Investigation of Live White Blood Cells using Raman Tweezers spectroscopy

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Recent years have been witnessing keen interest in studying the light interaction with biological systems. The demand for sensitive and real-time optical technologies, which enable thorough investigation of biological samples keeps on increasing these days. Raman spectroscopy based modalities have been achieving utmost attention amongst the scientific fraternity due to their advantages such as high sensitivity and no chance of background interference from aqueous environment. Still, the conventional Raman technique faces limitations in probing live blood cells due to its Brownian motion. Raman Tweezers, which couples optical trapping along with Raman spectroscopy has been explored for studying live human blood cells, their interactions with external factors and the alterations occur as a result of various health disorders. In the present study, Raman Tweezers has been utilized for investigating the spectral features of white blood cells. The spectra were in general, dominated by nucleic acids, proteins and lipids. Significant variations were evident in spectral features of nucleic acids and proteins amongst three different classes of white blood cells – Lymphocytes, Monocytes and Granulocytes. An enhancement in the Raman band at 974 cm^{-1} resulting from deoxyribose was evident for Granulocytes in comparison with Lymphocytes. Similarly, the bands resulting from amino acids as well as proteins were also high in Granulocytes. An inverse trend was observed for the bands arising due to nucleic acids. Future works will be focused on evaluating the spectral variations between normal white blood cells and cells acquired from subjects with hematological malignancies.