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# FTIR spectroscopy in biological research

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Biological investigations are among the principle researches with great influence on the improvement of human knowledge in life and living organisms. Different methodological approaches have facilitated these achievements throughout the history of science; from macro-morphological to cellular and now a day at micromolecular levels. Scientists have always been looking for novel, short cutting, simple, precise and accurate protocols for their investigations. Spectroscopy, as one of old and fundamental techniques introduced to novel sciences, is coming back to its golden days, with the recent findings of its biological applications. The idea of using spectroscopy on biological samples has been started from mid 1960s, when tissues and cells have been used as samples for FTIR and Raman spectroscopies. The initial results were very blur not providing of enough detail for the researches, but enough to correlate various peaks to groups of macromolecules. That is why the initial applications were very much limited to the distinguishing and recognizing of different biological samples. 1990s witnesses the first diagnostic application of spectroscopy in medicine with the discrimination of cancer tissues from normal and inflammation ones , damaged teeth and like these; very much comparable with pathological findings. The recent introduction of Principle Component Analysis (PCA) and Artificial Neuronal Network (ANN) to spectroscopic investigations was of great help to discriminate peaks of interests from others in multiple spectra. With more than 17 years of research in the application of FTIR, Raman and NMR spectroscopies on biological system, our group has examined the boarder and limits of current state of spectroscopy for medical diagnosis, therapeutic program selection and monitoring, to the pharmacological studies of the mechanisms of actions. Our results on the application of spectroscopy for the diagnosis of cancer and normal cells in cellular and clinical samples, mechanisms of resistance to chemotherapeutic agents, investigation on the cellular mechanism of actions at the molecular level, as well as the monitoring of chemotherapy outcome will be presented in the congress, with discussion on the application of mathematics in understanding biological spectra.