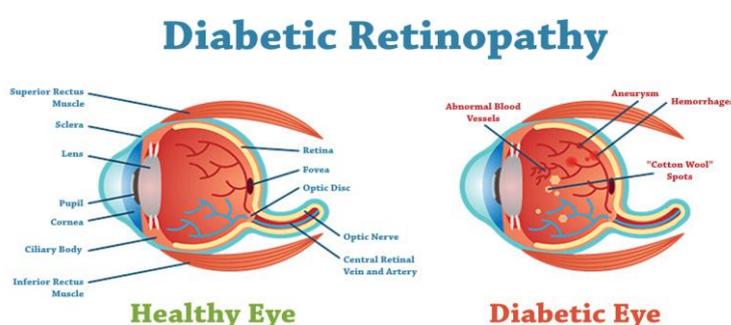


Potential beneficial effects of plant bio-active molecules on diabetic retinopathy

Background

One of the major complications of diabetes is diabetic retinopathy (DR) characterised by the appearance of retinal vascular disorders in people with diabetes mellitus for several years. Early stages are characterised by retinal vascular occlusions and dilatations that evolve into new vessels leading to vitreous haemorrhage and macular oedema with a risk of significant loss of vision.

Almost all patients with type 1 diabetes and more than 80% of patients with type 2 diabetes will develop retinopathy during the first 20 years of the disease and approximately 4% and 2% (respectively) will become blind (visual acuity less than 1/20).



<https://2020vision4nh.org/diabetic-retinopathy/>

Several biochemical mechanisms have been proposed to explain the toxic effect of hyperglycaemia on retinal micro-vessels. The inflammation and the appearance of free radicals induce the overexpression of vascular endothelial growth factor (VEGF), which has a stimulating effect on angiogenesis, particularly an increase in abnormal new blood vessels. This process plays an important role in the development of diabetic retinopathy. There are two types of DR: non-proliferative diabetic retinopathy (NPDR): This is the milder form of diabetic retinopathy and is usually symptomless, and proliferative diabetic retinopathy (PDR): PDR is the most advanced stage of diabetic retinopathy and refers to the formation of new, abnormal blood vessels in the retina.

Research project

Vision loss in DR is often associated with the oxidative stress of Retinal Pigment Epithelial Cells (RPEC) generated by high glucose levels. RPEC is a highly specialised retinal cell layer that plays a crucial role in the survival and function of retinal photoreceptors.

Over many years, scientists have been interested in finding out the effect of natural products, particularly phenolic compounds, for their biological activity as antioxidant and anti-inflammatory agents against a variety of diseases including diabetes.

Several plants are used in southern Mediterranean countries in traditional or folk medicine and are documented to possess high antioxidant and anti-inflammatory properties. Consequently, they are considered a valuable component in a healthy diet to prevent metabolic and cardiovascular diseases, such as dyslipidaemia, obesity, diabetes and their related complications. This beneficial effect could be through their high content levels in flavonoids, phenols and polyphenols.

The aim of our study is to investigate the potential beneficial effects of the bio-active molecules of plants from southern Mediterranean countries, on cell survival, oxidative stress and inflammation responses in human Retinal Pigment Epithelial Cells.

- To reproduce the acute and chronic hyperglycaemia, the human retinal pigment epithelial cells will be exposed to glucose rich medium or another oxidative stress inducer. To evaluate the antioxidative effect of the plant bioactive molecules, reactive oxygen species (ROS) will be assessed in normal media and high glucose media exposed cells.
- To induce the acute or chronic inflammatory responses, retinal pigment epithelial cells (RPEC) will be stimulated by a pro-inflammatory agent such as Interleukin one beta (IL-1 β) or tumour necrosis factor alpha (TNF- α). The potential protective effect of the natural bio-active molecules will be evaluated by measuring the levels of pro- and anti-inflammatory cytokines, as well as vascular injury markers secreted in the culture media. The up-regulation or down-regulation of target genes involved in angiogenesis will be also investigated.