Treating bladder cancer with self-propelled nanobots

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One of the dreams in nanotechnology is to engineer small vehicles and machines, called here nanobots, which can eventually be applied *in vivo* for medical purposes. Yet, reaching that fascinating goal is not a trivial thing and several challenges need to be addressed. First, researchers need to incorporate efficient but also bio-friendly propulsion mechanisms into the nanobots. Our strategy comprises the use of biocatalysts such enzymes for converting biologically available fuels into a propulsive force. Secondly, nanoparticles' chassis should be generally recognized as safe (GRAS) material, biocompatible and/or biodegradable.

In my talk, I will present how we bioengineer hybrid nanobots combining the best from the two worlds: biology (enzymes) and (nano)technology (nano-micro-particles, Figure 1) providing swimming capabilities, biocompatibility, imaging, multifunctionality and actuation.

Besides the understanding of fundamental aspects (1), and controlling the performance of micro-nanobots (2) I will present some of the proof-of-concept applications of biocompatible nanobots such as the efficient transport of drugs into cancer cells (3) and 3D spheroids (4), sensing capabilities (5), anti-bactericidal applications (6) and the use of molecular imaging techniques like PET-CT (7) or Photoacoustic (8) for the tracking and localization of swarms of nanobots both in vitro and in vivo in confined spaces like mice bladder. Moreover, I will present our recent advances in the treatment of bladder cancer in mice using radionuclide-labelled nanobots (9).

References

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Figures

Figure 1. Mesoposous silica nanoparticles used as self-propelled nanobots