Title: Pyrene-functionalised gold nanoparticles for DNA delivery

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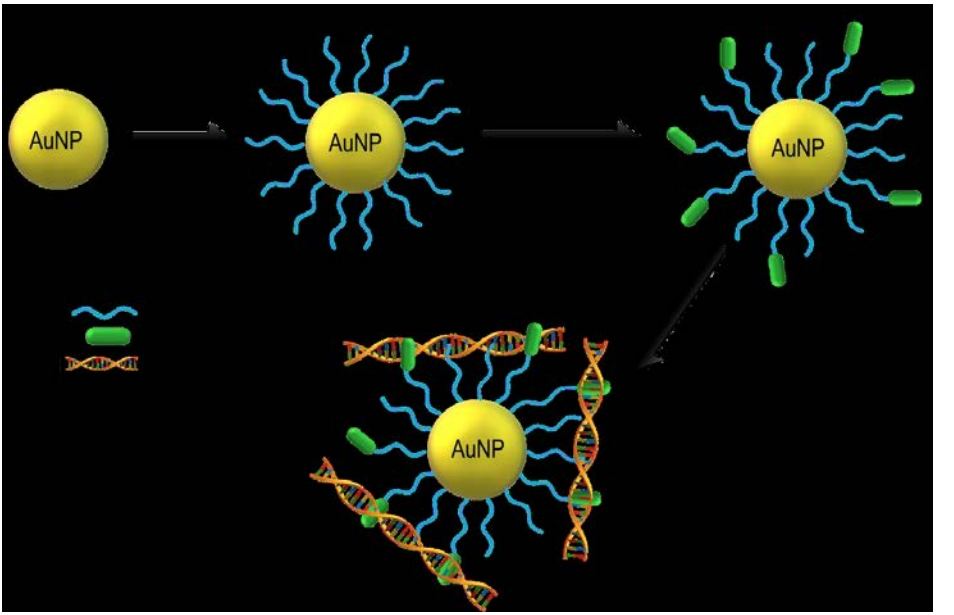
Gene therapy may allow to treat a disease by introducing genetic material (e.g. DNA, siRNA) into a patient's cells, with the subsequent expression and production of a deficient protein, avoiding the use of drugs or surgery. However, a successful delivery of genetic material is limited by their large size, vulnerability against enzymatic degradation and anionic nature. Such features make gene delivery very challenging. Therefore, carriers are commonly required to enhance their entry into cells/tissues.

This project aims at preparing pyrene-functionalized gold nanoparticles and studying their interaction with double-stranded DNA through intercalation. The strong affinity between these structures would allow to immobilise double-stranded DNA onto the surface of pyrene-functionalized gold nanoparticles, acting as carriers. The genetic material can then be released into the target cell by applying and external stimulus (e.g. controlled light irradiation). The gold nanoparticles are synthesised by means of the Frens method and functionalised with PEG short chains followed by their binding to the pyrene derivative via EDC/NHS chemistry.

The functionalised gold nanoparticles are characterised by UV-vis and fluorescence spectroscopy techniques. Moreover, an experimental simulation is featured to provide a roadmap towards a complete study of the products obtained. Thus, dynamic light dispersion, transmission electron microscope, gel electrophoresis and circular dichroism are to be employed to characterise the gold nanoparticles and its interaction with double-stranded DNA. In addition, a release study is designed to evaluate the binding force between the pyrene derivative and the DNA base pairs.



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