

FT-IR Spectrometry and imaging for concentrations measurements: a tool to explore cell metabolic status

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FT-IR spectrometry has previously proved to be a useful tool for determining a series of plasma molecular concentrations. We investigated whether this technology was able to allow quantification of metabolic parameters (glucose and lactic acid) within cells, and tissues as an alternative method to the “classical” biochemical approaches, which require sophisticated biological material treatment and expensive reagents. For this purpose we used a series of plasma samples to determine glucose and lactic acid concentrations, which are common markers of cancer growth. We compared the results of the main spectral data treatments commonly achieved for FT-IR data analysis. No significant differences were found regarding the analytical performances of these methods. Spectral deconvolution was finally undertaken on cultured and on xenografted cells (U87 glial cells involved in human gliomas) to determine glucose and lactic acid concentrations. In this case, qualification was only allowed by FT-IR imaging on the cellular models since biochemical approaches are not efficient to reach metabolic concentrations at the cellular level while keeping tissue organization.

In another approach, we underwent studies to characterize the effects of oxidative stress on erythrocytes. Endurance exercise was chosen as a model of oxidative stress. FT-IR proved to be an efficient method to analyze effects of stress at a molecular level. It allowed us to perform a follow-up of the influence of endurance training on molecular effects of oxidative stress.

References

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