

The role of hydrophilic porphyrin-[C60] fulleropyrrolidine dyads as nano-assisted photosensitizers towards cancer photo dynamic therapy (PDT)

Devashish Sengupta
Assam University, India

Nanoparticles are non-immunogenic and fail to elicit any immune response when introduced into the body's circulatory system, which could otherwise lead to severe consequences like shutting off or blockage of the circulatory system. However, strong functionalization of nanoparticles like fullerenes with supramolecular photosensitizers (PS) can solve the problem and help develop nano-assisted PS with efficient applications in cancer photodynamic therapy (PDT). Hydrophilic porphyrin-fulleropyrrolidine dyads of various topologies, consisting of *meso*-substituted pyridinium derivatives, covalently-linked to a fulleropyrrolidine, have shown selective cytotoxic action towards ovarian cancer cells. These compounds are expected to be produced in an optically transparent form. Thus, light activation and optical probing can readily be accomplished for efficient generation of Reactive Oxygen Species (ROS). This is expected to enhance their role as anti-cancer agents. Depending upon their subcellular and submicron size, the C60 or C70 particles present in these PS can penetrate deep into tissues through fine capillaries and are able to pass through the fenestrate into the endothelial cells lining the blood vessels. The gel electrophoresis results indicated efficient cleavage of pUC DNA under light irradiated conditions. In the *in vitro* MTT cancer cell assays, the dyads inhibited the growth of ovarian cancer cells more significantly than it did the other adenocarcinoma epithelial cell lines like stomach, liver, lung etc. The most interesting outcomes of the study revealed that their biological activities with respect to cytotoxicity and DNA cleavage was higher and specific for dyads that experienced lower π - π interactions and showed higher fluorescence quantum yields. These results indicate great promise for the possible replacement of the controversial yet commercially available PS like photofrin, vasudyne etc with such dyads.

Biography

Devashish Sengupta obtained his PhD from The University of Sydney, Australia in 2007. His work was based on biomolecular medicinal chemistry of photosensitizers. He joined Assam University, India as an Assistant Professor in 2008. His research interest focuses on medicinal organic chemistry of fullerenes and porphyrin analogues. He is dedicated to the study of Structure Activity Relationships (SAR) of different nano-assisted photosensitizers and their relevance to pharmacology. He is working on two major projects recommended by DBT and collaborating with NIMHANS, Bangalore and ICGEB, Delhi. His present research ventures explore the applications of structurally modified molecular topologies of fullerene derivatives towards Parkinson's Disease (PD), retro-virus (HIV-1) and cancer PDT.

devashish.sengupta@uni.sydney.edu.au