Raman scattering spectroscopy is a method based on inelastic scattering of light by molecules. This technique, experimentally accomplished by C. V. Raman in1928 (Nobel prize in 1930), enables registering of the spectrum in the shape depending on functional groups building molecules present in the measured sample. A Raman spectrum is, therefore, chemically specific and as such enables to characterize "material" of the sample. Raman spectroscopy has many other advantages; is a label-free, non-destructive technique that can be used in measurements in the aqueous environment. Due to above-mentioned reasons, Raman spectroscopy is more and more frequently used to study biological samples, such as cells or tissues and their changes following pathology development. In the experiments using cells, *in vitro* (Latin: "in glass") cultures are used, while in the tissue studies animal models (genetically modified animals or specimens with the externally induced diseases) *ex vivo* (Latin: "out of the living") are studied. Such models are based on a number of assumptions, for example negligible influence of tissue/cell preparation on the obtained results and applicability of animal models in the analysis of diseases in human beings. Therefore, alternative methods, enabling verification of results obtained in model studies are seek. In the case of Raman spectroscopy, *in vivo* spectroscopy with application of the fiber optic probes is such a method.

An optical fiber is a silica-based structure used to transmit light, and therefore to propagate the information. The optical fiber can be equipped with optical elements forming an optical fiber probe that can be connected to a Raman spectrometer. Such a setup enables registering the information from areas in the sample that are difficult to access or inside the sample in a similar way in which an optical fiber in the endoscope provides the visual picture from the inside of the body. A Raman setup with the optical fiber probe can be applied to a noninvasive examination of living organisms (*in vivo*). Up to now such research are not developed in Poland, although they are successfully used in many laboratories in the world to characterization of the pathological changes in the tissues, predicting of the disease progress or intraoperative determination of the margins of the pathological changes. The most frequent target of *in vivo* research are diseases of affluence, such as atherosclerosis or cancer, what is directly related to the increasing incidence of these pathologies not only in the western and suddenly occidentalizing (such as Poland) countries, but also in the developing countries (for instance in India).

Raman *in vivo* studies require connecting of the setup based on the fiber optic probe, what is the first stage of this project. Such setups can be built in various ways. In the proposed project two solutions are planned to be used. The first approach is an application of the typical setup, in which an excitation source delivering the light in the near-infrared range (that is less invasive and generating a lower background compared to the light in the visible range) is connected to a multiple-channel fiber probe. The alternative solution, non-applied up to now in tissue studies is the usage of the single-channel fiber probe and the excitation with the light in the visible range (in this case a significantly increased intensity of the scattered light compared with the application of the light in the near-infrared range is obtained). These setups will be used to measure Raman signal in in the following sequence of samples: phantom, i.e. imitating tissue (stage 2), animal samples *ex vivo* and *in vivo* (stage 3-4) and human samples *in vivo* (stage 5).

In the light of facts presented above, the aim of the presented proposal is easy to understand. It assumes realization of the fundamental scientific aspect, i.e. application of Raman *in vivo* spectroscopy to the chemical characteristic of the tissue with the developed civilization diseases. Additionally, obtained results will deepen the knowledge about these diseases and, in the future perspective will enable better understanding of the mechanisms governing their progress. It is predicted that development of the above-mentioned methodology (in the future and beyond this very project) will indirectly translate into prevention of lifestyle diseases and will lead to the use of this methodology in medical diagnostics.