



PERSONA CIENCIA EMPRESA
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SCHOOL OF
ENGINEERING

GENE DELIVERY SYSTEMS BASED ON ZWITTERIONIC POLYMERS

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Biologics therapeutics such as enzymes or polynucleotides are steadily becoming the new standard in the pharmaceutical industry. By 2016 already nine out of the top ten pharmaceutical products were biologicals. This success is owed to their inherent selectivity, low toxicity, and high efficiency and activity compared to the long-time used small therapeutic drugs. Despite their potential, their application remains hindered due to their in vivo fragility. Many elegant strategies emerged to overcome this drawback involving virus capsids, polyelectrolites, or surfactants.^[1,2] While these nano-vectors improve the chemical and colloidal stability of the (bio)cargo, they are often recognized by the immune system and cleared from the body before conducting their therapeutic function. In this context, embedding biologics within a polymeric shell containing zwitterionic monomers has shown promising prospects to improve in-vivo stability and increase cellular uptake while avoiding immune system clearance.^[3] During this master thesis, you will design and synthesize new (co)polymers containing zwitterionic monomers to encapsulate polynucleotides into nanocarriers. The size, composition, stability, and morphology of these polynucleotide-loaded nanoparticles will be assessed using state-of-the-art physicochemical techniques involving scattering radiation and microscopy. Furthermore, you will test the toxicity and efficiency of your designed systems in-vitro.

References

- [1] J. R. Magana, C. C. M. Sproncken, I. K. Voets, *Polymers (Basel)*. **2020**, *12*, 1953.
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- [3] P. Cabanach, A. Pena-Francesch, D. Sheehan, U. Bozuyuk, O. Yasa, S. Borros, M. Sitti, *Adv. Mater.* **2020**, *32*, 2003013.