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NANOPARTICLES FOR THE TREATMENT OF LAFORA DISEASE

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Summary

Lafora disease is an inheritable neurodegenerative condition affecting children. The onset of the disease is in adolescence, in apparently healthy teenagers, with headaches, seizures, and insidious decline in cognitive function. No effective treatment is known, and the disease progresses rapidly with amplification of seizures, loss of neurologic functions and dementia, inevitably leading to the death of the patient 5-10 years after the onset. This great-unmet clinical need is the source of considerable effort and the focus of our research (1,2).

Biologics therapeutics based on the delivery of enzymes or polynucleotides is steadily becoming the new standard in the pharmaceutical industry. Despite their potential, their application remains hindered due to the low stability and the poor cellular uptake of these macromolecules upon administration. Many elegant strategies emerged to overcome these drawbacks involving virus capsids, polyelectrolites, or surfactants (3). While these nano-vectors improve the stability of the (bio)cargo (i.e. enzymes or nucleic acids), they are often recognized by the immune system and cleared from the body before they can exert their therapeutic function. In this context, embedding (bio)cargos within a polymeric shell has shown promising prospects to improve stability and increase cellular uptake while avoiding immune system clearance (4).

During this master thesis, you will design and synthesize new treatments for Lafora disease based on (co)polymers that 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 cells and, possibly, in animal models.

References

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3. Magana JR, Sproncken CCM, Voets IK. On complex coacervate core micelles: Structure-function perspectives. Vol. 12, Polymers. Multidisciplinary Digital Publishing Institute; 2020. p. 1953.
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