Master in Life Sciences

Development of animal-free models and therapy approaches for neuro-retinal degeneration

Research

The primary purpose of the group of experimental ophthalmology, director Prof. Gabriele Thumann, are investigations of the etiology and treatment of retinal degeneration focusing on cell-based gene therapy, stem cell transplantation, pharmacology, and biomaterial science.

Using non-viral methods, we are able to efficiently transfect retinal (RPE) and iris pigment epithelial (IPE) cells by stably integrating a recombinant gene into the host cell genome and by producing a functional gene product. Using this technology we are developing new treatment approaches for retinal diseases.

Potential drugs and therapy approaches are evaluated *in vitro* on their benefit and toxicity in cultures of ocular cells or whole retina cultures. Cultured RPE and IPE cells, e.g., are analyzed for specific markers and functions like RPE65 and phagocytosis using various biochemical methods. Transferring *in vitro* results to *in vivo* conditions, candidate substances are applied or transplanted sub-conjunctivally, -retinally or intra-vitreally to assess biocompatibility in animal models. We are working with healthy mice, rats and rabbits and develop appropriate disease models.

To reduce the number of animals and animal-derived products used to a minimum, we are developing diverse organ culture models like the iPS-derived RPE cell-retina co-culture with induced oxidative stress to mimic age-related macular degeneration, and we are working on the replacement of fetal bovine serum (FBS) in our cell culture.

For more information about us please visit: https://www.unige.ch/medecine/neucli/en/groupes-de-recherche/925thumann/

Projects

Several projects are available for a master thesis. Some examples are: 1) Retina organ cultures should be optimized to allow mid-term culture of more than 14 days. 2) The possible efficiency and toxicity of drugs should be analyzed in retina organ culture. 3) An FBS-free cell culture for primary cells should be established. 4) The toxicity of different plasmid vectors for gene therapy has to be analyzed in primary ocular cells. 5) The influence of extracellular matrix proteins on RPE biology should be characterized. All studies are supervised by Prof. Thumann and Dr. Kropp while offering the possibility for independent research. The projects will be defined together with the applicant, taking into account his/her primary interests as well as research currently underway in the laboratory.

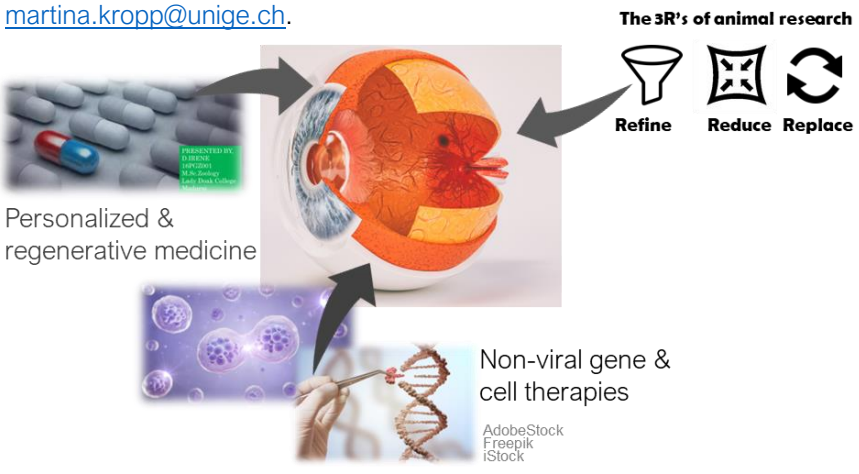
Methods

Cell and tissue isolation, cell culture, organ culture, quantitative Real-Time PCR, digital droplet PCR, phagocytosis assay, transepithelial resistance measurement, cell viability and death assays, immunohistology, fluorescence microscopy, oxidative stress induction and analysis, biochemical and cellular assays like western blot, and more.

When / How

Applications can be submitted at any time for Master projects of a duration of 6-12 months.

Please send your CV and a motivation letter to martina.kropp@unige.ch.



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