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Nonlinear microscopy as diagnostic tool for the discrimination of activated T cells

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Abstract

The ability to monitor the activation state of T-cells during immunotherapy is of great importance. Although specific activation markers do exist, their abundance and complicated regulation cannot definitely define the activation state of the cells. Previous studies have shown that Third Harmonic Generation (THG) imaging could distinguish between activated versus resting microglia and healthy versus cancerous cells, mainly based on their lipid-body profiles. In the present study, mitogen or antigen-stimulated T-cells were subjected to THG imaging microscopy. Qualitative and quantitative analysis showed statistically significant increase of THG mean area and intensity in activated versus resting Tcells. The connection of THG imaging to chemical information was achieved using Raman spectroscopy, which showed significant differences between the activation processes and controls, correlating of THG signal area with cholesterol and lipid compounds, but not with triglycerides. The obtained results suggested a potential employment of non-linear microscopy in evaluating of T-cell activation, which is expected to be largely appreciated in the clinical practice.