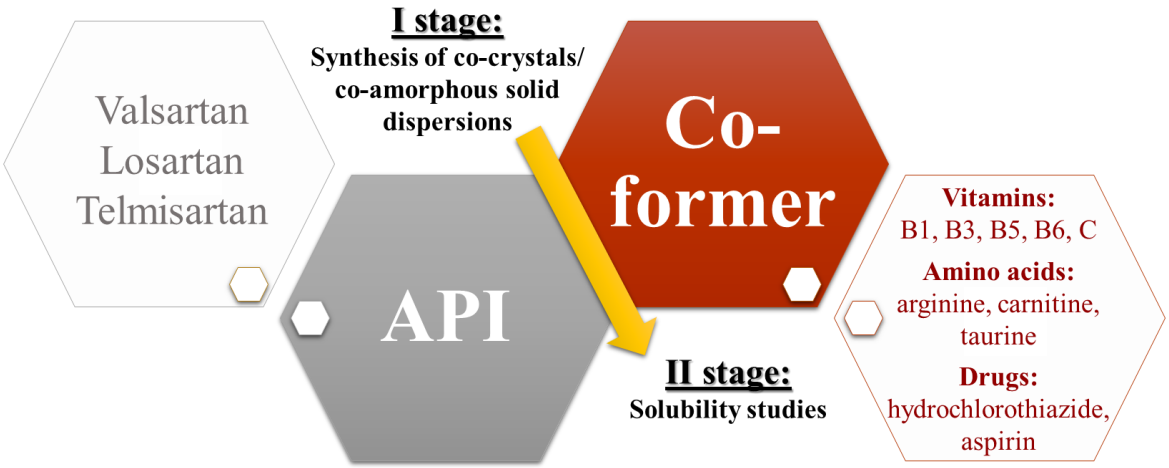
Most of the drugs are **administered orally** in a solid form, however about **40%** of the active pharmaceutical ingredients (**APIs**) are poorly soluble. This results in a low **bioavailability** and effectiveness of these drugs. Angiotensin II receptor blockers (**ARBs**) are example of poorly water soluble drugs. They are **antihypertensive drugs**, which, according to the recommendations of the European Cardiac Society (2016) provide alternative treatment for patients intolerant of ACE inhibitors or aldosterone receptor blockers therapy. However, their clinical application is limited mainly by a **poor solubility** and **low bioavailability**. These properties are key factors in determining the efficacy of a drug and their improvement is an important **challenge of modern pharmacy**. Pharmaceutical co-crystallization and co-amorphization are interesting approaches to improve the physicochemical properties, in particular the **solubility of APIs**.

The subject of the presented project is the synthesis of co-crystals/co-amorphous solid dispersions consisting of **ARBs** and **nutraceuticals** (e.g. vitamins, amino acids) or **other drugs**, used with ARBs in combination therapies (e.g. aspirin, hydrochlorothiazide) as well as investigation of their physicochemical properties. Above mentioned nutraceuticals are safe food additives from the U.S. Food and Drug Administration GRAS list (*Generally Recognized as Safe*) used in dietary supplements to **improve function of the cardiovascular system**. Hence, their presence in the co-crystals and co-amorphous dispersions carries an additional, beneficial, biological activity. Thus, this synthetic concept leads to compositions of **bifunctional** character.



It is planned to synthesize **multicomponent solid forms** of **ARBs** by using a variety of solution- and solid-state synthetic methods, including ultrasound-assisted approach. The comprehensive solid state characterization of the obtained materials will include spectroscopic (**FT-IR**, **solid state NMR**), X-ray (**XRPD** and **SCXRD**) and thermal methods (**DSC**, **TGA**) as well as scanning electron microscopy (**SEM**). The **solubility studies** of the obtained materials in a suitable medium simulating physiological conditions (water and phosphate buffer solution) at 37 °C will be essential part of the project.

It is anticipated that the **formation of multicomponent solid forms consisting of ARBs and selected GRAS or API substances of good solubility, will improve the solubility** and thus **oral bioavailability** of the discussed antihypertensive drugs. An additional advantage of the proposed system is the presence of both the active substance in the form of ARB, as well as the co-former, which exhibits a beneficial effect on the cardiovascular system. Therefore, the co-crystals and co-amorphous solid dispersions obtained in this project may become a new class of drugs with a **dual** or other words **bifunctional action** on the human body.

The project results will have a significant impact in the field of **crystal engineering** and **pharmaceutical sciences**. It will also expand the knowledge in the area of **mechanochemical** as well as **ultrasound-assisted syntheses** of multicomponent solid forms. Moreover, by depositing the structures of obtained co-crystals in the CDS database, the project's results will expand the knowledge in the area of **crystallography**. In future, these multicomponent solid forms may be developed by pharmacological industry as **new pharmaceuticals**.