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Hypothesis: Silver Nanoparticles as an Adjuvant for Cancertherapy

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SUMMARY

Cytotoxic agents are a main part of therapeutic process against the observed tumors, which lead to some unwished damages, due to drug uptake by normal body cells causing various tissue/organ failures associated with formal administration manners. But nowadays the risk is reduced by new target therapy techniques, of which the observed physical nature of micelles and nanosilver particles, governing their special behavior, could help using *micelle-coated silver nanoparticles* as a novel adjuvant for cancer target therapy.

Pharmaceutical application of nanomaterials is the most promising approach for generating new fields in biomedical sciences. However, a few nanomaterials are being used for medical purposes. Of these, nanosilver exhibits remarkable physical, chemical and biological properties at nanoscale such as antimicrobial effects due to its unique mechanism of action. [1] It is used widely as an antibiotic against wound infections and serious burn injuries. Moreover it has excellent antibacterial activity against *Staphylococcus epidermidis, Staphylococcus aureus, Escherichia coli, Staphylococcus aureus methicillin resistance strain (MRSA) and Pseudomonas aeruginosa.* [2]

Silver nanoparticles may interact with mammalian cells and affect proteins and enzymes with thiol groups like glutathione, thioredoxin, SOD and thioredoxin peroxidase, which are responsible to neutralize the oxidative stress of ROS (Reactive Oxygen Species) largely generated by mitochondrial energy metabolism. Silver nanoparticles may deplete the antioxidant defense mechanism, which leads to ROS accumulation, the initiator of an inflammatory response and perturbation and destruction of the mitochondria take place where afterwards apoptogenic factors like cytochrome C are released and programmed cell death is a final result. [1]

The micelle, another precious nanoproduct is a nano-supramolecular assembly with a spherical core-shell structure, and its surface and core can be modified with piloting molecules for cancer cells and *pH-sensitive* or *nanomagnetic* silver binding linkers for controlled nanosilver release, respectively.[3] Spherical supramolecular nano-assemblies from amphiphilic block copolymers, called polymeric micelles, have attracted considerable attention in the field of drug delivery systems due to their unique characteristics such as high water-solubility, high drug loading capacity and low toxicity, which are induced by the prolonged circulation in the blood and enhanced accumulation in tumor tissue. [3]

Considering the fact that micelles can deliver appropriate concentrations of the mentioned nanosilver particles to the target tumoral cells, the author hypothesizes that silver nanoparticles can be loaded and released as an anticancer reagent/adjuvant by the intracellular environment-sensitive polymeric micelles. This will improve the availability of silver nanoparticles controlled release profile, inducing high antitumor activity with almost no uptake by normal tissues.

References

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