Final Report

Project acronym: *BIOMAG*

Project number:

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Publishable project summary

An ever-increasing number of medical applications are adopting nanotechnology to a variable extent in order to go beyond the current state-of-the-art. Targeted drug delivery, regenerative medicine, tissue engineering, or biosensing already benefit from using nanomaterials to improve the current healthcare systems of our society. BioMag deepened on a a quick, sensitive, precise, reliable and low-cost in vitro diagnostics methodology for detection of biomarkers taking advantage of the current progress on the synthesis and characterisation of magnetic nanoparticles for developing and validating a novel magnetic detection of biomarkers present in human blood plasma. The BioMag detection methodology grounded on: i) the design of magnetic nanoparticles functionalised with recognition ligands (F-MNPs) that specifically interact with cardiac biomarkers (troponins I and T) related to myocardial infarction, ii) the change of magnetic properties of F-MNPs upon interaction with biomarkers (i.e. analyte), iii) the use of such variation of the magnetic properties of F-MNPs reflected on the hysteresis loops to quantify the target biomarkers. BioMag moved further the proof of concept of this novel and original methodology (European patent application number EP 17 38 2758 "Method for detection of an analyte"), which enables a significant modulation of the detection sensitivity by distinct means (i.e. MNP chemical composition and size, field conditions, multivalency of analyte, number of ligands per MNP). The advantage of the BioMag method with respect to other magnetic-ones is the quasi-instant displaying time (few seconds), the non-required sample preparation prior the dispersion of F-MNPs in the sample, and the low cost of the required displayer. BioMag achieved : 1) F-MNPs with outstanding transducing capacity for biomarker detection in buffer saline and human blood plasma media; 2) setting the suitable conditions to detect biomarkers; 3) the development of numerical simulations in order to model the variation of the AC hysteresis loops. BioMag consortium gathered excellent and multidisciplinary research teams that complement each other for achieving the proposed objectives while approaching fundamental material science towards market applications.