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Study co-aggregations of nucleic acid nanostructures with tetracycline molecules and their potential applications in smart drug delivery

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Recently, self-assembled DNA structures have been broadly used for various research areas, including drug delivery, biocatalysis and nanomaterials. DNA can bind to small molecules, such as antibiotics due to its highly programmable structure and high efficient. Several reported studies have demonstrated that DNA could bind to small molecules to enhance their release. In this project, we are exploring DNA nanoscaffolds for their ability to bind with a neuroprotective minocycline (MO), and to control its release kinetics. We discovered that magnesium played a critical role to bridge DNA with minocycline through electrostatic charge. Further, π - π stacking is suggested to form between the nitrogen base and MO's rings. We have demonstrated that, the encapsulation yield of Minocycline with DNA depended on length, shape of DNA. Moreover, pH level of buffer play important role on the aggregations of DNA with MO, where the pH=7 or 6 are compatible with body physiological conditions. The assembled DNA-MO complex was visualized by Atomic Force Microscopy (AFM). Figure shows the aggregations between DNA and minocycline in the presence of Mg^{2+} , there are particles formed. The study will have important impact on drug delivery for spinal cord therapy.

Biography

Nouf Alzahrani is a Graduate Student at Rutgers University-Chemistry Master's Program. She has a year left in her program. Her thesis is on DNA-nanostructure in smart drug delivery and she gained experience with several lab instruments, such as atomic force microscopy (AFM), plate reader, dynamic light scattering (DLS) and infrared (IR). She also attended several conferences that have been very helpful in clarifying her research area, including the 252nd American Chemical Society National Meeting and Exposition (2016), Celebration of Graduate Research and Creative Activities, Rutgers University (2017) and the Middle Atlantic Regional Meetings of the ACS (2017). She has made poster presentations of her research at the Celebration of Graduate Research and Creative Activities and the Middle Atlantic Regional Meetings of the ACS and they were well received by attendees.

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