

Psychiatry and Neuroscience Seminar



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(Host D Zala/G Van Niel)

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Nanobiomaterials: from the beauties of the nanoworld to the quest for real biological applications

Friday, August 25th, 2023, noon

Room D Levy, 102-108 rue de la santé - 75014 Paris & VISIOCONFERENCE

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Nanomaterials have astonishing properties compared to their bulk-size relatives, such as novel quantum states, higher surface area and reactivity, and specific interactions with light and matter. From a biological standpoint, nanomaterials are comparable in size with DNA chains, proteins, antibodies and viruses, and also with cell membrane pores, a fact that enables their proposal as delivery vehicles of theranostic compounds to cells. But, in order for nanomaterials to accomplish their expected "biological" aim, several conditions need to be met, notably their physico-chemical stability in biological environments, the retention of their biological functionality and target-specific characteristics during their long journey that spans from injection into the organism up to their arrival to the target site, or their adequate bioelimination from the body and toxicological profile. In this presentation, a subset of nanobiomaterials will be introduced and their biologically-relevant aspects will be discussed. Quantum dot fluorescent nanoparticles are explored as fluorescent markers for cell imaging, single particle tracking and diagnostics applications. In particular, the application of these nanoparticles for the evaluation of neuronal plasticity will be highlighted. Besides, magnetic nanoparticles are evaluated as theranostic agents for MRI, magnetic hyperthermia and NIR-based photothermia, while core-shell magnetite-silica nanoparticles are proposed as multimodal magnetic and drug delivery agents for cancer diagnostics and treatment. For the core-shell nanoparticles, preliminary results of their toxicological assessment in zebrafish will be presented and discussed.

Keywords:

Nanoparticle Synthesis

Enzyme Immobilization

Biofouling

Surface Modification

Microfluidics

Quantum Dots

Immunofluorescence

Lithography

Coatings Science

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