

Bioresorbable polymers and polymeric blends with bactericidal properties for use in cosmetics and dermatology

DESCRIPTION FOR THE GENERAL PUBLIC

Cosmetics composition is constantly improving. Recent cosmetics meet even a few functions: they cleanse and disinfect the skin, give it a pleasant aroma, correct its appearance, protect it or keep it in good condition. Cosmetics increasingly include sophisticated delivery and release systems for bioactive agents, comparable to modern pharmaceuticals. It is obvious that cosmetics must not cause unwanted reactions of both the skin and the whole body. In the case of complex compositions of contemporary cosmetics, it becomes a problem to obtain preparations that will be able to last a long period of time after opening the package, will have the desired effect all the time from the opening of the packaging, and at the same time will not become a habitat of bacteria or fungi. For this reason, the cosmetics contain preservatives and antibiotics which extend the shelf life of cosmetics after opening the original packaging. These preservatives are increasingly the cause of severe allergic reactions. The use of antibiotics in cosmetics, in consequence of relatively low doses and the nature of the application, is one of the reasons of the antibiotic resistance phenomenon of many strains of microorganisms, which is already an emerging medical problem.

The aim of this project is basic research dedicated to the search for new bactericidal systems for use in cosmetic formulations, dermocosmetics or the production of wound dressings in order to eliminate preservatives or antibiotics. At the same time, these polymers can be excellent carriers of many biologically active components currently used to stimulate skin renewal. Project objectives include bactericidal and fungicidal activity tests of three groups of materials: (i) natural polymers (polysaccharides with proven bactericidal activity such as chitosan, carrageenan or polygalacturonic acid), (ii) synthetic biodegradable compounds (polycations including poly(amine ester)s and poly(amine amide)s and functional polycarbonates with pendant amino groups) and (iii) compounds of selected metals or nanoparticles of these metals. The materials from different groups act bactericidal according to slightly different mechanisms, the research will cover also the search for synergism of bactericides, *i.e.* the activity of the mixture stronger than expected based on sum of the activities. The research will be conducted on selected bacterial strains (gram positive, gram negative and anaerobic) and fungi that cause the most common skin lesions. As a result of the work there will be reveal and "catalogued" activity of many biodegradable cationic polymers differing in structure and (the most probably) bactericidal activity. The antibacterial activity affection by cation position in the polymer chain, as well as the composition and structure of the macromolecule chains will be known. On the basis of the synthetic materials, systems will be prepared containing also polysaccharides (known for stimulation effects of skin renewal) and metal compounds or metal nanoparticles. The bactericidal activity of the new systems will be investigated. Degradability and tests of toxicity for human cells will be performed for the selected, most promising systems. In the last stage, exemplary cosmetic formulations will be prepared containing the obtained systems. Exemplary dressing for the skin wound will also be prepared since bactericidal and fungicidal character and compatibility with human tissues are expected.

In the frames of this project, there will be developed knowledge about influence of the structure of the material and its composition affecting the bactericidal properties and how to compose new cosmetic systems to get the maximum bactericidal effect without affecting the skin and how to extend the shelf life of the cosmetic after opening the package.