spectrometer with fiber optic probe to an acoustic levitation device provides a technology for monitoring and taxonomically identifying populations of algal cells.[1] The applicability of the micro-Raman technique for molecular analysis of live erythrocytes has also recently been demonstrated[2-4] In this presentation we show that the RALS approach can be used to monitor the heme dynamics of a levitated suspension of erythrocytes and to detect hemozoin directly in malaria infected cells.[5] The application of this technology has important implications as a diagnostic and monitoring tool for erythrocyte disorders including malaria and sickle cell disease.

Fig 1. 5 μL acoustic levitated drop of erythrocytes irradiated with 780 nm laser

References

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