

ELECTROSTATIC FORMULATION OF INHALABLE DRUG CARRIERS WITH COMPLEX STRUCTURE

Supervisor: Dorota Lewińska, Assoc. Prof.
Co-supervisor: Katarzyna Kramek-Romanowska, PhD

*Nalecz Institute of Biocybernetics and Biomedical Engineering PAS
Department II, Department of Biomaterials and Biotechnological Systems*

Laboratory of Electrostatic Methods of Bioencapsulation

Aerosol therapy has become for the past two decades one of the main strategies of treatment for patients with respiratory diseases. It is also a flagship example of targeted therapy, which is aimed at reduction of systemic adverse side effects of treatment. What is more, delivery of drugs to the respiratory system can be an attractive option to other routes also for systemic therapies, because the lung and conducting airways possess a large absorptive surface area and a highly permeable membrane for the medication to transport to the blood. In addition, first pass metabolism in the liver is avoided. All of these characteristics indicate that the relative concentration of drug per unit area of tissue can be minimized during a treatment and thus adverse side effects, which depend on high local surface area concentration, can be reduced, indeed.

The aim of this study is the application of the electrostatic method of bioencapsulation, elaborated and patented in IBBE PAS, to the production of novel inhalable drug carriers with complex structure. Abovementioned method possesses a number of advantages that are important during the production process of microcapsules intended for biomedical applications, such as size control of obtained capsules and the possibility to encapsulate safely biologically active material (proteins and cells). Besides, the method is a one-stage process, which makes it attractive for potential commercialization. So far the technique has not been employed to the production of inhalable drug carriers, which constitutes an important aspect of novelty of the proposed research.

Main steps of the study are as follows: optimization of the electrostatic encapsulation process in a lab-scale in order to obtain product with desired features for effective therapeutic inhalation; preparation of drug carriers with complex structure from selected model substances; evaluation of the carriers in terms of their possible practical application in the discussed field of interest.