Polymer nanofibers obtained by electrospinning are one of the main research routes on modern drug carriers. Filling nanofibers with drugs allows maintaining the structure and chemical activity of the drugs and provides their slow release over a long period. Nanofibrous materials in form of sheets or smaller patches can be placed near the drug target (enzyme, receptor). This allows local maintenance of the therapeutic effect for a longer time and a reduction of drug dose. As a result, nanofibrous drug carriers allow for a significant increase in the effectiveness and safety of therapy compared to traditional forms of drug administration and increase patients' compliance to treatment.

The aim of the project is to optimize the chemical composition and production conditions of modern nanofibrous material intended for gradual local release of an ophthalmic drug. The nonwoven fabric will consist of biodegradable polymers (cellulose derivative - hydroxypropyl cellulose - and polyester - polycaprolactone), oligosaccharide (β-cyclodextrin) and a hydrophobic drug used in clinical practice in the treatment of glaucoma (brinzolamide). The last two substances will form an inclusion complex in which the drug will be placed in the cyclodextrin cavity.

The selection of materials is justified. Hydroxypropyl cellulose has mucoadhesive properties, causing a good adhesion of the carrier to the cornea. This will allow to bypass the non-corneal routes of drug penetration, thus reduce its penetration into the bloodstream, which in case of anti-glaucoma drugs carries the risk of systemic side effects and reduces the effectiveness of therapy. The addition of polycaprolactone will improve mechanical properties of the fibers and slow down their biodegradation. The unique structure of cyclodextrins in form of a truncated cone with hydrophobic cavity and hydrophilic outer layer will allow delivering the hydrophobic drug directly to the hydrophobic cornea through an aqueous tear film. Based on literature analysis on cyclodextrin-drug complexes in aqueous suspensions, it can be assumed that complexes will be released from the fibers and distributed in the tear film, releasing the drug in contact with it. It will be examined in the study of penetration of the substance through porcine cornea and synthetic membranes. Complexation will also eliminate the need to add pH-modifiers and preservatives, both giving commercially available formulations (including eye drops) irritating properties. The combination of hydroxypropyl cellulose and polycaprolactione with cyclodextrin complexes with the drug will therefore allow obtaining materials with a unique structure and kinetics of active substance permeation, and thus with potential therapeutic properties exceeding those used in clinical practice and developed so far in scientific units.

In order to implement the project, a number of tests will be carried out using advanced research equipment. Testing of the non-woven will include studies of their structure, mucoadhesive properties, thermal properties, interaction between drug and complexes with the polymer matrix as well as *in vitro* permeation of the drug, and finally also cytotoxicity tests. These activities will provide valuable information from the point of view of basic research and in the field of modern methods of treatment using drug carriers.

It is postulated that placing the carrier on the cornea would allow slow delivery of a larger proportion of the drug to the target site, and thus outperform other developed carriers, in particular broadly discussed nanoparticles. Undertaking this research topic is dictated by the insufficient state of knowledge about nanofibrous carriers of ophthalmic drugs, while the use of this type of materials brings enormous benefits that will provide a large cognitive step towards the development of science, especially from the perspective of biomaterials.