

#### Objective

The main objective of the project is to evaluate the usefulness of in vitro measurements using iv SS OCT (in vitro swept-source optical coherence tomography) in ophthalmic applications. In particular, we wish to check the possibility of using iv SS OCT to evaluate the morphology and geometry of the corneal donor tissue intended for transplantation. We also plan to confirm that it is possible to measure the geometry of the contact lens if it is placed in a solution of high reflectivity. In addition, we shall check how the curvature of the contact lens changes during wear and look for the factors that influence these changes.

#### Implementation of interdisciplinary basic research

The study proposed in this application is consistent with the definition of the basic research. The project includes experimental studies aimed at improving knowledge and understanding of the basic aspects of the potential ophthalmic uses of measurements using iv SS OCT. The implementation of the project requires simultaneous conduct of the basic research in two areas. The research in the first field, technical sciences, will help expand the knowledge of the physics of optical imaging. For this part of the study it is vital that a prototype of in vitro OCT tomograph be designed and optimized. The second area includes life sciences, and in particular, the diagnosis of human diseases. This research will include measurements of human corneas intended for transplantation and obtained from a tissue bank, as well as contact lenses by means of an innovative OCT prototype. The project will contribute to the development of knowledge in both of these areas, which can lead to real practical applications in the future.

#### Reasons for research topics

At the moment, there is a lack of good diagnostic technique, which would allow for a qualitative and quantitative assessment of corneas intended for transplantation without removing them from a storage solution. The development of iv SS OCT technique could allow to use it in the assessment of donor corneal tissue at the tissue bank. In addition to screening assessment of corneas towards abnormal curvature, it may provide valuable knowledge about the curvature of the individual corneas intended for transplantation. The knowledge of the donor corneal topography makes it possible to appropriately choose suitable donor tissue for the recipient. So far, there has been no OCT system that would be able to make reliable measurements of the geometry of contact lenses either. Potential applications of iv SS OCT include industrial processes of lens design, production quality control, and research. This knowledge will enhance the practitioner's capabilities in the proper selection of soft contact lenses, may be useful in developing new materials and design of contact lenses, especially in the face of the incipient revolution in contactology including such concepts as: drug-eluting lenses or ones containing electronic components