Polycyclic aromatic hydrocarbons (PAHs) constitute one of several classes of organic pollutants that are released into the environment quantities due to human activities. Anthropogenic sources, which are the main origin of environmental pollution PAHs compounds are: coke industry, metallurgy, power plants, manufacturing and then wear a rubber and asphalt, motor vehicles especially cars diesel engines, foods and cigarette smoke.

Epidemiological studies associated with the alarming data concerning atmospheric pollution, suggests that pregnancy disorders, premature births, intrauterine growth retardation and baby low birth weight, may result from exposure of mother during pregnancy. Normal function of the placenta is essential for optimal fetal growth and development. Placenta that corresponds for nutrient transport and gas exchange also is the important endocrine gland. Disruptions of sex steroid hormones functions are associated with serious obstetric complications. In addition, the performance of the detoxification system of placental cells depends on how much and in what form toxic compounds goes to the fetus. For this reasons, the aim of the project will be determination the direct effect of polycyclic aromatic hydrocarbons (PAHs) mixtures, noted in maternal plasma and placenta on endocrine and metabolic function of human placenta cells.

For the project in our laboratory we adapted two co-culture models: adrenal cell line H295R (reflecting the adrenal glands of the fetus) and placental cell line: BeWo (syntrophoblast) and JEG-3 (cytotrofoblast) as a unique new model in vitro for study placental steroidogenesis, and the trophoblast cell differentiation.

In the proposed project we plan to determine the direct effect of two PAH mixtures on: 1) secretion of placental hormones: progesterone, estradiol, and human chorionic gonadotropin, and the expression of proteins of key enzymes in the pathway of steroidogenesis (3βHSD and CYP19) in the cells of the BeWo and JEG-3 cultured in co-culture; 2) identification of receptor mechanism of action by determining the protein and gene expression of progesterone (PR), estradiol (ERα / β), AhR and Arnt receptors in BeWo and JEG-3 lines; 3) identification the metabolic capacity by examining the impact of PAH on the enzymes of I (CYP1A1) and II (COMT) phase of metabolism.

Results of research carried out under this project will provide new and unique information on the mechanism of mixtures of PAHs action on endocrine and metabolic function of placental cells. These studies are very important in light of the alarming data concerning air pollution and a necessity reduction of occupational exposure limits for PAH in the environment and food products in the European Union. Furthermore will indicate whether the levels of PAHs observed in women in Poland threaten the pregnancy and fetal development.