Opinion Article

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Polymeric Network of Amines and Metals Colloids: Conformational Analysis of Interaction, Orientation with DNA

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Opinion

Over the last decade numerous promising synthetic, non-viral gene delivery systems have been developed and an outline of their potential advantages and disadvantages has materialized [1]. Synthetic vectors have advantages in interconnected pharmaceutical issues, safety, and ease of use but tend to be less efficient than some viral systems. Advanced delivery systems can be developed that will have higher potential and more advantages. Moreover, physicochemical properties including charge, dissociation behavior, and the shape and nanoparticle size of the cationic complexes can play a significant role in efficient gene transfer in vitro and in vivo. Even though the interaction between the polymeric cations and DNA is electrostatic in origin, geometric and chemical structures of the polymer also play a substantial character in complex formation. Even the number of positive charges and the spacing of cationic charges within the polymer upsets the size of DNA nanoparticles fashioned by polycations [2]. Hence, a complete set of biophysical measurements for the characterization of physical and chemical properties of cationic complexes offered consists of cationic polymers/surfactants with DNA. By considering this beginning as a study on the structural properties of the cationic complexes, the understanding of the effect of polymer architecture on the DNA/cationic polymer interaction at the molecular level in terms of DNA stability, conformation, size, shape, binding affinity, and complete thermodynamics of the interaction are also necessarily required [3].

In the area of nanoscale architecture, the interaction and orientation of the polymeric network of amines on the surface of colloids, is an important phenomenon that occurs in topologically predefined superstructures [4]. The adsorption between both polymeric network of amines on nanoparticles leads to a conformational change that affects both macromolecules and implies a charge transfer effect on its surface. Regarding this opinion, the author explores the importance and newer possibilities of their usage in the development of gene drug delivery systems by applying various physicochemical and spectroscopic characterization techniques [5]. That's why, a detailed description of the structural variety as well as their synthetic counterparts with their biological significance will discourse altogether. By keeping the consequence of these aspects, the characterization of physical and chemical aspects will be underlined. The selective modifications of the functional groups of polymeric networks of amines, and the fragment-synthesis-related protocols through which the skeleton of polymeric network of amines is assembled with the desired length to nanoparticles/DNA are exposed [6].

By using relatively simple amino building blocks, numerous differently functionalized nitrogen atoms were merged [7]. These conjugates can execute using solid chains by applying selective functionalization of the amino functions of polymeric network of amines or by the assembly of the skeleton of polymeric network of amines [8]. Many biophysical measurements will put on to solve the chemical and physical attraction, which is responsible for cationic complex stability [9]. The ability of the two polymers to form stable complexes in an aqueous medium can be detected by ethidium bromide exclusion and gel retardation experiments. The accessibility of DNA to nuclease enzymes has already been assessed. Besides, the charges of the cationic complexes, the conformational changes, the stability of the DNA in the cationic complexes, the size and shape of the cationic complexes are characterized by different techniques such as zeta-potential measurements, circular dichroism (CD), temperature-dependent UV, differential scanning calorimetry (DSC), atomic force microscopy (AFM), and light scattering [10]. The overall thermodynamic parameters of the binding event of these cationic complexes will be followed by isothermal titration calorimetry (ITC). Binding of these cationic complexes with DNA enhance the enthalpy of the helix–coil transition by reinforcing the base-pair stacking interactions of the DNA. A comparison of the thermodynamic parameters will reveal some significant aspects and explore the understanding of the binding ability associated with small exothermic enthalpy changes [11].

Overall, the binding process is entropically favorable. In the end, it was believed that this opinion will provide a newer look on the polymeric network of amines and Ag/Au colloids: conformational analysis of interaction, orientation with DNA.

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References

1. Mingzhou Ye, Yuyuan Wang, Yi Zhao, Ruosen Xie, Nisakorn Yodsanit, et al. (2019) Double-Network Nanogel as a Nonviral Vector for DNA Delivery. ACS Appl Mater Interfaces 11: 42865-42872.
2. Tan NPB, Lee CH, Li P (2016) Green synthesis of smart metal/polymer nanocomposite particles and their tuneable catalytic activities. Polymers 8: 1-14.
3. Raspaud E, Toma AC, Livolant F, Rädler J (2007) Interaction of DNA with Cationic Polymers. in DNA Interactions with Polymers and Surfactants.
4. Bai X, Wu J, Han X, Deng Z (2011) Probing DNA's interstrand orientation with gold nanoparticles. Anal Chem 83: 5067-5072.
5. Ilaria Fratoddi, Iole Venditti, Chiara Battocchio, Giovanni Polzonetti, Cesare Cametti, et al. (2011) Core shell hybrids based on noble metal nanoparticles and conjugated polymers: Synthesis and characterization. Nanoscale Res Lett 6: 2011.
6. Rungsardthong U, Touraj Ehtezazi, Lindsey Bailey, Steven P Armes, Martin C Garnett, et al. (2003) Effect of polymer ionization on the interaction with DNA in nonviral gene delivery systems. Biomacromolecules 4: 683-690.
7. Agostinelli E, Marques MPM, Calheiros R, Gil FPSC, G Tempera, et al. (2010) Polyamines: Fundamental characters in chemistry and biology. Amino Acids 38: 393-403.
8. Mahouche-Chergui S, Guerrouache M, Carbonnier B, Chehimi MM (2013) Polymer-immobilized nanoparticles. Colloids Surfaces a Physicochem Eng Asp 439: 43-68.
9. Kumar N, Kumar R (2013) Nanotechnology and Nanomaterials in the Treatment of Life-Threatening Diseases.
10. Klinov DV, Protopopova AD, Andrianov DS, Litvinov RI, Weisel JW (2020) An Improved Substrate for Superior Imaging of Individual Biomacromolecules with Atomic Force Microscopy. Colloids Surf B Bio interfaces 196: 111321.
11. Tamayo L, Palza H, Bejarano J, Zapata PA (2018) Polymer Composites with Metal Nanoparticles: Synthesis, Properties, and Applications. Synthesis, Properties, and Applications. Polymer Composites with Functionalized Nanoparticles: Synthesis, Properties, and Applications 2018: 249-286.