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Opinion Article

Modern Therapuetic Technique on Nanomedicine

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DESCRIPTION

The bioactive capabilities of water-soluble fullerene derivatives, fullerenols, have recently received a lot of interest, especially their pro- and antioxidative effects. Fullerenols may give a major alternative to currently utilized pharmaceutical approaches in chemotherapy, neurological disease treatment, and radiobiology in the future due to their hydrophilic qualities and ability to scavenge free radicals. Anthracycline antibiotics are among the most often used chemotherapy medicines. Despite its excellent anticancer action, anthracycline therapy causes systemic oxidative stress, which reduces the treatment's effectiveness and causes substantial side effects. By scavenging free radicals, fullerenols may be able to prevent the adverse effects of anthracyclines and hence improve the effects of chemotherapy.

Fullerenols may also have a hollow spherical shape due to their hollow spherical shape utilized as medication transporters Furthermore, because there are currently ineffective treatments for neurodegenerative illnesses, researchers are still looking for alternative substances that can avoid the detrimental consequences of oxidative stress in the brain. The bioactive properties of newly found water-soluble fullerene derivatives have received a lot of attention in recent years. The existence of delocalized double bonds in the fullerene cage has resulted in a greater emphasis on their pro- and antioxidant characteristics.

Fullerenes' limited solubility in polar liquids has been a key impediment to their potential biological applications. In order to boost their solubility in polar solvents (particularly water), the idea of adding polar functional groups to the carbon fullerene cage was investigated. Adding hydroxyl groups to fullerene derivatives resulted in a polyhydroxylated fullerene with hydrophilic characteristics (fullerenol, fullerol). With visible or ultraviolet light, fullerenol molecule can be excited and converted into the triplet state, resulting in a reactive molecule that can easily interact with oxygen or biomolecules and has uses in photosensitization.

The 1995 study, which revealed that fullerenol served as an excellent scavenger of superoxide anions generated by the xanthine-xanthine oxidase system, was one of the earliest publications on fullerenol's possible antioxidative capabilities. Scientists have also fully discussed the antioxidant capabilities of fullerenols in their comprehensive review publications. In addition to scavenging Reactive Oxygen Species (ROS), fullerenols also limit reactive nitrogen species reactions by interacting directly with Nitric Oxide (NO).

The dualistic nature of fullerenols could lead to their use as cytotoxic agents against tumor cells or as protecting agents in normal cells in the future. Fullerenols may also be employed as carriers of contrast agents, radiopharmaceuticals, and medications due to their hollow spherical structure, making them intriguing tools for medical diagnostics and therapy. The first is linked to cell function as a result of ischemia, which occurs when the amount of oxygen given to the tissues is reduced (hypoxia), resulting in a decrease in ATP concentration and an excess of purine metabolites (mainly hypoxanthine and xanthine). Reperfusion (or the restoration of blood circulation) causes a "respiratory burst" of previously ischemic cells, resulting in oxidative stress.

CONCLUSION

Every year, fresh findings on the impact of fullerenols on diverse systems are published, demonstrating the continued interest in hydroxylated fullerenes and their uses. Despite compelling evidence of fullerenols' potential applications in biomedicine, there is still a lack of understanding of their mechanism of action and potential adverse effects.

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