A study of cytokinetic and motile prostate cancer cells using synchrotron based FTIR - microspectroscopic imaging

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Synchrotron based Fourier transform infrared (SR-FTIR) microspectroscopy has been applied to the study of dynamic cellular events. SR-FTIR microspectroscopy is a powerful bioanalytical technique for the simultaneous analysis of proteins, carbohydrates, lipids and a variety of phosphorylated molecules within whole cells. In imaging mode, SR-FTIR microspectroscopy can be used to generate biospectroscopic chemical maps of the distribution and intensity profiles of subcellular biomolecular domains at diffraction-limited spatial resolution. In the present study we present highly spatially resolved images of formalin-fixed prostate cancer cells of the PC-3 cell line, which have been preserved in the process of cytoplasmic division (cytokinesis) and locomotion. IR spectra derived from the midbody of the cytokinetic cells were used to construct a model of the plasma-membrane lipid bilayer system at this location. This was carried out after spectral subtraction of the protein component from the midbody. Furthermore and for the first time, we present SR-FTIR images of the motile cell, in which we demonstrate that the organisation of the actin cortex and its influence upon the overlaying plasma membrane may be determined with the intensity distributions of IR signals corresponding to the lipid $\nu_{as\ and\ s}$ (CH_2 and CH_3) and lipid ν_s (=C-H) vibrational modes (fig 1)