

Bacterial-mediated drug delivery systems to target cancer cells

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Cancer remains to be a life-threatening disease and it is one of the main reasons for a large number of deaths occurring every year throughout the world. The shortage of enough therapies has driven many researchers to design efficient drug administration techniques leading to advanced microbial-based drug delivery systems. Cancer treatment that involves nanoparticles as drug carriers has shown decreasing growth of tumour cells but the human body allows only a few types of nanoparticles to get into the targeted cancer cell growth region. Even though the drugs have enough potential to eradicate the tumour cells, there are no sufficient drug carriers to carry them to the targeted cancer cells. Henceforth, the living microorganisms are being involved in the drug delivery systems. Among all the microorganisms, the bacterial species have shown the best results as anti-cancer drug carriers. The recent research has disclosed the nanoscale bacteria-enabled autonomous drug delivery system (NanoBEADS), which is a bacteria-based bio-hybrid drug delivery system. In this system, attenuated bacterial cells are used to carry the anti-cancer drugs. This has expressed high potential and efficiency in transporting the anticancer drug specifically to the targeted cancer region that is poorly accessible from circulation without affecting the other organ system in the human body. Similarly, there is a group of bacteria called magnetotactic bacteria (MTBs) that are abundantly found in water bodies, which possess the organelles called magnetosomes that control the magnetotaxis of these organisms with the presence of ferromagnetic crystals. These MTBs can easily be modified and conjugated not only with anticancer drugs but also with siRNA, DNA, antibodies, and liposomes; additionally, the ferromagnetic property of MTBs allows them to be controlled inside a magnetic field. The bacterial ghost (BG) platform technology is another interesting system that is used for delivering anti-cancer drugs. Bacterial ghosts are non-living, non-denatured empty cell envelopes developed from any Gram-negative bacteria by controlled expression of the cloned lysis gene E within which the desired anti-cancer drugs are loaded. On that account, the bacterial-mediated drug delivery systems are found to be promising as effective drug carriers in cancer treatment.

Keywords: Cancer, Drug carrier, Nanoparticle drugs, NanoBEADS, Bacterial ghosts, Magnetotactic bacteria, Magnetosomes

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