# Novel fluorescent and antioxidative polyesters for vascular tissue engineering

Nowadays synthetic polyesters (Dacron) or teflon grafts are materials of choice in the treatment of vascular diseases. However these polymers are hydrophobic, crystalline and non-biodegradable hindering tissue regeneration. Novel approach in biomaterials science and tissue engineering requires that biomaterials elicit required activity only for required period of time. In other words, they should act as scaffolds supporting tissue creation and after fulfilling their role they should be removed from the body by natural metabolic pathways. Therefore many efforts have been devoted to design materials for vascular tissue engineering covering a wide range of mechanical properties of human soft tissues. Recently, polyesters derived from citric acid and diols (PDC) evolve into one of the most promising biomaterials for the fabrication of vascular tissue scaffolds.

The main objective of the project is fabrication and characterization of materials for construction of new generation blood vessel grafts. Polyesters of citric acid and diols (PDC) were chosen to be a polymer matrix for further modifications because they are known to be biocompatible and easily resorbable in the human body. The novelty of the project lays in the idea of chemical binding of pro-healthy substances such as glutathione and provitamin $B_5$ within the polymer matrix. Above substances after binding to the polyesters will give rise to novel materials exhibiting fluorescence and antioxidative properties. Aforementioned properties may become crucial considering reduction of post-implantation oxidative stress, prevention of neointima overgrowth and excessive proliferation of smooth muscle cells, in bioimaging of the implant state as well as in visualizing of implant degradation. Taking into account possible decomposition of modifying agents (glutathione and provitamin $B_5$) it is planned to conduct modifications of the PDC-based materials with their derivatives (glutamic acid, glycine and cysteine as well as pantolactone and 3-amino-1-propanol).

Materials will be processed into tubular shape for construction of small-diameter vascular grafts and applied as coatings of commercial synthetic grafts made of teflon and/or polyesters.

Characterization of all materials prepared in the project will be carried out in four renowned national and international research centers (Cracow University of Technology, AGH University of Science and Technology, Northwestern University and University of South Australia). Chemical structure, surface topography and chemistry of prepared materials as well as fluorescence, antioxidative and degradation properties will be evaluated. Furthermore, biological activity of the polymers will be assessed in contact with cell lines which are building healthy human blood vessels, i.e. endothelial cells and smooth muscle cells. Above tests will shed light on the influence of conducted PDC polymer modifications on cell adhesion, proliferation and viability as well as exclude potential cytotoxicity. Moreover, it is planned to conduct analyses necessary for determination of chemical structure and assess optical and biological properties of fluorescent compounds formed in modified materials.