Neurological disorders are the third most common cause of disability and premature death in EU, and the number of patients is expected to grow intensively over the next years. The most common neurological disorders are associated with the malfunction in the delivery of neurotransmitters – chemical messengers that transmit a signal from a neuron across the synapse to a target cell. For instance, epilepsy, Parkinson's and Alzheimer's diseases are related to the defects in neurotransmission of gamma-aminobutyric acid, dopamine or acetylcholine, respectively. Current therapies for these disorders include the use of biologically active compounds, which regulate the secretion of particular neurotransmitters. Unfortunately, the common limitation of this approach is the fact that drugs are administrated systemically, so may affect the whole organism with serious side effects.

The aim of this project is to design a neurotransmitter-loaded material that will be able to release neurotransmitter molecules in a highly controlled, electrically-triggered manner. We are planning to use this material as a neural electrode coating, so neurotransmitter can be released directly in the nervous system. To prevent neurotransmitter from spontaneous release, developed material will exhibit a multi-layer structure, with consecutive layers differing in neurotransmitter permeability. For the fabrication of coatings, we are going to use conducting polymers, which are atypical plastics, since they are able to conduct electrical current. Thanks to this feature, we will be able to achieve controlled release of neurotransmitter – it will be enough to pass the electricity through a coating to release neurotransmitter molecules. We will use selected cell lines to verify if neural cells are sensitive to released neurotransmitters. The most successful materials will be also analysed *ex vivo*, with the use of a rat brain slice model. Upon project completion, we expect to provide a unique biomedical device able to stop the devastating changes in the brain resulting from neurodegenerative diseases.