

Functionalized Nanoparticles for Biomolecular Imaging and Sensing

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Gold nanoparticles have been used for several decades as labels in immuno-electron microscopy. In the last decades, progress in the synthesis, functionalization and optical detection of these particles have opened a range of new applications in imaging and sensing. For most of these applications, the capping layer is a critical feature as it provides colloidal stability and control specific and unspecific interactions.

The presentation will cover three related themes of research. First, I will present the synthesis and characterization of peptide-capped gold nanoparticles [1] and discuss our efforts to generate complex and controlled nanomaterials based on self-assembly of these small molecules at the surface of the particles. Then, I will report on the entry and fate of the particles in live cells, with a particular focus on the fate of the capping layer [2]. Finally, I will discuss our current attempts to break the barrier of endocytotic trapping of the nanoparticles using a variety of methods including toxins, signalling peptides and direct injection.

References

[1] Rational and combinatorial design of peptide capping Ligands for gold nanoparticles; Lévy, R., Thanh, N.T.K., Doty, R.C., Hussain, I., Nichols, R.J., Schiffrin, D.J., Brust, M. and Fernig, D.G. (2004) . J. Am. Chem. Soc. 126, 10076-10084

[2] Cathepsin L Digestion of Nanobioconjugates upon Endocytosis; Violaine Sée, Paul Free, Yann Cesbron, Paula Nativo, Umbreen Shaheen, Daniel J. Rigden, David G. Spiller, David G. Fernig, Michael R. H. White, Ian A. Prior, Mathias Brust, Brahim Lounis and Raphaël Lévy, ACS Nano, 2009, 3, 2461-2468