IZKF Interdisziplinäres Zentrum für Klinische Forschung | RWTH AACHEN UNIVERSITY | DWI Leibniz-Institut für Interaktive Materialien

We are currently seeking a highly motivated medical student (f/m/d) for a project on

"Mechanobiology of genetically modified retinal epithelium"

The integrity and homeostasis of the retinal pigment epithelium (RPE) are critical to sustain the healthy function of the retina. RPE cells tightly interact with each other, forming a monolayer of cuboidal and polarized cells located between the choriocapillaris and the photoreceptor outer segments. It fulfils multiple tasks, including the maintenance of the blood-retina barrier to protect the retina, the transport of nutrients, the removal of metabolic products and the secretion of vital factors and molecules. Degeneration of the RPE interferes with the normal retinal metabolism, breaks the blood-retina barrier and causes vision loss. The RPE undergoes chronic mechanical stress, which generally plays a critical role in the (patho-)physiology of living cells. Dysfunctions contribute to the pathogenesis of many retinal degenerative diseases, such as proliferative diabetic retinopathy (PDR), proliferative vitreoretinopathy (PVR), RPE tears and high myopia. These diseases have global prevalences of up to 3% and are characterized by harmful stretching of the RPE, resulting in the distortion of the retinal architecture up to retinal detachment and leading to the disruption of the essential interactions between RPE and outer retina and, finally, to blindness.

This project aims to characterize the mechanobiology of genetically modified retinal pigment epithelium. *The genes for pigment epithelium-derived factor (PEDF) and brain-derived neurotrophic factor (BDNF) are delivered via electroporation using the Sleeping Beauty transposon system. The functionality of the monolayers from non-transfected and transfected cells will be performed by* **electrical impedance spectroscopy** *to monitor RPE barrier properties and morphological changes, as well as* **traction force microscopy** *and* **monolayer stress microscopy** *to evaluate RPE mechanobiological properties.*

The resulting characterization of the genetically modified monolayers will set a step forward for the use of the transfection strategy in a novel therapeutic strategies.

Your Tasks

- *Optimization of traction force microscopy and electrical impedance spectroscopy of RPE.*
- *Live imaging of RPE monolayer's actin cytoskeleton with confocal microscopy*
- *Computational data analyses using MATLAB and Fiji software*

Your profile

- *You are studying medicine*
- *You are interested in the field of mechanobiology*
- *You are interested in mammalian cell culture*
- *You are a reliable and careful worker with the ability of integrating well in a team*

The student will have the possibility to apply for a scholarship to the German Society of Ophthalmology *and will be working in a team of engineers, physicists, biologists and medical doctors from the groups of Dr. Di Russo (UKA, DWI), Dr. Johnen (UKA) and Dr. Linkhorst (RWTH).*

If you are interested, please contact Dr. Jacopo Di Russo at **jdirusso@ukaachen.de**.

REMeD

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