Offer for a medical doctoral thesis in the Faculty of Medicine (December 2022)

Does human Meibum content sexual hormones and environmental toxins?

Dry eye disease (DED) is a multifactorial disease of the ocular surface. Common causes of DED are meibomian gland dysfunction (MGD) due to abnormally altered meibomian glands in the eyelid, and a lack of aqueous tear volume due to hyposecretion of the lacrimal gland. With more than 12 million people affected in Germany alone, DED is one of the most common diseases of the ocular surface. MGD is characterized by increasing keratinization (hyperkeratinization) of the terminal meibomian gland ducts and increasing viscosity of the meibomian gland secretion. Currently, DED can only be treated symptomatically, but not causally, because the pathophysiology of the disease is not sufficiently understood. Therefore, it is of great scientific importance to understand the pathomechanisms of this disease to develop causal therapy options.

Environmental toxins may promote keratinization. Since keratinization of the meibomian gland outlet leads to meibomian gland inflammation and dysfunction, the focus of this work is to investigate environmental toxins at the ocular surface and specifically in the meibomian gland. Following preliminary work by our group, human meibum secretions will be collected (Fig.1) and examined for the presence of environmental toxins. Likewise, the corresponding receptors (AhR) will be detected in human tissues of the ocular surface.

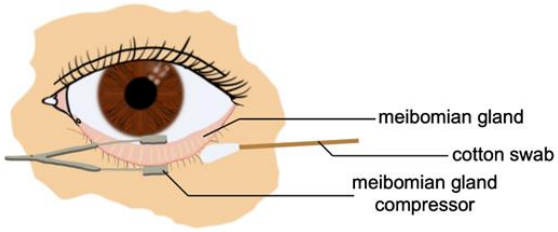

Figure 1: Meibum extraction from the lower eyelid

The influence of various hormones on the ocular surface has also not yet been conclusively clarified. Prolactin (PRL), a multifunctional pituitary hormone, is present on the human ocular surface and prolactin-induced protein (PIP) is increased in the tear fluid of dry eye patients. The binding of PRL to the prolactin receptor (PRLR) causes the increased formation of PIP, which leads, among other things, to the incorporation of the water channel aquaporin 5 (AQP5) into the apical cell membrane. Therefore, the present research project will also investigate the influence of PRL on the expression of PIP and AQP5 in a human lacrimal gland cell line, as well as the occurrence of PRL in human meibum and tear fluid.

The planned investigations include obtaining meibum samples from DED patients, cell culture experiments and various molecular microbiological methods.

For learning the methods and collecting the meibum samples, a research sabbatical semester is required.

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