Evaluating the protective effect of berries-derived polyphenol metabolites in mouse retina degeneration

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Project Summary/Thesis Plan

Parkinson’s Disease (PD) is the second most common neurodegenerative disease worldwide, affecting 1% of the population over 65 years of age. Dopaminergic cell death in the substantia nigra and accumulation of Lewy bodies are the defining neuropathological hallmarks of the disease. However, neuronal death and dysfunction have been reported in other central nervous system regions, including the retina. Epidemiology studies have indicated that diet rich in (poly)phenols can have an impact in the prevention/delaying of neurodegenerative diseases.

An nutritional trial in a MPTP induced mice model of PD will be used to study berries diet supplementation effects at retina level. The effect of berries-derived polyphenol metabolites on retina degeneration will be evaluated by assessing the retinal layers integrity, area and thickness on mice retina slices. The several retinal populations such as ganglion, bipolar, horizontal, amacrine and photoreceptor cells, will be evaluated using specific markers by immunohistochemistry (IHC) and confocal imaging. Moreover, glial reactivity will be assessed with specific markers for astrocytes and Müller cells, by IHC.

Moreover, expression levels of genes involved in specific stress responses and signaling pathways such as oxidative stress, cell death pathways and inflammation, and complemented with the evaluation of the levels of proteins of interest by western blot.

Also, we aim to do a functional evaluation of mice retina by performing Multielectrode Array (MEA) recording of mouse retinas to assess if the berries-derived polyphenol metabolites is able to protect/restore retina function.

This MSc project is expected to undertake the following tasks:
1. Characterization of the retinal degeneration induced by MPTP;
2. Evaluation of the protective/treatment effect of berries-derived polyphenol metabolites on retina degeneration induced by MPTP;
3. Evaluation of the protective/treatment effect of berries-derived polyphenol metabolites on retina function affected by MPTP by MEA.