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MAGNETIC MATERIALS FOR WIRELESS ACTUATION IN BIOMEDICINE

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This talk introduces the key aspects of magnetic actuation for medical devices in the miniature scale, based on the research group's experience on robotics for minimally invasive intervention, targeted therapy, personalized medicine or bionic artificial organs. The quest for miniaturization and natural access to the targeted pathologies led to the development of diagnostic and therapeutic tools to be delivered with an endoluminal and transluminal approach and to be controlled and propelled by remote operation schemes from outside. The quest for targeted therapy has recently opened new opportunities for robotic technologies, which are used more and more as controllers for the delivery of drugs embedded in nano biotech vectors and as solutions for making therapy really localized in interest, thus enabling on-demand release kinetics and eliminating (or strongly limiting) side effects. After a description of magnetic solutions developed in the speaker's group for actuating, locomoting and triggering mechanisms to be employed in medical devices, the talk will focus on recent applications of magnetic control of microrobots for personalized therapy and lab-on-chip technologies.

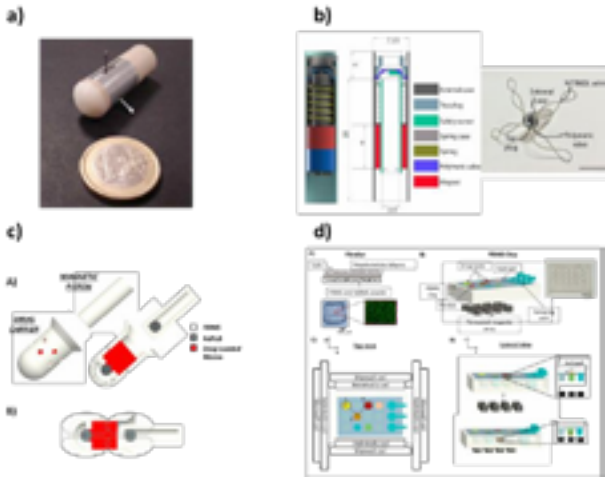

Figure.1: Magnetic solutions developed by the speaker. a) magnetic endoscopic capsule, b) magnetic artificial urinary sphincter, c) Untethered magnetic millirobot for targeted drug delivery, d) magnetic films for cell manipulations and lab- on-chip applications.