



Fund “Nauka” Project № 20016 Resume – Competition-Based Session 2020:

“Pharmaceutical development and characterization of viscoelastic and bioadhesive therapeutic systems with silver nanoparticles and their complexes with potential applicability in oncological and infectious diseases of the skin and mucous membranes”

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The current project is focused on the development of a therapeutic system with antineoplastic, antimicrobial and anti-inflammatory action for dermal and mucosal application. The desired therapeutic properties will be sought in “green”-synthesized silver nanoparticles and their complexes with natural and synthetic compounds, among which – polyphenols, aloe-emodin/ aloverose and chlorhexidine. The main goal of the project is to introduce the obtained complexes in a bioadhesive therapeutic system suitable for dermal and mucosal drug delivery. Objects of the study will be the viscoelastic behavior, textural and adhesive properties, biopharmaceutical and therapeutic properties (in vitro/ in vivo study for antineoplastic, antimicrobial and anti-inflammatory activity), as well as chemical, physical and microbiological stability of the therapeutic systems.

Main contribution of the project is expected to be the development of bioadhesive therapeutic system (patch) for dermal and mucosal application with silver nanoparticles and their complexes with aloverose/ acemanan, chlorhexidine and catechins from *Camelia Sinensis* leaves, with potential antineoplastic, antimicrobial and anti-inflammatory activity.

The goal is to be completed in several defined stages:

1. Isolation, qualitative and quantitative analysis of catechins from *Camelia Sinensis* leaves;
2. Synthesis and characterization of silver nanoparticles in an aqueous medium; Experimental design for the synthesis of silver nanoparticles, focused on the dependence of the resulting nanosuspensions on critical process variables: reagents' ratio, reduction under sonication time;
3. Preparation and isolation of stable complexes of silver nanoparticles with chlorhexidine, aloverose, catechins;
4. Preparation of lyophilized samples of silver nanoparticles and their complexes for the purposes of their further use and analysis (X-ray, thermal and FTIR);

5. Obtaining data on the structure, size and surface morphology of the silver nanoparticles; qualitative analysis of silver nanoparticles complexes with chlorhexidine, aloverose and/ or catechins;
6. Investigation of the adsorption geometry, functional groups and optical properties of silver complexes and their thermodynamic stability;
7. Preparation and optimization of bioadhesive therapeutic systems (patches) with functionalized silver nanoparticles (with aloverose and/ or *Camelia Sinensis* catechins, and chlorhexidine);
8. Study on the textural, rheological and bio-/mucoadhesive properties of the obtained therapeutic systems for dermal and mucosal delivery;
9. Investigation of the in vitro drug release/ permeation properties of the therapeutic systems on skin and mucosa samples;
10. Pharmacological study on the antineoplastic, antibacterial and anti-inflammatory activity of bioadhesive therapeutic systems (patches) with functionalized silver nanoparticles (with aloverose and/ or catechins from the leaves of *Camelia Sinensis* and chlorhexidine).

The research team includes specialists from different scientific fields - pharmacognosy, pharmaceutical technologies, pharmaceutical analysis, pharmacology, physics and biophysics; the interdisciplinary structure of the research group is a guarantee for a comprehensive research and a prerequisite for successful realization of the project.