

Nanosecond pulsed electric field (nsPEF) is still developing bioelectrical technology that has potential in cancer therapy. This technology have focused much attention during last years because it represents purely electrical cancer therapy that does not require pharmaceuticals. nsPEF uses ultra-short pulses of high electric field strength (up to several hundred kV/cm). In the project is assumed that nanopulses can trigger the signaling pathways of apoptosis induction and proteasomal activity via oxidative stress induction.

In the present project we will assess the influence of nanosecond pulsed electric field (nsPEF) on cellular mechanisms in colon adenocarcinoma cells (sensitive and resistant) and normal epithelial cell line. All experiments will be performed on the cellular level and on murine experimental model which strictly covers the basic research. The results will be the knowledge base expanding the field of the mechanisms of action nsPEF in adenocarcinoma cells. NsPEFs supra-electroporate cells creating large numbers of nanopores in all cell membranes. These features are supposed to be responsible for apoptosis induction as well as other cell death and cellular mechanisms. The current studies focuses in particular on the analysis of oxidative stress level (lipid peroxidation, free radicals, protein degradation), proteasomal activity, cytoskeleton rearrangement and cell death type after exposition to pulsed electric field. These mechanisms are crucial in planning new strategies for selective elimination of cancer cells. NsPEF mediates cell destruction by multiple mechanisms, which needs more detailed studies and experiments. The project will allow for better understanding of nsPEF processes cancer and normal cells.