

Ureteral stents are essential tools in the treatment of obstructive uropathy, which disrupts the functioning of the kidney. About 1.5 million stents are placed worldwide each year. According to the National Health Fund (NFZ) data from 2012-to 2018, there is a constant increase in the number of patients with urinary implants in Poland. Ureteral stents in the current clinical use are mostly based on polyurethanes. They are non-degradable devices that have to be removed after therapy by the second intervention, what is the most important disadvantage. This intervention generates additional costs and is time-consuming.

The aim of the project is to develop novel bioresorbable ureteral stents based on the following polymer materials: poly(ortho-esters) and poly(ester-carbonates). These polymers will be precisely designed and will have favorable properties, i.e. they will gradually dissolve by surface erosion and thus reduce the risk of crumbling and potential blocking of the urinary tract. Moreover, by continuous surface erosion, they will potentially reduce the risk of bacterial colonization of the stent. Ureteral stents will be manufactured in the form of thin-walled tubes using two processing methods, i.e. extrusion and electrospinning, which is another challenge of the project. The novelty of the project will be drug-loading into the stent structure (stents obtained by electrospinning), or into a biodegradable coating (stents obtained by extrusion). Papaverine has been selected to obtain a potential spasmolytic effect during and after stent implantation, in order to increase the patient's comfort. The developed ureteral stents will be verified *in vitro*- during the dynamic flow of artificial urine solution, the degradation process, drug release, and changes of mechanical properties will be examined. In a separate task, the cytotoxicity of the stents selected after the *in vitro* study will be tested. In the last task, the developed and selected ureteral stents will be verified *in vivo* in a swine model. Ureteral stents will be implanted in both ureters and examined over a 35-day period.

The project meets the criteria of the basic research- its results will determine the relationship between the properties of new polymer materials, the processing method, and their functionality. They will also allow determining the effect of artificial urine pH on the course of degradation of poly(ortho-esters) and poly(ester-carbonates) in various artificial urine solutions (different pH values). It will also allow determining the effect of pH on the course of the papaverine release process.

The results of the project may contribute to the development of innovative, personalized treatment of obstructive uropathy. A bioresorbable ureteral stent that degrades at the optimal time and at the same time releases antispasmodic drug which widens the lumen of the ureter, will enable the spontaneous excretion of kidney stones, and will help eliminate the need for complicated surgical removal of kidney stones