Description for the general public:

The rapid development of 3D printing (3DP) has opened up the previously undiscovered possibilities in drug design. It is expected that this technology will introduce a new era of personalized dosage forms tailored for individual needs of each patient. Currently, solid dosage forms (i.e. tablets or capsules) are the most popular form of drug administration. Pharmaceutical industry produces them in well-defined doses which often makes them not appropriate for children, i.e. pediatric patients as well as for elderly people being geriatric patients. They often need to be treated with small doses what may require to divide tablets. Such operation may be impossible or even forbidden due to the structure of dosage form or its application. Even if the tablet can be divided into smaller parts, precise dose adjustment may be a limitation. Moreover, growing number of drugs containing small doses of active compounds also lead to technological difficulties as the uniformity of drug content of the total tablet mass should be provided. Drug substances and excipients with the appropriate properties and technological processes need to be applied in order to achieve high bioavailability of drug substance. Thus, 3D printing seems to be a solution to aforementioned limitations of classical methods of drug manufacturing and a way of introducing the idea of personalized therapy into a real application.

The project is aimed at formation of polymeric matrices containing active substances obtained in hot melt extrusion and 3D printing that will be used in future to design and preparation of an innovative formulation. The physicochemical and mechanical properties of the obtained, precisely defined systems, as well as physical stability and pharmaceutical availability of the drug substance in polymer matrices will be analyzed. During the project the solubility limits of selected drug substances will be determined in various types of polymer matrices. Moreover, the physical stability of the prepared systems will be evaluated under standard drug storage conditions as well as under the conditions mimicking their preparation process. The temperature dependence of the viscosity of the tested systems will be determined as well. 3D printer will be further used in order to obtain drug-polymer systems and their physical stability, mechanical properties and dissolution of drug substances will be analyzed.

We hope that the results of our research will significantly contribute to the further development of the innovative field of personalized medicine.