University of Naples Federico II
Department of Pharmacy
Doctoral Course in Pharmaceutical Sciences XL Cycle

IN SITU-FORMING VITREOUS LIKE HYGROGEL EMBEDDING DRUG LOADED MICRO/NANOPARTICLES TOWARD AN EFFECTIVE TREATMENT OF POSTERIOR EYE DISEASES

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Diseases of posterior eye segment, common in the elderly, are often chronic and degenerative and carry a high risk of blindness. Current therapies usually involve long-term inhibition of the vascular endothelial growth factor (VEGF) pathway. However, the bioavailability of active molecules is limited by biological barriers and efflux pumps. The aim of this project is to develop a composite injectable drug delivery system (ic-DDS) for the treatment of posterior ocular segment diseases. Designed for intravitreal injection, ic-DDS will maintain therapeutic drug levels in the eye for extended times. The ic-DDS will be liquid at room temperature to be easily injected and will form a gel at physiological eye temperature. The ic-DDS will consist of a natural polymeric hydrogel simulating the vitreous body and will incorporate biodegradable micro/nanoparticles (MP/NPs) for sustained drug release, aiming to minimize the burst effect. Drugs commonly used for these diseases, such as anti-VEGF agents, will be used. The system will be optimized to gel at eye temperature, aiming to guarantee its effectiveness regardless of the patient physio/pathological conditions. The gel rheological properties will be engineered to hamper particle migration into the diseased vitreous, thereby reducing the risk of vision impairment. Furthermore, the gel will contribute to control drug release kinetics and provide mechanical support to the pathological vitreous body. Particle diffusion in vitreous-simulating hydrogels will be studied to ensure that the MPs/NPs they incorporate do not undergo aggregation/precipitation. In vitro biocompatibility of ic-DDS will be evaluated using a human corneal epithelium (HCE) tissue model.