MicroRaman Spectroscopy detection of oxidative stress in different glioblastoma cell lines

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In recent times the use of Raman Microspectroscopy for detailed analysis of biological materials has gained more and more interest. The analytic and diagnostic potentials of such technique are mainly due to the possibility of enabling non invasive analysis of biosystems in the absence of fixative or labels and in physiological conditions. Recording the spontaneous Raman scattering from a cell allows to simultaneously investigate, at a molecular level, the properties of different biological constituents. Besides, the opportunity to combine the Raman spectroscopy with a confocal microscopy lead to single cell analysis; this can give a detailed comparison between healthy and diseased samples making this technique a promising diagnostic tools [1].
We used a 532 nm excitation to collect the Raman spectra of glioblastoma cells and enhance by resonance the Raman signals of cytochrome c. These features are particularly magnified when cytochrome c is in the reduced form, while an important decrease of Raman signal is evidenced for the oxidized one [2]. In a recent study, we evidenced the irreversible decrease of the cytochrome c Raman signals for some neuronal cells, and gave the monitoring of the oxidative stress conditions. In particular, we observed an intensity decrease of the 1580 cm^{-1} and 1314 cm^{-1} Raman bands of cytochrome [3] and proposed these bands as markers of cells viability.
In the present study we have performed microRaman analysis on different Glioblastoma cell lines. We have treated the U251 cell line with DMSO/(E1-51 solution) 10% v/v at different incubation time. Than we have tested the response of U87 cells to 24h rapamycin treatment, a drug that is known to induce autophagy. U251 and U87 were grown on Silicon and Germanium substrates, to compare the behavior of cytochrome c under different stress inducing conditions and to discuss the role of the substrate in such behavior.

References

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