The aim of the project is to determine the effect of the type of electrodes on the efficiency of introducing molecules into cells by electroporation led in a microscale. Parameters of the electrodes to be tested are: the material they are made of, their shape and the distance between them. In the tests we will use electrodes made of gold and a gal-indium eutectic. Gold is a non-toxic, biocompatible metal with high chemical resistance, which makes it an ideal candidate for use in electroporation. The use of eutectics for this purpose is new. Due to its fluid consistency, it creates new design possibilities and seems to be a promising material. In the research, it was decided to examine two shapes of electrodes: straight and semicircular - both set parallel to each other, which ensures the creation of a homogeneous electric field. The electroporation is to be carried out in a specially designed Lab-on-a-chip microfluidic system. The use of the microsystem will allow the cells to provide the conditions most suited to those *in vivo* and to minimize the amount of reagents and waste produced. In addition, thanks to the special geometry of the microsystem, it will be possible to obtain results simultaneously for the electroporated sample as well as control samples in one experiment.

The project will determine the effect of the type of electrodes and electroporation parameters on the quantity and size of pores formed in the cell membrane under the applied electric field. For this purpose, quantum dots of various diameters will be used. Based on microscopic observations and fluorescence measurements, the efficiency of introducing nanoparticles into the cells during electroporation will be determined. In addition, the migration of selected ions (such as calcium, magnesium, sodium potassium, chlorine) through the cell membrane during electroporation will be examined. Commercially available fluorescent indicators will be used for this purpose. The changes in the concentration of ions in the cell will determine whether during the electroporation they migrate through the pores to the external environment. The possibility of introducing selected ions into the cells under the influence of the applied electric field will also be tested. On the basis of measurements of cell viability and membrane potential, the reversibility of electroporation will also be determined.

Research within the project will be conducted on four cell lines: cancer and normal skin and breast. Thanks to this, it will be possible to determine the impact of the electric field on both normal and cancerous cells. In addition, it will be investigated whether cells from different organs react differently to electroporation.

The subject matter of the project seems to be very interesting because the process of electroporation is still not fully understood. The results of the research carried out as part of the project will expand knowledge on this subject. In addition, the microsystem used in the research will open new possibilities for conducting electroporation. It may be used in the future to lead pre-tests of drugs with potential application in electrochemoradiotherapy.