CELLULAR INTERNALIZATION MECHANISM OF NANOPARTICLE-BASED COATINGS

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Description: Interaction between cells and micro or nanoparticles is a topic still widely discussed in the literature, especially in the frame of the internalization process and biochemical response of the cell. This question concerns the developpement of new biomaterials as well as therapeutical strategies and public health in the case of exposure and dispersion of nano-objects. The most common configuration for studying these interactions is when cells and particles are both dispersed in solution. Cells interacting with particles already adsorbed on a surface is never considered. It is however representative of many situations such as particle-based biofunctional coatings or particles adorbed on tissues for example. This configuration also modelizes interactions between cells and adsorbed bacteria or any other adsorbed pathogens. Our first results on the interactions between macrophages and silica particles monolayers (diameter ranging from 30 nm to 450 nm diameter) have shown internalization efficiencies remarkably different from those obtained with particles in solution.

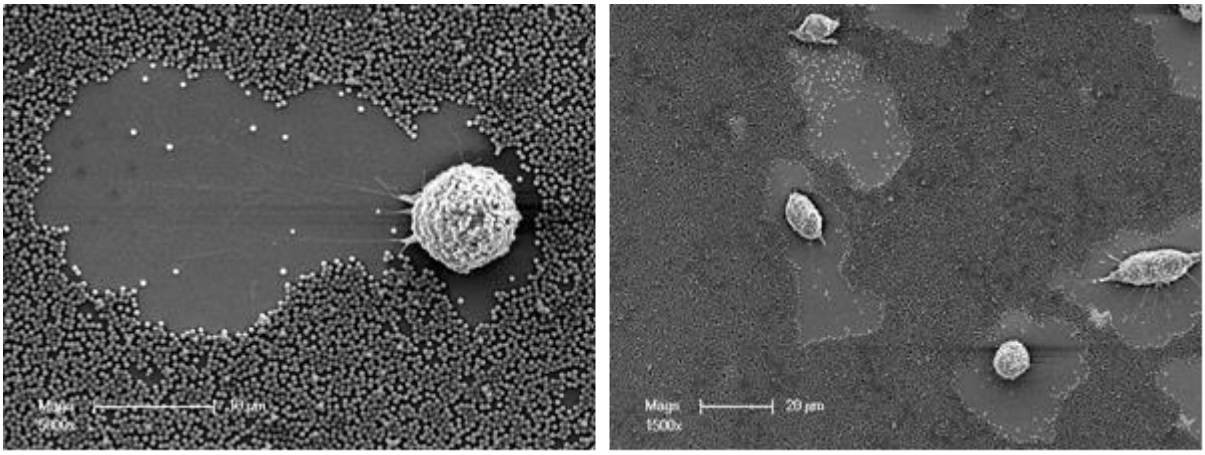

Figure1: Scanning electron micrographs of silica particles monolayers (450 nm diameter), damaged by macrophages (following internalization of the particles)

We propose to study these new behaviors in the framework of a PhD. Different aspects of the cell/nanoparticle interaction will be addressed:

- the modulation of the interaction force between particles and surfaces, the modification of surface chemistry, particle size and density.
- the biochemical response triggered by the particle monolayer, the behavior of different cell types in regard to nanoparticle coatings and the caracterization of the pathways involved in the internalization process.

This work at the interface between cell biology and material science will give a dual competency to the student.