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4D molecular scale imaging of the effect of suicide anticancer nano-particles on individual live cancer cells

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The unique ability of the real time Atomic Force Microscopy (AFM) in providing valuable information in the field of biomolecular sciences, gene delivery and cancer therapy will be demonstrated. For example, the formation of the most durable, individual, DNA nanoparticles (DNPS) able to resist the enzymatic digestions of cancer cells and evoke apoptosis was monitored in 4 dimensions (4D) from the first second of the interaction between individual DNA molecules and individual dendrimers nano-polymers till the death of individual cancer cells in their environment. Optimizing both, the incubation time between DNA/dendrimers and the DNA/dendrimers ratios have shown significant effects in producing the best DNPS. Finally, cancer cells were exposed to the ideal DNPS and directly imaged by 4D AFM. Cell membrane liquefaction, cytoplasmic shrinkage, cytoskeleton structure loss and changes in cellular nanomechanical properties were observed. In contrast, control cells have no changes. Thus, understanding the real-time effects of anticancer DNPS on the cytoskeletal and nanomechanical behaviors of cancer cells may provide new methods for cancer treatment.

Biography

Hosam Gharib Abdelhady has completed his PhD in Biophysics and Surface Analysis from College of Pharmacy, University of Nottingham in 2004 and Postdoctoral studies with Professor Donald Dendrimers at Central Michigan University in 2005. He has then served as a Senior Scientist and directed the Analytical Department at Dendritic Nanotechnologies, CMURC, Michigan from 2005-2009. He is currently an Associate Professor at College of Pharmacy, Taibah University, Saudi Arabia. He has published more than 15 papers in reputed journals, a patent in Nanomedicine and received more than $ 1M grants.

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