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Space-Time AFM monitoring of the formation and dissociation of genetic-nanoparticles

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Abstract

The need to protect genetic substances from enzymatic digestion is one of the basic targets of efficient gene delivery and a standard test for any proposed delivery vector. The currently applied in vitro methods, however, provide no direct link between the molecular morphology/behavior of the nanoplexes and their success in protecting the DNA and RNA from the digestive enzymes. Thus, hindering the rational design of successful gene delivery nano-devices.

Here we apply a four dimensions atomic force microscopy (AFM) imaging in near physiological conditions to visualize at the molecular scale and in real time, the effect of DNase and RNase enzymes on polymer-Gene nanoplexes.

The formation of the nanoplexes is observed to provide a degree of protection to the genetic materials. This protection is related to the structural morphology of the formed complex, which in itself shown to be dependent on the polymer loading and the time allowed for complex formation.

We believe that by optimizing the incubation time of DNA or RNA with their carriers, the dose of polyplexes required for efficient gene delivery will be reduced, and hence decreasing the cytotoxicity of the particles and their cost.

Biography

Hosam Abdelhady completed his Ph.D at the age of 36 years from College of Pharmacy -Nottingham University in the field of Biophysics and Surface Analysis and postdoctoral studies in Donald Tomalia Group at Central Michigan University. He was the director of the analytical department at dendritic Nanotechnologies INC-Mount pleasant Michigan, and currently an Assistant Professor at College of Pharmacy-Taibah University-Saudi Arabia. He has published 12 papers in reputed journals. He has awarded a $500K from King Abdulaziz City for Science and Technology (KACST) for biomolecular imaging in 2010. He was awarded a golden meddle from Cairo University for Laser Application in 2012.