Description for the general public

Title: Tyrosine-modified polyethylenimine polymers as a promising vectors for siRNA delivery in synergistic cancer immunotherapy.

The aim of presented project will be the evaluation of poliethylenimine polymer (PEI) modified with tyrosine as a nanocarriers for siRNA in synergistic cancer immunotherapy.

The research hypothesis: polymer (PEI) modified with tyrosine deliver siRNA in an efficient and non-toxic manner to the cancer cells and tumor-associated macrophages, thus promoting tumor growth inhibition.

Gene therapy is an attractive treatment method among last years. It offers many advantages and seems to be a good alternative for standard treatment regimens and for un-drugable diseases. Currently, searching new, non-viral nano vectors which efficiently deliver therapeutic nucleic acids to targeted cells is a challenge. Polyethylenimine polymers are known as cationic nano carriers of plasmid DNA. Recent data indicate, that they might be used in siRNA delivery. However, their usage is limited due to their high toxicity. A new tyrosine modification in the polymer structure reduce the cytotoxicity and enhance the transfection efficacy.

siRNA delivery is a promising strategy in cancer therapy. Cancer cells might be targeted without any harmful effects towards normal cells. New research in cancer therapy are still ongoing. An important and innovative strategies in nanomedicine are focused on targeting cancer cells as well as the tumor microenvironment. Synergistic immunotherapy is a strategy, which allow to fight more efficiently with cancers. Thus, the main goal of the project will be the evaluation of potent use of tyrosine-modified polymers in RNAi based immunotherapy. We believe, that simultaneous delivery of therapeutic siRNA to the cancer cells and tumor microenvironment strengthen the effects of cancer therapy.

In order to verify research hypothesis two steps are planned:

1. Evaluation of biophysical properties of complexes.
2. Evaluation of gene expression knockdown in cancer cells cells and tumor-associated macrophages.
3. Evaluation of migration, invasion and microenvironment reprogramming after gene knockdown.