Growing globalization and constant upscaling have for many years intensified production in all sectors of the economy, including the pharmaceutical industry. Once a pharmaceutical active compound is ingested by both humans and animals, it is not 100% metabolized, so it is excreted from organisms in an altered and unaltered form. The major source of drug contamination is wastewater from animal treatment centers, hospitals, pharmaceutical companies, as well as households and livestock farms. Consequently, pharmaceutical active compounds are commonly detected in wastewater, surface water and soils, where they enter from landfills and through fertilization of soils with animal feces. Increasing concern is also being raised about the presence of antibiotics, hormones and drugs for heart diseases in surface water, groundwater and even drinking water. A number of harmful effects of their presence in the aquatic environment can already be observed, including drug resistance in many animal species, as well as in humans.

The problem has recently been addressed by the European Parliament, which on April 10, 2024 approved new EU regulations for the collection, treatment and discharge of municipal wastewater. According to the regulations, a 4th stage of treatment is to be introduced in wastewater treatment plants by 2045. To properly control the presence of pharmaceuticals in the environment, including in wastewater, it is necessary to develop a method for their determination. Current methods are based on the use of environmentally hazardous solvents. The aim of our research is to develop, optimize, and validate microextraction procedures for selected pharmaceuticals based on NADES synthesized from by-products and natural, non-toxic compounds (e.g. sugars, glycerol, lactic acid, citric acid were selected as non-hazardous components of NADES), as well as nanofibers and fabrics coated with NADES. We will investigate the presence of selected pharmaceuticals in various environmental elements, such as water and wastewater, and assess the risk of their occurrence in the environment.

The developed methodology is expected to contribute to environmental and public health protection. During the study, samples will be taken from waters, lakes, as well as from wastewater treatment plants. This will allow testing the effectiveness of the methodology in different samples and estimating the real impact of pharmaceuticals on the water environment. The developed methodologies will be subjected to an evaluation of ecological performance and compared with other existing methodologies for detecting selected pharmaceuticals in the environment in terms of solvent consumption, time required to test one sample, and ecological performance of the methods. The results obtained from the project will expand the knowledge of the impact of selected pharmaceuticals on environment. They will also make it possible to control the presence of selected pharmaceuticals in the environment in a manner consistent with circular economy.