

## **DESCRIPTION FOR THE GENERAL PUBLIC**

The tear film is an integral part of the eye surface providing a smooth optical surface, moisturizing and nourishing the avascular cornea and protecting against infection. Tear film that is unstable or too thin may lead to inflammation of the eye surface and results in its damage. This condition of the eye is referred to the dry eye syndrome, because the patient most often suffers from dry eye sensation, as well as discomfort and visual disturbances, which often limit life activity. Dry eye syndrome, which occurs more often in the elderly, is a disease of affluence affecting millions of people world-wide. Cataract is another common eye disease associated with age, which according to the World Health Organization is the main cause of vision impairment. Cataract is the clouding of the crystalline lens, to which the only currently known solution is surgery, consisting of removing the crystalline lens and replacing it with an artificial intraocular lens. After such surgery, patients often experience dry eye symptoms, which normally lessen up to six months post-surgically, but it may also last longer. The aims of this research proposal is to understand thoroughly the risk factors influencing the induction of postoperative dry eye syndrome, to determine the scope of post-cataract pathophysiological changes in the eye surface parameters, and to describe their regression in order to reduce the occurrence of postoperative discomfort. In previous studies, two separate groups of patients have been compared most often: healthy and suffering from dry eye syndrome. In contrast, studies of the disease process itself were limited to animal studies in which the dry eye syndrome was induced. In the proposed project, the phenomenon of transient dry eye syndrome after cataract surgery will be utilised as a potential research platform for chronic dry eye syndrome in order to understand the causes of tear film stability disorders. The project, realised in cooperation of the Wroclaw University of Science and Technology with an ophthalmology clinic, will involve patients qualified for cataract surgery that have not previously been diagnosed with dry eye syndrome. They will undergo comprehensive ophthalmological examinations before and up to six month after the procedure, to which experimental biophysical and biochemical methods of tear film analyses will be added. Two control groups will also be comprehensively examined, i.e., patients with non-iatrogenic dry eye syndrome and healthy individuals. For a detailed study of the causes and the postoperative course of dry eye, new measurement techniques will be used focusing on individual parameters of the eye surface including tear composition, glands and cells that secrete layers of the tear film imaging, characteristics of the tear film distribution dynamics and tear break-up while keeping the eye open. Advanced measurement techniques based on interference, spectrometry and infrared imaging will be utilised. The attention will be focused primarily on an in-depth understanding of the tear lipid layer role, which is responsible for the smoothing and for the stability of the entire tear film on eye. The project will contribute to acquiring previously unavailable knowledge about the relationship between the dynamics of the tear film and the composition of the outer layer of the tear film. The knowledge acquired during the research will allow to fully understand the causes of dry eye formation and provide basis for the development of better diagnostic methods, based on the analysis of medical data and mathematical modelling. The development of a predictive model of changes in the parameters of tear film and ocular surface will help eye care professionals choose an effective therapy when treating a particular type of dry eye diseases.