New developments in analysis of ocular surface diseases|Nieuwe ontwikkelingen in analyse van ziekten van het oogoppervlak

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CHAPTER 1

GENERAL INTRODUCTION

General introduction

A first step in the process of vision is the proper focusing of the visual image on the retina. This focusing is brought about through the refraction of light by the cornea and the lens. The refractive power of the cornea is constant and makes up about 2/3 of the total refractive power of the eye. The lens has an adaptive refractive power from a few to maximally 15 to 20 diopters allowing us to see nearby and far away objects. The high refractive power and low scattering properties of the cornea are largely due to the specific lamellar organization of its stroma. This lamellar organization is carefully controlled by the endothelium on the back of the cornea and by the corneal epithelium in front of it. From this it is evident that a healthy clear corneal epithelium is crucial for vision in general and for good visual acuity in particular. The corneal epithelial cells provide a smooth refractive surface and in addition form a first defense barrier for injuries from the environment. Moreover, the microvilli at the outermost epithelial surface provide a base for the tear film. The tears contribute to a balanced healthy environment of the ocular surface, and contains a range of important proteins. Anti-inflammatory proteins present in the tears like Interleukin-10 (IL-10) and lactoferrin inhibit excessive immune reactions thereby preventing corneal inflammation and subsequent scarring of the epithelium and stroma. Lactoferrin and lysozyme are anti-microbial tear proteins that contribute to the reduction and/or eventually prevention of ocular surface infections.

The corneal epithelial cells are continuously replenished by stem cells at the limbus. Without functioning stem cells at the limbus the conjunctival epithelium would invade the corneal surface causing a severe decrease in transparency and visual acuity. The local limbal environment is important for optimal function of the limbal stem cells. Their anatomical location in palisades protects the stem cells. Additional protection is provided by surrounding pigmentation and dendritic cells. Blood vessels in the limbal region provide metabolic factors, and direct access of the immunological active cells to the cornea. When the anatomy is disturbed, the function of the limbal stem cells can be compromised. Acquired anatomical changes to the limbal region have a variety of causes ranging from tumors, to excessive inflammation, and surgery. Pigmented conjunctival lesions like primary acquired melanosis, nevi, and conjunctival melanoma frequently arise at the limbus, and surgical removal or biopsies can influence the limbal environment. Cytological smears are less disturbing for the ocular surface than biopsies for histological examination. Part II of this thesis investigates conjunctival pigmented lesions, with emphasis on impression and exfoliative cytology.

Limbal stem cell deficiency is the topic of Part I of this thesis, describing a new animal limbal transplant model. In the final part (Part III), corneal infections like herpes simplex keratitis and corneal ulcers are discussed. We have investigated whether single nucleotide polymorphisms in the lactoferrin and IL10 gene are involved in the susceptibility of these infections.