

## **LABEL-FREE BIOCHEMICAL CHARACTERIZATION OF BOVINE SPERM CELLS USING RAMAN MICROSCOPY**

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In this work, we present a Raman spectroscopy-based method for sensitive biochemical characterization of bovine sperm cells. By acquiring spectra from different cell locations, we are able to identify characteristic Raman features associated with DNA, protein and lipid molecular vibrations, opening the way for novel bio-imaging platforms.

Raman spectroscopy is a non-invasive, label-free technique that allows the biochemical analysis of the cellular components. This spectroscopic technique is based on the inelastic scattering of laser photons upon interaction with the sample molecules. It offers detailed information on the conformation, composition and molecular interactions of important cellular macromolecules, such as DNA and proteins, and can be used to characterize and study individual living cells with sub-micrometric resolution [1-2]. For these reasons, Raman spectroscopy has been used as a powerful tool to investigate different biological tissues and living cells.

In this paper, we applied Raman spectroscopy technique to detect and characterize single sperm cells. By analysing separate Raman spectra from the nucleus, acrosomal vesicle and tail of single sperm cells, we are able to identify characteristic Raman features associated with DNA, protein and lipid molecular vibrations. Using Principal Component Analysis we can reconstruct a chemical map of the cell resolving sub-cellular structures and we demonstrate that our Raman spectroscopy facilitates spectral assignment and increases detection sensitivity, opening the way for novel bio-imaging platforms.

[1] De Luca AC, Rusciano G, Ciancia R, Martinelli V, Pesce G, Rotoli B, Selvaggi L, Sasso A, Opt Express 16, 7943, 2008

[2] Canetta E, Mazilu M, De Luca AC, Carruthers AE, Dholakia K, Neilson S, Sargeant H, Briscoe T, Herrington CS, Riches AC, J Biomed Opt 16, 037002, 2011