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An interaction study of colloidal silver nanoparticles with calf thymus DNA using mass spectrometry

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Deoxyribonucleic acid (DNA) has an important role as it carries hereditary information and instructs molecular machinery to conduct the biological synthesis of proteins and enzymes through the process of replication and transcription in living cells. Looking to the vast applications of silver nanoparticles (AgNPs)—the most widely manufactured nanomaterial—in food products, optical, electronic, and nanomedical devices, humans are exposed to AgNPs by eating, breathing or even skin contact. Interaction of AgNPs with DNA can occur covalent or noncovalent and molecules can bind between two base pairs (full intercalation), in the minor groove, in the major groove, and on the outside of the helix of DNA. Therefore, the nature and strength of interactions of DNA and its components (bases and nucleosides) with AgNPs are amongst the most critical issues owing to its possible effects on the synthesis, replication, and structural integrity of DNA. The aims of this study is to investigate the interaction of AgNPs with calf thymus DNA and its bases by mass spectrometry (MS) methods. Due to interaction of AgNPs with gens of calf thymus DNA, the molecular weight of gens and its fragments have been changed. Primary MALDI-TOF/TOF and ESI-MS/MS results show the interaction of them. Further information about interaction location and type of interaction can be obtained by MS techniques.

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