IS44. SIMCA ANALYSIS APPLICATIONS IN BIOMEDICAL AND FORENSIC SCIENCE

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The ability to analyze body fluid traces is critical for determining the key details of a crime. Now, a combination of advanced statistical methods such as SIMCA with Fourier Transform Infrared (FTIR) spectroscopy shows potential for minimizing false negatives and positives during samples classification. SIMCA is a statistical method for supervised classification. In this approach Principal Component Analysis (PCA) is run on the whole spectra dataset to identify the spectra groups. The advantage of SIMCA is that the unknown spectrum is assigned to the group which has high probability only. If the variance of a spectrum exceeds the upper limit for all modeled of dataset, the spectra will not assign to any of the groups because, it is either an outlier or comes from a class that is not represented in the dataset. SIMCA also can work with few samples number in each group which is an important consideration. We used FTIR coupled with SIMCA analysis to examine the accumulated pleural fluid of benign transudate, Malignant Pleural Mesothelioma (MPM) and lung cancer for their characterization and diagnosis. SIMCA results revealed more than 90% sensitivity in differentiation of MPM from the other groups. Overall, FTIR spectroscopy coupled with SIMCA statistical analysis showed great potential for nondestructive, objective and confirmatory identification of MPM from pleural fluids. Similar to the identification of MPM from pleural fluids, SIMCA analysis can be performed for any similar body fluids which demonstrates great potential for the nondestructive and rapid confirmatory identification of body fluids at crime scenes.

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