Two-Photon-Excited Tryptophan Fluorescence Microscopy for Leukocytes and Cancer Cells Imaging

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Cancer screening and early diagnosis is an important yet controversial issue due to the safety and practicality of methods used. Our objective is to study the efficiency of an in vivo two-photon microscope developed in our laboratories to monitor cell inflammation. First, leukocytes were separated by subpopulation. The tryptophan fluorescence intensity level of each type of leukocyte was then quantified with two-photon microscopy, in their naïve and inflamed states, respectively. Finally the tryptophan fluorescence intensity of multiple myeloma cells was quantified and correlated to the resulting images. The cancerous tissue auto-fluorescence from NADH and FAD was also recorded as a control to determine the specificity of the technique. Comparison of the fluorescence of leukocytes and cancer cells has demonstrated the presence of tryptophan in different quantities per cell, thus offering the potential for distinguishing multiple myeloma cells from leukocytes in circulation and record multiple myeloma cell trafficking process. This is a significant advantage over spectroscopy techniques for safe in vivo imaging of cancer screening, since it can be applied without the need for labeling. It is potentially applicable for tracking leukocytes and monitoring inflammatory cellular reactions in humans.