The electromagnetic field is a state of expanse where each electric load or magnetic dipole is acted by specified, electromagnetic force. Emitters of such fields are high voltage lines, transformer stations, devices powered from industrial networks, radar stations and mobile base stations. In the recent years there has been an increase in usage of electromagnetic field in physiotherapy. A magnet therapy and magnetostimulation is used to treat, inter alia, inflammations of the abdominal organs. One of the most important contraindication for using magnet therapy and magnetostimulation is pregnancy, since the consequences in embryos exposed to electromagnetic field remain unknown.

Recent research indicates that females exposed to electromagnetic fields of similar parameters to the ones that are used in magnet therapy (usually 25, 50 or 120 Hz) are more likely to pregnancy lost and sexual cycle disturbances. Nevertheless, the molecular basis of this effect remains unknown. The studies in reproductive biology area highlights, that the above described effects can be due to changes of steroid hormones concentration in uterine lumen. Therefore, one may not exclude that electromagnetic field exposure induces variety of effects on molecular (gene expression changes) and physiological (including hormonal) background.

In spite of provided data, the aim of this project is to determine the effect of electromagnetic field exposure (50 and 120 Hz) on steroid hormones biosynthesis pathway, which is critical for creation the proper intra-uterine hormonal conditions (the expression of genes and proteins involved in the process of sex hormones biosynthesis pathway and the effect of these changes which is steroid hormones release changes), transcriptomic profile changes (gene expression alternations) and the methylation level of differentially expressed genes in response to electromagnetic treatment, to determine whether these changes are due to epigenetic regulation of gene expression by DNA methylation.

The study will be performed on uterine tissues and embryos harvested from pigs during early stage pregnancy. Tissues and embryos will be exposed to electromagnetic field during *in vitro* incubation. Next, in media collected after *in vitro* incubation will be measured the concentration of steroid hormones (radioimmunoassay method) to determine whether the electromagnetic field exposure affect secretory potential of studied tissues. Tissue samples and embryos collected after *in vitro* incubation will be used for molecular analyses, including the analysis of the expression alternations of genes and proteins involved in the regulation of steroid hormones biosynthesis pathway (Real-Time PCR and immunofluorescence methods) and whole transcriptome profiling with Next Generation Sequencing (NGS). This method is one of the most modern techniques of transcriptome profiling and enables detection of even small treatment-induced changes. Furthermore, the level of methylation of genes altered mostly in response to electromagnetic field exposure (detected by NGS) will be analyzed (Methylation-Specific PCR). This approach will lead to better understanding whether detected changes are regulated on the epigenetic level by DNA methylation process.

The Project will contribute to increase of the knowledge about the consequences of long-term exposure to electromagnetic field and allow to determine the molecular basis of pregnancy lost and sexual cycle disturbances in females exposed to electromagnetic field. This scientific problem is important to be solved, since electromagnetic field is still present in the human habitat and the amount of its sources increases with the civilization explosion. Even now, when reading this description you are affected by electromagnetic field generated by your device. Would not you like to know whether and how it affects the activity of your reproductive organs and whether it can lead to pregnancy disturbances? The results of this Project will contribute to answer these questions.