

# Advances in Cancer Treatment: Microbiota, Nanotechnology and Cu-based Therapies

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## Description

Due to the limitations and harmful side effects of conventional treatments, cancer remains a significant health threat. Late exploration in the field of cancer microbiota plays uncovered the critical part microscopic organisms play inside growths. Bacteria have the unique ability to serve as carriers for therapies to combat cancer. This is because they are capable of accumulating within tumor tissues, aiming for the blood-brain barrier, and thriving in hypoxic conditions. In the meantime, research into bacteria in the tumor's microenvironment has grown in importance and targeting important intratumoral bacteria is now a major focus of cancer treatment. In addition, cancer treatment strategies increasingly incorporate multifunctional nanoparticles. This is because of their high biocompatibility, adaptability, and ability to precisely target. Not only are these nanoparticles becoming more popular, but their applications are also getting better, making them the best option for treating cancer.

## Nanotechnology in cancer treatment

This article offers an outline of techniques that use microorganisms as transporters to convey nanodrugs for designated cancer treatment. In addition, it examines the potential benefits and advantages of these strategies for the creation of intelligent drug delivery systems. The use of nanodrugs to target key tumor-associated bacteria for effective cancer treatment is the focus of the article, which emphasizes the impact of the tumor's internal bacterial environment on cancer. The presented findings have practical value and serve as a reference for the creation of novel bacteria-based cancer therapies.

## Cu-based nanomaterials

Copper (Cu) and Cu-based nanomaterials have received a lot of attention in recent years for their crucial roles in the treatment of a variety of diseases, particularly cancer. This is due to the intrinsic physiochemical and biological properties of these materials as well as their crucial role in living organisms. In the interim, critical and arising nanotechnologies significantly work with the creation of Cu-based nanomaterials with captivating

remedial properties for nanomedicine, which constructing a "Cu age". Given the quick headway of Cu and Cu-based nanomaterials in the field of malignant growth treatment, the motivation behind this audit is to study, sum up, feature and talk about the present status of-the-craftsmanship circumstances, advantages and difficulties and possible remedial utilizations of Cu and Cu-based nanomaterials, including Cu digestion and homeostasis, focusing on Cu treatment by means of Cu chelators and ionophores, TME-responsive treatment, cancer imaging, chemodynamic treatment, photothermal treatment, photodynamic treatment, drug conveyance framework and cuproptosis-related treatment. In addition, the biocompatibility of Cu-based nanomaterials and the potential for clinical application in the treatment of cancer in the near future are discussed. Malignant growth as a sickness that jeopardizes a great many lives every year has a unique nature and one of the most basic difficulties to tracking down a successful strategy to treat disease is the rise of an opposition instrument. It is worth focusing on that it is appropriate to change the procedure in disease treatment from tracking down better approaches to upgrading existing successful and imaginative medicines. The utilization of nanotechnology could be an answer since it can further develop treatments and empower them to target all the more exactly, increment limited drug viability, increment double medication stacking and decline fundamental poisonousness to check obstruction systems. Bladder cancer is a common urogenital cancer with a high incidence and recurrence rate. In recent years, a lot of research has been done on the impact that mitomycin C has on the treatment of bladder cancer. MMC is an extremely potent antibiotic that can kill cells and was isolated from *Streptomyces caespitosus*. Despite the fact that MMC can thwart the development of Multidrug Resistance (MDR), the therapeutic effect may be limited due to the potential for prolonged tissue damage. Numerous studies have been conducted on potential ways to improve MMC administration.

## Conclusion

Numerous cases of bladder cancer continue to occur despite the most effective methods of administering MMC. Because this approach is unlikely to have cross-resistance, it may be possible to overcome treatment resistance by utilizing MMC and other agents that target various pathways in combination therapy. In

addition, various effective materials like methylcellulose and Chitosan, among others, could be incorporated with biological macromolecules and polymers in order to enhance MMC's ability to target cells, reduce. Because MMC dissolves in water, it is transformed into prodrugs or lipid complexes and loaded or encapsulated with liposomes and nanoparticles. Demethylation emerged as a common factor in these candidate lists when we analyzed targets for cancer treatments and cardiac repair. A natural compound library is screened and dioscin is found to be a novel agent that is targeted at DNA Methyltransferase 1

(DNMT1) and is widely used for heart diseases. It was discovered that dioscin inhibits breast cancer cell growth and reduces the activities of DNMT. After dioscin, the promoters of antioxidant genes were demethylated in conjunction with RNA-seq and MeDIP-seq analyses, attracting NRF2 and boosting their expression. The cardiac protection function of dioscin was prevented by Nrf2-loss in Nrf2 knockout mice. This is the first study to identify dioscin as a novel demethylation agent that simultaneously protects the cardiovascular system and fights cancer.