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"Predicting Metabolic Syndrome based on Vibrational Spectroscopic Signatures of Low-Density Lipoproteins"

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Abstract: Metabolic syndrome is one of the major causes behind early death and many chronic conditions related to Coronary Heart Disease (CHD), atherosclerosis etc. This has reached an epidemic level in western world and developing countries are catching up first. Determination of total cholesterol is a usual way to evaluate the risk of having cardiovascular accident. However, this is not an accurate diagnosis due to the presence of other non-atherogenic particles in plasma. The diagnosis of cardiac arrest in patients without increased cholesterol raises the question if other factor such as Low-density lipoprotein (LDL) profile could be responsible [1]. Hence, there is an urgent need of an alternative method which focusses on detecting metabolic syndrome considering the state of entire LDL.

Vibrational spectroscopy is widely used to monitor the biochemical properties of biomolecules as it is very sensitive to the molecular vibrations. However, in case of human samples, data analysis becomes complex due to the interference of signals from a plethora of components. Only appropriate pre-processing of the data and incorporation of correct chemometric tools can lead to meaningful interpretation of data in such cases [2].

Herein, we have shown the challenges of data interpretation in case of complex human data taking metabolic syndrome as the case study. Using our pre-processing and analysis methods, potential of IR and Raman spectroscopy to predict metabolic syndrome, will be discussed.

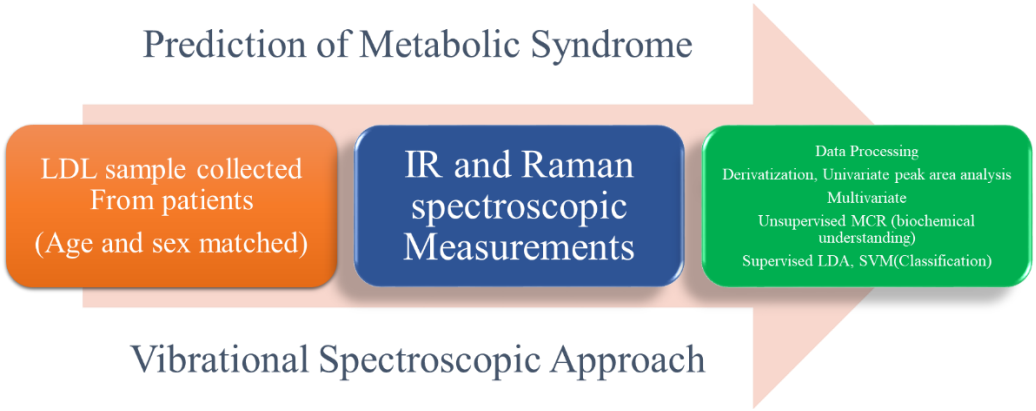

Figure 1. Schematics of the workflow of predicting Metabolic Syndrome

References and Notes:

1. Lüscher, Thomas F. "Low-density lipoprotein: the culprit. From evidence to counselling, drugs, and vaccination." European heart journal 38.32 (2017): 2447-2450.

2. Kumar, Srividya, et al. Raman and infra-red microspectroscopy: towards quantitative evaluation for clinical research by ratiometric analysis. Chemical Society Reviews 45.7 (2016): 1879-1900.