FTIR spectroscopic imaging of live cancer cells

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FTIR spectroscopic imaging allows the visualization of the distribution of chemical components in cells. However, obtaining images of living cells is difficult because of the strong absorption of water in the mid-infrared region. The use of attenuated total reflection (ATR) FTIR spectroscopic imaging provides a possibility to study tissues or live cells in an aqueous environment.[1] This approach allowed us to monitor live human cancer cells on a single cell level in situ with very fast acquisition times and the high spatial resolution.[2] Two complementary approaches have been used, providing flexibility with field of view and spatial resolution: micro-ATR-FTIR imaging using a microscope objective with a Ge crystal, and macro ATR-FTIR imaging using a single-reflection diamond ATR accessory.[2] The micro ATR-FTIR spectra allowed the differentiation between several cellular organelles, e.g., the nucleus and the endoplasmic reticulum. These approaches demonstrate the potential of ATR-FTIR spectroscopic imaging for revealing the details of the dynamics of biological processes and for studying the effects of environmental conditions on cellular behaviour. Therefore, this chemical imaging methodology could provide a method for optimization of chemotherapy approaches and drug testing in the clinic. ATR-FTIR spectroscopic imaging was also applied to studies and differentiation of stem cells. [3]
Recently, applications of ultrafast chemical imaging of live cells were also demonstrated using a combination of a pulsed tuneable laser source with an infrared microscope and an infrared array detector. [4]

References

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