

The gut microbiota is currently emerging as an important metabolic and immunological organ playing a key role in the whole organism homeostasis. Nowadays host: gut microbiota interactions are considered as critical for human health and disease. The mechanisms by which the microbiota affect gut health include immune signaling, toxin release, nutrients and xenobiotics metabolism as well as modulation of the mucosal barrier function. The results of research on structural changes in orally applied compounds resulting from the gut microbiota metabolism, cause the need of these metabolites bioactivity consideration. Especially when the influence of nutrients and orally applied medicines on human organism is referred.

One of the group of compounds, which were shown to undergo significant structural changes are ellagitannins, being a high-molecular-weight polyphenols which are present in many medicinal plants as well as various food products such as walnuts, almonds, pomegranate juice, raspberries, strawberries and oak-aged wine. It is known, that ellagitannins are metabolized by gut microbiota to urolithins, which in contrast to the parental compounds are low molecular weight compounds, which have well documented bioavailability and can reach high concentrations in blood, tissues, feces and urine.

The *in vitro* bioactivity tests conducted for urolithins have indicated that in particular one of them- urolithin A expresses very strong anti-inflammatory properties. Despite these very promising results, it occurred, that immediately after absorption in the gut urolithin A is deactivated by human metabolic system, thus it can express its activity only locally in the gut, but not at the systemic level.

The aim of the project is to conduct chemical modifications of the urolithin A molecule in a way that it will remain active towards inhibition of inflammation but will not be susceptible to quick metabolism. The successful performance of the submitted project will allow to give a closer look at the molecular mechanisms of anti-inflammatory activity of urolithin A and precisely indicate the structural features responsible for its interaction with certain biochemical pathways. It will lead to a selection of such structural modifications which are stable, not toxic, do not deplete the biological activity of urolithin A, but at the same time prevent its fast deactivation. In a far-reaching perspective the results can be a basis for a development of novel drug originating from natural product area, first one basing on postbiotic metabolite produced by human gut microbiota.