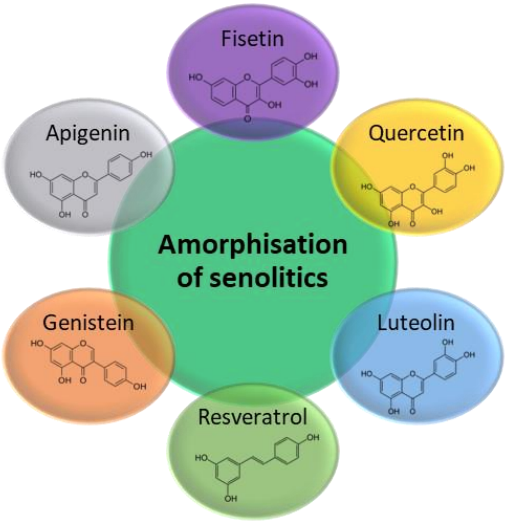
Amorphous Senolytics: A Breakthrough Approach in Senescence Modulation and Age-Related Disease Treatment

This scientific project delves into the fascinating world of ageing and age-related diseases, seeking to unlock the potential of natural compounds known as senolytics. Senolytics are compounds capable of selectively eliminating senescent cells, contributing to tissue dysfunction and the progression of age-related disorders. However, the therapeutic efficacy of senolytics is often hindered by the poor solubility of their active ingredients. The potential of senolytics lies in their ability to specifically target senescent cells while sparing healthy cells, thereby minimising side effects. This targeted approach holds great promise for improving ageing populations' health and quality of life. By developing senolytics with enhanced bioavailability and therapeutic efficacy through the amorphisation process, this project aims to unlock their potential further and advance the field of senolytic therapy.



To address this challenge, the project explores the revolutionary technique of amorphisation. Unlike their crystalline counterparts, amorphous formulations of senolytic compounds exhibit enhanced solubility, improved bioavailability, and faster dissolution rates. This transformative process can potentially optimise the performance of senolytics and enable more efficient targeting of senescent cells. The project focuses on natural compounds with senolytic potential, including fisetin, quercetin, luteolin, resveratrol, genistein, and apigenin. These compounds have promising senolytic properties and are candidates for preventing and treating age-related diseases. By harnessing the power of amorphisation, the project aims to increase the bioavailability and therapeutic efficacy of these natural senolytics.

The amorphisation process will employ innovative techniques such as supercritical CO2, hot-melt extrusion (HME), and electrospinning. Supercritical CO2, an environmentally friendly solvent with excellent solvating properties, will be utilised to produce amorphous solid dispersions. HME, a continuous and scalable manufacturing method, will facilitate the incorporation of poorly soluble senolytic APIs into amorphous formulations. Furthermore, electrospinning offers a unique approach to fabricating amorphous nanofibrous scaffolds for targeted drug delivery and tissue engineering. By advancing the development of senolytic therapies through amorphisation, this project aims to overcome the limitations posed by poorly soluble APIs. The findings can potentially revolutionise the treatment of age-related diseases by designing optimised amorphous formulations that enhance therapeutic performance. The ultimate goal is to pave the way for more effective interventions targeting senescent cells, promoting tissue rejuvenation, and improving overall health.

In conclusion, this scientific project endeavours to harness the potential of amorphisation in senolytics, explicitly focusing on natural compounds with senolytic potential. By applying advanced techniques such as supercritical CO2, hot-melt extrusion (HME), and electrospinning, the project aims to enhance these compounds' bioavailability and therapeutic efficacy in preventing and treating age-related diseases. The findings can transform the landscape of senolytic therapy by overcoming the challenges posed by poorly soluble APIs and providing more effective treatments targeting senescent cells.