

Changes in lifestyle and social phenomena characteristic of developed western countries may influence how often fertility problems occur in couples of reproductive age. Infertility is currently recognized as a disease that has substantial consequences - for the society both and for individuals. The development of reproductive medicine made it possible to provide effective assistance to couples who cannot get pregnant naturally. This project aims to broaden knowledge about the very early mechanisms involved in human reproduction, with particular emphasis on genetic and biological factors. Its objective is to better understand the processes that affect the quality of reproductive cell- oocyte, its fertilization capability and embryo development potential. The project is focused on gaining knowledge about the proteins secreted by the egg and determination of the relationship between those proteins and oocyte maturation, ability to fertilize and final embryo development, its genetic status and the ability to achieve a healthy pregnancy. To achieve the objective we will use the potential of proteomic methods. We will carry out the morphological evaluation of embryos, and also determine their genetic status checking for aneuploidy i.e., incorrect number of chromosomes which is the most common chromosomal abnormality. Previous studies have shown these methods to be highly sensitive and safe for the process of fertilization and pregnancy. Proteomic analysis will be performed on the follicular fluid looking to identify proteins present in the analyzed material. For this purpose, we will use the latest developments in the field of mass spectrometry - SWATH methodology which enables the quantitative analysis without isotopic labeling. Correlation of the results of the genetic and proteomic analysis will be a key element of the project. We will analyze the genetic status of embryos and proteomic profiles in the context of pregnancy results and the birth of healthy children. Infertility is a dysfunction with significant medical and social consequences but, at the same time, there are gaps in knowledge about processes associated with reproduction. It is important to undertake more basic science research that would lead gaining knowledge about genetic and biological factors determining the potential of the ovum, and after fertilization - the ability of the embryo to continue its normal development. This could have an impact medical science and the ability to provide infertile patients with effective assistance. We should also note the ethical aspects of assisted reproduction. There are suggestions to minimize the number of oocytes that are retrieved and then fertilized. This project involves a detailed examination of the possible factors of protein/molecular determination of the quality of oocytes, their ability to be fertilized and their potential to develop into a healthy pregnancy.