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Nanocarriers-mediated siRNA delivery for treatment of cancer

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Cancer is one of the major health problems worldwide and the number of cancer cases is projected to increase by 50% by 2030. Current therapies include surgery, chemotherapy, radiation and hormonal therapy, which are also used sometimes in combination to lower the risk of reoccurrence. These therapies used till date is followed by various side effects and disadvantages. Hence, newer and targeted therapies are required. One of the ways is to explore siRNA therapy that works on RNA interference mechanism. siRNA of 21-25 nucleotide long help in turning off expression of cancerous gene by directing degradation of selective mRNA. The major bottleneck in siRNA therapies is their delivery to desired cell type. siRNA does not readily cross the cellular membrane because of their negative charge and size. Moreover, they are very sensitive to nuclease degradation, thus, posing serious challenges in efficient delivery. Nanotechnology has been drawing a huge attention for successful and targeted delivery of siRNA. Hence, we thought of using nanotechnology-based vector which can be used to deliver siRNA efficiently. Multifunctional cationic dendrimers, mesoporous silica nanoparticles (MSNPs) and other NPs are being used by use to deliver siRNA specifically to breast as well as prostate cancer cells. Our study shows that a unimolecular dendritic system conjugated with luteinizing hormone releasing hormone (LHRH) analogue was able to deliver siRNA specifically to LHRH receptor overexpressing breast as well as prostate cancer cells. In one of our recent study, we observe that siRNA delivery can be achieved via unimolecular dendrimers conjugated with peptide by targeting integrin receptors of breast cancer cells. Also, cationic cobalt ferrite nanoparticles synthesized in our lab was able to successfully deliver siRNA in breast cancer cells. Similarly, our latest results show that multifunctional MSNPs can be effectively use for the treatment of drug resistant breast cancer cells.

Biography

Virendra Gajbhiye has completed his MPharm and PhD from Dr. Hari Singh Gour University, Sagar, India. He was a Postdoctoral Research Fellow at Wisconsin Institute for Discovery, University of Wisconsin-Madison, USA and Department of Biomedical Engineering, Oregon Health and Science University, Portland, USA. Currently, he is working as a Scientist at Nanobioscience Group, Agharkar Research Institute, Pune, India. He has his expertise in developing multifunctional nanocarriers and their use in nanomedicine and theranostics, targeted delivery of drug/siRNA/miRNA for cancer therapy and tissue engineering. Currently, he is extensively working on delivery of siRNA/miRNA for treatment of breast cancer.

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