Assisted reproductive techniques (ART) are successfully used in farm animals, which lead to increase reproduction efficiency and accelerate the breeding progress. One of them is *in vitro* fertilization and *in vitro* embryo culture. So far, oocyte collection from slaughterhouse ovaries was the most efficient method for *in vitro* embryo culture. But it allows the recovery of a very limited number of gametes with respect to the potential oocyte population contained in the ovary. Acquisition of oocytes from live animals overcomes this limitation. Moreover, the quality of oocytes is crucial during *in vitro* embryo culture. It was documented that the developmental ability of oocytes obtained from cows is significantly higher than that obtained from calves. The assessment of oocyte quality is provided by the molecular markers of the embryo implantation ability and developmental competence. The potential significance of prostanoids in the early embryo development has been described in the literature.

Prostanoids belong to the group of biologically active lipids, containing prostaglandins, prostacyclins and thromboxans. They are well known mediators of the pathological conditions, but also they are involved in the regulation of many female reproductive processes. The literature data about prostacyclin influence on the preimplantation embryo development is limited mainly to rodents, and their role in oocyte maturation and implantation. The data obtained by several groups of researchers present the expression of PGIS at the implantation sites for the embryo in rodents and humans. In mice, PGI_2 was implicated in blastocyst spacing, implantation, and decidualization. Moreover, it was showed that the PPARδ deficient embryos had defects in the blastocyst formation and hatching. It was shown that in the murine embryos PPARγ deficiency led to the disturbances in the terminal differentiation and placental vascularization, and ultimately to the embryo mortality. In the cow, factors involved in prostacyclin synthesis and action were expressed during different stages of the embryonic development, which suggests possible relation of PGI2 signaling pathway with developmental competence of the bovine embryos.

Taking above into consideration, the scientific objective of the proposed research project is to investigate whether PGI_2 synthesis and PGI_2 receptors expression in *in vitro* cultured bovine embryos at different stages of their development reflects the quality of oocytes collected *in vivo* by OPU method from prepubertal and pubertal heifers and cows.

Two research tasks are planned in the project. Task 1 will determine the endocrinological status of prepubertal and pubertal heifers, and cows. Within Task 1. the concentration of 17-βestradiol (E2), progesterone (P4), follicle-stimulating hormone (FSH), luteinizing hormone (LH) and anti-Mullerian hormone (AMH) will be assessed in the blood plasma. In Task 2. we will determine the relationship between prostacyclin signaling and quality of oocytes and in vitro produced bovine embryos derived from oocytes collected in vivo by OPU method from prepubertal and pubertal heifers, and cows with the quality of oocytes. For this purpose, we plan to determinate the developmental rates of the *in vitro* cultured bovine embryos at different stages of their development derived from oocytes collected *in vivo* by OPU method from prepubertal and pubertal heifers and cows. The production of PGI_2 by embryos at different stages of the preimplantation development derived from oocytes collected in vivo by OPU method from prepubertal and pubertal heifers and cows will be determined. Moreover, we intend to determine the mRNA expression profile of oocyte quality markers (FST, GDF9, BMP15) and enzyme responsible for PGI_2 synthesis (PGIS) and PGI_2 receptors (PTGIR, PPARγ, PPARδ) in oocytes after *in vitro* maturation as well as mRNA expression of CTSS, CTSZ, CTSB, CTSK, PGIS, PTGIR, PPARγ and PPARδ in cumulus cells after *in vitro* maturation and *in vitro* fertilization. Also, we will compare mRNA expression profile of enzyme responsible for PGI_2 synthesis (PGIS) and PGI_2 receptors (PTGIR, PPARγ, PPARδ) as well as gene markers of embryonic implantation ability and developmental competence (PLAC8, IFNτ, IGF1R, IGF2R, OCT4, SOX2) in blastocysts derived from oocytes collected *in vivo* by OPU method from prepubertal and pubertal heifers and cows. At least, we determine the possible relation between quality of oocytes collected *in vivo* by OPU method from prepubertal and pubertal heifers and cows and survival rates of cryopreserved blastocysts as well as conception rates.