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Application and evaluation of Raman spectroscopy for dengue fever analysis and its comparison with the routine dengue diagnostic tests

Saranjam Khan and Rahat Ullah

National Institute for Lasers and Optronics (NILOP), Pakistan

We are presenting the evaluation of Raman spectroscopy as rapid diagnostic test for the detection of disease in the human blood serum. Blood samples of 84 clinically dengue suspected patients has been used in this study. Out of these 84 sample (95%) were positive based on nonstructural protein 1 (NS1), whereas (50%) and (52%) were positive based on Immunoglobulin G (IgG) and Immunoglobulin M (IgM) antibodies tests, respectively. Raman spectra from all these samples have been acquired in the spectral range from 600 cm^{-1} to 1700 cm^{-1} using 532 nm laser as an excitation source. The Raman spectra from normal healthy blood sera have also been obtained in the same spectral range under the same conditions. In the Raman spectra of normal samples three intense Raman-peaks have been observed at 1006, 1156 and 1516 cm^{-1} . In the Raman spectra of dengue infected blood sera the intensity these three major peaks get suppressed whereas additional peak gets appear at 750, 855, 1032, 1306, 1333, 1355, 1580, 1603 and 1660 cm^{-1} . The spectral differences between normal and abnormal (dengue infected) sera have been evaluated by using support vector machine (SVM) techniques. SVM models has been developed on the basis of three different kernel functions i.e. polynomial, linear, and Gaussian radial basis function (RBF). The model has been tested with the k-fold cross validation method. A diagnostic accuracy of about 85% with the precision of 90%, sensitivity of 73% and specificity of 93% has been achieved under these conditions.

Biography

Saranjam Khan did his PhD studies in 2011 from Division of Biomedical Physics, Innsbruck Medical University Austria. Currently he is working as Principal Scientist at National Institute for Lasers and Optronics (NILOP). His main research area includes spatial light modulator (SLM) based imaging, Raman and fluorescence spectroscopy. Recently he is working on the optical diagnosis of different types of diseases. He is the author 27 peer reviewed papers in well reputed journals.

k.saranjam@yahoo.com

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