Capability of Fourier Transform Infrared Spectroscopy in Early Recognition of Systemic and Pulmonary Hypertension in Blood Plasma

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Hypertension is one of the fastest growing civilization disease in the world today. There are two types of this disease: systemic and pulmonary hypertension. Despite the fact that their symptoms are clearly identified in the advanced state, their etiology is still unknown. To date, no clinical chemistry test has been established in the recognition of these civilization diseases.

On the other hand, infrared microspectroscopy (FTIR) has been employed in the analysis of biological material such as cells, tissues or body fluids towards medical diagnosis for several years [1-4]. Therefore, the aim of our work is to investigate whether FTIR technique would be useful in identification of systemic and pulmonary hypertension at the early stage of the disease progression. Since, biochemical events responsible for cardiovascular disorders appear on the border of vascular wall and blood stream, we used platelet poor plasma as an object of our studies.

Plasma samples were collected from animal models of systemic hypertension (induced by NO synthase inhibitor, L-Name) and of pulmonary hypertension (induced by administration of monocrotaline). We observed clinical and spectral changes within 8 and 4 weeks, respectively. PCA analysis clearly differentiate the advanced state of the diseases with variance of ca. 60 % for the entire spectral region exhibiting IR bands. These results suggest for the first time possibility of recognition of pulmonary hypertension by using blood plasma. In the case of systemic hypertension, spectral features allowed for discrimination of the disorder from the control group in the 3rd week of the L-Name administration, on the contrary to biochemical marker (thromboxane metabolite, TXB2) that indicates the development of the disease from the 6th week only.

References:

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