The problem of infertility, according to the statistics of the World Health Organization, affects from 10 to 18% of the world's population. One of the main reasons of infertility in women is polycystic ovary syndrome (PCOS), diagnosed in about 15% of women of reproductive age. It determines the occurrence of hormonal disorders, which have negative impact on the ovaries' functions and preclude the maturation of female egg cells and, consequently, preclude the occurrence of ovulation. Due to the complex nature of this disease, the diagnosis of PCOS is very problematic. In 2006, the International Society for Excess Androgens and PCOS (Androgen Excess & PCOS Society, AES & PCOS) published basic guidelines concerning the diagnosis of PCOS, which are now widely used. It has been assumed that to diagnose PCOS it is necessary to meet three criteria: (i) biochemically and/or clinically defined hyperandrogenism, (ii) oligoovulation/total lack of ovulation and/or the presence of cysts on the ovaries in the ultrasound image (iii) and along with exclusion of other diseases that involve androgens' excess. In addition to hormonal disorders, women with PCOS are often characterized by obesity, especially the abdominal type, which leads to disturbances in carbohydrates and lipids metabolism – causing the appearance of cardiovascular diseases. PCOS treatment is only symptomatic and is directed to a specific field of disease, however the most important therapeutic goal is always to restore regular ovulation and reduce androgen levels.

Unfortunately, the mechanism of PCOS has not been recognized so far, therefore the pathogenesis of this complex disorder is currently the topic of many studies. One of the approaches allowing to study the mechanism of many diseases is metabolomics. It enables qualitative and quantitative analysis of metabolites present in the human organism. Due to each disorder, which affects living organism, causes changes in the metabolic profile, so it is possible to monitor these changes and to search which biochemical pathways are disturbed by the development of the disease.

The aim of the project is to study changes in the metabolic profile of serum and urine samples obtained from women diagnosed with PCOS in comparison with healthy women. Two basic research strategies will be applied. In the first stage, untargeted metabolomic analysis will be carried out, in order to identify a wide range of metabolites. Then, after selecting those compounds that will discriminate studied groups of women the most, to determine the their exact concentrations, a targeted metabolomic analysis will be performed.

Finally, we will identify metabolites, whose content in the organism of women suffering from PCOS is significantly changed. Thanks to this, it will be possible to identify metabolic pathways pathologically disturbed by PCOS and propose a potential mechanism of its development. The knowledge of its pathomechanism could facilitate diagnosis and contribute to development new therapeutic strategy.