

Valorisation of natural compounds and their evaluation as therapeutic agents for ocular surface inflammatory diseases

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Summary

Our aim is to determine the potential effect of high value natural bioactive compounds on the maintenance of ocular surface health in inflammatory diseases, such as dry eye and ocular allergy. This project will be carried out at the Institute of Applied Ophthalmobiology (IOBA) in collaboration with the High Pressure Processes (HPP) Group (both from the University of Valladolid, Spain); part of the project will be carried out at the iBet Institute (Portugal) and the University Hospital of Cologne (Germany). The most efficient way to obtain natural bioactive compounds will be established, along with their best performance in ocular surface cells and animal models, in order to develop new medicines for the treatment of ocular surface inflammatory diseases.



State-of-the-art

Dry Eye Disease (DED) is a chronic eye disease due to inflammation and dysfunction of the Lacrimal Functional Unit of the ocular surface. It is considered as a major health problem due to the ability to affect the quality of life of hundreds of millions of patients, while its prevalence is continuously growing and there is scarcity of effective therapy. Natural products have played a key role in medicine, being for several centuries the sole means to treat diseases. So far, there are many evidences proving their efficacy for a variety of diseases. However, the presence of undesirable substances can lead to limitations regarding their use and applicability, which along with the lack of industrially applicable and efficient extraction methods are some of the major unmet needs in this field. Our purpose is to obtain extracts with bioactive natural products, managing to remove the irritating for the eye substances in an applicable and eco-friendly way, which can be used as a potential topical therapy for the treatment of DED.



Testing different extracts on ocular surface cells



Techniques

- Extraction techniques (Microwaves, Ultrasounds, etc)
- Purification methods (f.e. Ion-Exchange resins)
- Qualitative and quantitative analytical techniques (f.e. HPLC)
- Spectrophotometric methods (f.e. UV-Vis)
- *In vitro* cell-based assays
- *In vivo* animal model
- Statistical analysis



Task description

- Establishment of the best extraction protocol for the selected natural sources
- Screening of the extracts and the pure natural bioactive compounds for their *in vitro* toxicity and their selected activities in ocular surface cell cultures
- Purification of the most potent extracts
- *In vivo* assays in a mouse dry eye model for the selected molecules/extracts
- In collaboration with the ESR6, study of different formulations for the adequate delivery of the selected compounds/extracts on the ocular surface