Offer for a Master's thesis in the Faculty of Medicine (April 6, 2022)

Characterisation of the extracellular matrix of lacrimal glands

The tear film covers the ocular surface and is essential for its function. The physiological composition of the tear film is complex and consists of water, inorganic salts, proteins, mucins and lipids, which are mainly produced by the lacrimal glands and the so-called meibomian glands (Figure 1). A tear gland dysfunction or a meibomian gland dysfunction can therefore lead to dry eye disease (DED). In Germany alone, about 12 million people suffer from dry eye disease, which can lead to chronic irritation and inflammation and even blindness in patients. Therefore, it is highly clinically relevant to develop approaches to reconstruct the glandular tissue using tissue engineering. A prerequisite for successful reconstruction is detailed knowledge of the composition of the extracellular matrix, as this predominantly determines the biomechanical properties. The extracellular matrix represents the part of the tissue that lies between the cells and is responsible, among other things, for the shaping of the organ, the anchoring of the cells in the tissue association and the communication of the cells. The main components of the extracellular matrix are collagen, reticular and elastic fibres. Collagens can be subdivided into four further groups. For the lacrimal gland of the mouse, it is known that collagen type I, type III and type IV as well as elastin occur. In a previous project, we were able to show that the lacrimal gland has sex-specific differences in the biomechanical properties as well as in the proportion of elastic fibres in the extracellular matrix. So far, no differences could be detected in the total proportion of collagen fibres.

In this part of the project, we therefore want to determine the composition of the different collagen types in the lacrimal gland of the mouse in detail. In addition, the collagen and elastin content of female and male mice will be determined by (semi-)quantitative methods. Furthermore, we would like to evaluate the proportions of collagen and elastic fibres in human lacrimal glands by means of "machine learning" in order to be able to already address species-specific differences for the future development of proxy materials for the reconstruction of the lacrimal gland.

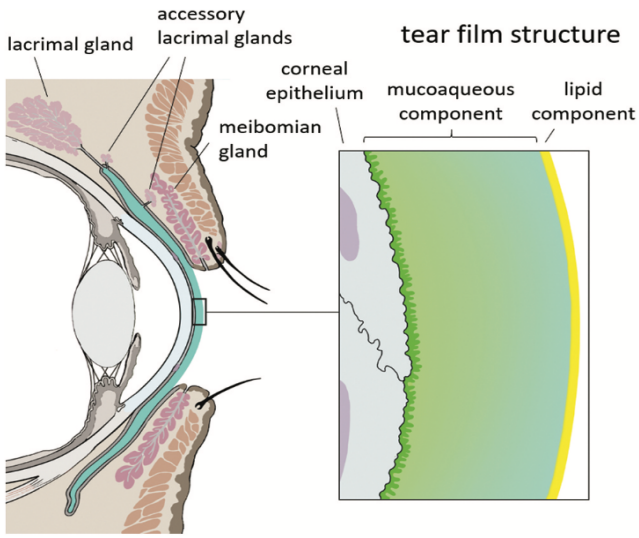

Figure 1 Schematic representation of the functional unit eye including lacrimal gland and tear film (Dietrich et al. 2021, Ocular Immunology and Inflammation).

Supervision and further information: Dr. rer. nat. Jana Dietrich, Prof. Dr. med. Friedrich Paulsen I Institute of Functional and Clinical Anatomy I FAU Erlangen I Universitätsstr. 19 I 91054 Erlangen I Germany, jana1.dietrich@fau.de