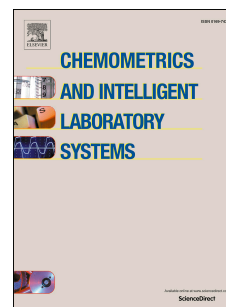


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Confocal Raman spectroscopy and multivariate data analysis for evaluation of spermatozoa with normal and abnormal morphology.

A feasibility study.

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Abstract.

This paper investigates a feasibility of using confocal Raman spectroscopy (CRS) and multivariate analysis for classification of sperm cells. The spectral based classification is compared with the morphological analysis, which is the main criterion for sperm selection in intracytoplasmic sperm injection procedure. The spectral analysis is conducted using the data driven soft independent modeling of class analogies method. The supervised classification reveals numerous outliers that pass from the 'normal' class to the 'abnormal' class, and vice versa. The ultimate result shows that the initial morphological discrimination overlaps with the spectral classification only partly. It is shown that CRS provides additional information regarding the nuclear DNA stability and helps to reveal spermatozoa with fragmented and defective DNA. This can be a promising direction for future evaluation of spectra from live, unfixed cells.

Key words: confocal Raman spectroscopy, sperm morphology, DNA fragmentation, data driven soft independent modeling of class analogies

1. Introduction

Over the past 25 years, Raman spectroscopy has proven to be an effective and reliable method for characterization of the intermolecular bonds [1]. This method has perspectives in the biological and medical applications. The confocal Raman spectroscopy (CRS) does not need any special conditions or sample preparation to acquire spectra. It can be used for the structural and compositional analysis of a sample before application of

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