Adhesion and Phagocytosis of Functionalized Emulsion Droplets

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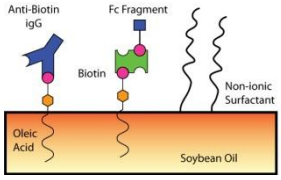
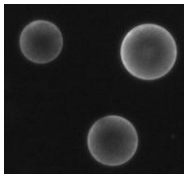
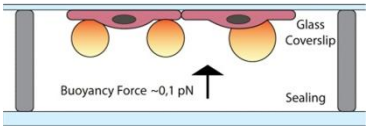
Robust and highly versatile, the recent progress on the functionalization and characterization of liquid emulsion droplets give them all the assets to become a generic targeted drug delivery system able to encapsulate and transport [1] active molecules at specific locations within the body.
Similarly to what happen to pathogenic agents when they penetrate the organism, the drug carriers are first opsonized and then captured, engulfed and degraded by specific cells of the immune system, the phagocytes. To reach their targets, the carriers have to go through the physical and biological barriers they can encounter [2] and therefore need to dodge either opsonization or phagocytosis.
In the framework of the project, we aim first at understanding which parameters govern the adhesion of opsonized emulsion droplets to macrophages and how the theoretical models of cell adhesion are relevant for these experiments. In a second step, we will focus on the phagocytosis itself, and we will use the functionalized emulsion droplets to study the ability of a macrophage to adapt its dynamics of phagocytosis to the size of the particle bound to it.



(a)


(b)



(c)

During the first steps of our work that we will present here, we used well characterized emulsion droplets [2], functionalized by fluorescent immunoglobulins (a,b) able to trigger the phagocytosis process. We will show that the adhesion of the droplets to the cell surface, observed by fluorescence microscopy in a chamber (c), increases the density of receptors in the contact area, and also that the droplets are able to be internalized quickly by the macrophage through phagocytosis.

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