PHOTOSENSITIZER ENCAPSULATED METALLOCATANIONIC VESICLES FOR PHOTODYNAMIC THERAPY

Bunty Sharma[1,2] Gurpreet Kaur[1], Ganga Ram Chaudhary[1] and Lluisa Perez-Garcia[2]

[1] Department of Chemistry, Panjab University, Chandigarh, 160014

[2] School of Pharmacy, University of Nottingham, University Park, NG7 2RD, Nottingham, United Kingdom.

Background: Developments in the field of photodynamic therapy (PDT) are being made by investigating appropriate photosensitizers (PSs) and enhancing the penetration effect of light by developing new nano-carriers. So, to boost the PDT effect, new metallosurfactant based metallocatanionic vesicles (MCV) were fabricated by a convenient, efficient, green and inexpensive method to encapsulate Rose Bengal as PSs and evaluate their antimicrobial PDT against the drug-resistant bacterium.

Methods: We have prepared from a combination of a double-chained copper-based cationic metallosurfactant (CuCPCII) and an anionic surfactant sodium bis(2-ethylhexyl)sulfosuccinate (AOT). We have prepared the different ratio of CuCPC II:AOT from 10:90 to 90:10 in PBS of 7.4 pH. In this approach, two of the fractions, one each from a cationic rich and anionic rich side, were selected to encapsulate anionic (rose bengal (RB)) PSs. It was characterized by SAXS, AFM, FE-SEM, Zeta-sizer, and conductivity measurements.

Results: These studies reveal that the MCV have dual functionality *i.e.* encapsulate PSs and even show dark toxicity against *S. aureus.* MCV help in enhancing singlet oxygen yield of RB. To study the killing of *S. aureus*, bacterial DNA was extracted and its interactions and conformational changes in the presence of MCV were analyzed *via*., UV-Visible, and circular dichroism (CD) spectroscopy. Comet assay (single-cell gel-electrophoresis) demonstrated the DNA damage after PDT treatment in an individual cell. The bacterial DNA damage was more with the metallosurfactant rich 70 : 30 fraction than with the 30 : 70 fraction, in combination with RB under irradiation

Conclusions: This work provides a new metal hybrid smart material that possesses dual functionality and is prepared by an easy, economical and feasible procedure which resulted in enhanced PDT against a drug-resistant bacterium, thus, providing an alternative for antibacterial therapy.