

Study of nucleic acids extracted from tumor cells by means of UV Resonant Raman and FTIR spectroscopies

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Vibrational spectroscopies have been widely employed to investigate the nucleic acids structure. Particularly, Raman spectroscopy has been used in the past to characterize the chemical structure of DNA by using UV excitation instead of visible one, allowing to obtain a higher scattering efficiency without intense fluorescence backgrounds [1]. FTIR spectroscopy, instead, offers many distinct bands indicative of the major DNA and RNA conformation and it allows distinguishing the nucleic acids structural changes upon environmental modifications, mainly according to the intensity and the position of the bands relative to the phosphodiester bonds [2]. Spectra of the two techniques are complementary each other. We carried out a series of Raman and FTIR measures, performed in parallel at the IUVS and SISSI beamlines at Elettra. The aim of these experiments was to collect FTIR and Raman spectra from both DNA and RNA extracted from cells. Exemplificative results on the same solution of DNA extracted from cancer cells B16 are reported in Figure 1. **a** and **c** are Raman spectra acquired with different excitation wavelength (250 and 266 nm respectively), while **b** spectrum has been acquired with single reflection ATR-FTIR spectroscopy. The square highlights the range where Raman shifts are relevant, and mostly associated to Adenine and Guanine. It is evident from the image that the main signals for FTIR spectroscopy fall outside this range. In the 1500-1280 cm^{-1} spectral region there are indeed infrared signals, which however are very weak. We believe that by exploiting the complementarity of the two vibrational techniques we can achieve a complete overview of the biochemistry of this molecular system.

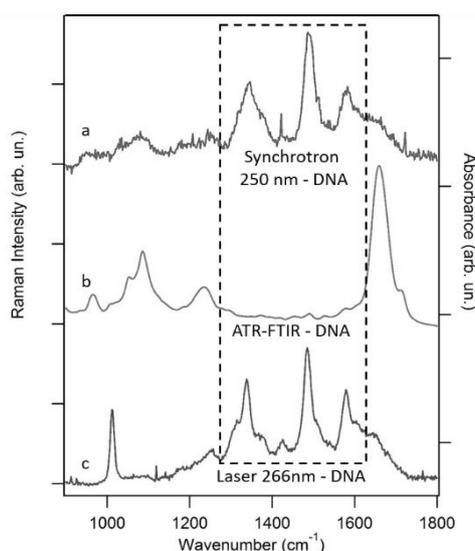


Figure 1: Spectra of DNA solutions from B16 cells acquired with different vibrational spectroscopies. The square highlights the Region of interest.

References

- [1] F. D'Amico, and L. Pascolo, *Analys, Rcs*, 140 (2015).
- [2] B. R. Wood, *Chem. Soc. Rev.*, Acs, 45 (2016).