Soft polymeric nanoconstructs for vascular drug delivery and tissue depots

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Abstract

Over the past 10 years, a plethora of multifunctional nanoconstructs has been proposed for the 'smart' delivery of therapeutic and imaging agents.

The Laboratory of Nanotechnology for Precision Medicine at IIT-GE synthesizes disease- and patient-specific particle-based nano-scale systems by finely tuning during the fabrication process the *4S parameters* of the nanoconstructs.
Specifically, our platforms present *sizes* ranging from a few tens of nanometers to a few microns; *shapes*, including spherical, cubical and discoidal; *surface* properties, with positive, negative, neutral coatings; and mostly mechanical *stiffness*, varying from that of cells to rigid, inorganic materials, such as iron oxide.

While the effects of size, shape, and surface properties on nanoparticels in vivo performance has been extensively investigated, only recently softness is emerging as a key parameter for modulating nanoparticles interaction with biological environment. In this lecture, the role of manipulating these 4S parameters will be fully elucidated.
Particularly, it will be emphasized how softer nano-constructs are able to evade immune system surveillance and uptake regardless of the size and shape, thus enhancing their accumulation within the diseases tissue.
Overall, our research approach based on the rational design of multifunctional nano-constructs is expected to inspire more efficient strategies for drug delivery and biomedical imaging.

References

[1] Key Jaehong, et al. *ACS nano* (2015), 9, 11628−11641..
[2] Palomba, Roberto, et al. *ACS nano* 12.2 (2018): 1433-1444.

Figures

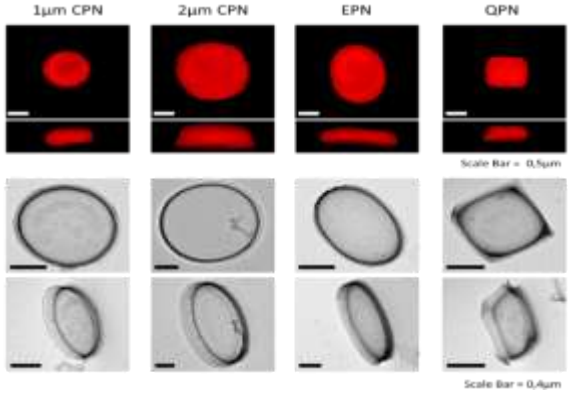

Figure 1. Different geometries and sizes of Discoidal Polymeric Nano-constructs

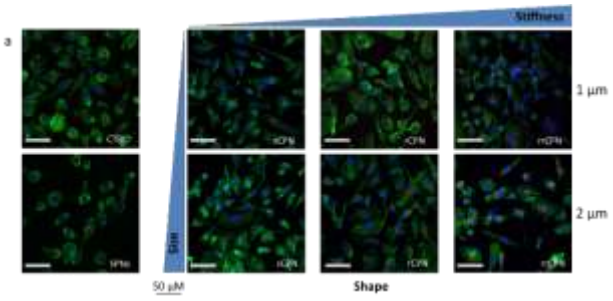

Figure 2. Discoidal Polymeric Nanoconstructs with different mechanical stiffness interacting with professional phagocytic cells.