Instituto de Medicina Molecular João Lobo Antunes

Master Project Proposal

Title: Bottom-up reconstruction of a synthetic erythrocyte: membrane properties, biomechanical assessment and cell-cell interactions

Synopsis:

Artificial cells can mimic several basic cellular and physiological functions. This MSc proposal is part of SynEry, a European project (directly collaborating with partners from Belgium, France, Italy and Spain) with the main goal of building a synthetic erythrocyte from the bottom up. Thus, the aim of the MSc project is to assess the biophysical and biomechanical properties, as well as the cell-cell interactions, before and after *in vivo* administration of the biomimetic erythrocytes. To achieve this goal, we will characterize the overall membrane properties of biconcave GUVs and the biomechanical properties of the synthetic erythrocyte. The assessment of how this artificial erythrocyte behaves under flow conditions and performs cell-cell adhesion will also be carried out. The development of this MSc project will involve the use of atomic force microscopy (AFM), fluorescence spectroscopy and microscopy, zeta potential analysis and erythrocyte deformability assessment under flow conditions. By employing these biophysical and nanotechnology techniques, it is possible to gain valuable insights into the physicochemical properties, functionality, stability, and performance of synthetic erythrocytes, both before and after *in vivo* administration. This information is crucial for optimizing the design, production, and application of artificial erythrocytes in different biomedical and therapeutic contexts, such as blood transfusion.

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