Tailored Elastin-like Recombinamers as Advanced Systems for Cell Therapies in Diabetes Mellitus: a Synthetic Biology Approach towards a Bioeffective and Immunoisolated Biosimilar Islet/Cell Niche

Acronimo: **ELASTISLET**

Call: **H2020-NMP-2014-two-stage**

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Abstract: The GENERAL OBJECTIVE of this project is the development of a novel immunoisolation and scaffolding systems based on multi-bio-functional elastin-like polymers (recombinamers –ELRs-) for long-term and efficient pancreatic islet and human induced pluripotential stem cells (hiPSCs) transplantation for the cell therapy of Diabetes Mellitus (DM). This objective is based on fabrication of multi-bio-functional capsules that are able to efficiently immunoprotect their content but also to promote the complete bio-integration and fusion of the capsule and its content with the host surrounding tissues. To this end, we will study the cell-material interaction on both, the inner and outer surface of the capsule so the capsule will mimic a "normal" extracellular matrix for both, the cell cargo and the surrounding tissues. In this way, such cellular cargo will be still kept isolated from the host's immune system but, biomechanically integrated and fused with the host tissues. The cell cargo inside the capsule will be able to sense the biomechanical signaling, in addition to other biological signaling, as a way to assure an adequate connection to its surroundings. Ideally, this must lead to substantially increased chances of long-term survival and functioning of the implant. To successfully develop these breakthrough paradigm, new encapsulating multi-bio-functional polymeric materials with advanced properties and tailor-designed, as well as novel encapsulation technologies, will be used for the first time in the field of DM cell therapies. The selection of innovative biomaterials and encapsulating technologies herein proposed, derives from a strategic inter-disciplinary approach, addressing challenges at level of both, the implant-surrounding tissue interface and the cell/islet-biomaterial inner interface. This biohybrid, integrated system may be key to generating an efficient radical treatment, so far missed, for the epidemic-size problem posed by DM. University of Perugia partecipates to ELASTISLET with the Department of Medicine.