**Raman spectroscopy and chemometrics for the detection of chronic heart disease and kidney failure**

*Yulia A. Khristoforova, Samara University, Russia*

*Ivan A. Bratchenko, Samara University, Russia*

*Lyudmila A. Bratchenko, Samara University, Russia*

*Petr A. Lebedev, Samara State Medical University, Russia*

*Maria A. Skuratova, Samara City Clinical Hospital №1 named N.I. Pirogova, Russia*

*Elena A. Lebedeva, Samara City Clinical Hospital №1 named N.I. Pirogova, Russia*

*Valery P. Zakharov, Samara University, Russia*

Inflammatory and degenerative processes in the heart and kidneys lead to physiological and pathological changes in the chemical composition of biological tissues and biofluids due to metabolic disorders in the human body. The structural changes in the functional groups of nucleic acids, proteins, lipids and carbohydrates are most important biomarkers of non-infectious diseases. The human skin is accessible and therefore attractive as an in vivo diagnosis object for detection of biochemical changes. In this study, nearly 200 skin Raman spectra of patients with chronic heart disease and kidney failure and 80 skin Raman spectra of healthy volunteers were registered. *In vivo* study was performed using Raman portable setup that includes laser diode with 785 nm central wavelength with 80 mW output laser power, QE65Pro spectrometer, inPhotonics optical probe. The major registered Raman band are associated with υ𝑎𝑠(P02-) in phospholipids at 1240–1280 cm–1, δ(CH3) in lipids at 1370–1380 cm–1, δ(CH2) in collagens at 1445–1450 cm–1, Amid I at 1645–1650 cm–1. The obtained experimental dataset was subjected to discriminant analysis with the projection on latent structures (PLS-DA). Based on the identified spectral differences, the spectra of the skin of patients with chronic heart disease and the skin of healthy volunteers in the control group were classified with ROC AUC of 0.99 (0.99-1.00, 95% CI). Achieved results of multivariate analysis demonstrated that Raman spectral differences between healthy volunteers and patients with chronic heart disease and patients with kidney failure can be associated with information about the biochemical profiles. It proves the sensitivity of the applied Raman methodology combined with multivariate technique to the biochemical skin changes. This study was supported by Russian Science Foundation grant No. 21-75-10097.