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Combining nanotheranostics and photomedicine: Design and synthesis of nanophotomedicine for cancer treatment

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Porphyrinic photosensitizers play essential role in photodynamic therapy (PDT), which is commonly used to treat diseases including cancer, cardiovascular disease and microbial infection. Tetrapyrrolic macrocycles are important members of porphyrin family, which largely contributes to PDT-mediated disease treatment. Though important as photomedicine, their hydrophobic nature prevents them to act efficiently in biological systems. Biocompatible nanomaterials are gaining high popularity in diverse biological applications. Nanoparticles are nowadays largely being applied as multifunctional probes, which can simultaneously be used for imaging and drug delivery. Combining photosensitizers with nanoparticles can large compensate limitations of their hydrophobicity. Various compact, hydrophilic and bio-conjugatable porphyrins were synthesized through rational routes. Taking advantage of the biocompatibility of NPs along with their large surface area for drug incorporation, porphyrins were successfully conjugated on NP surface via EDC mediated coupling. All those novel photosensitizers nanoconjugates were fully characterized by various techniques (e.g. spectrophotometric methods, HPLC). These newly developed nanophotosensitizer scaffolds are highly valuable for possible photomedical and biomedical applications of PDT due to their biocompatibility.

Biography

Jayeeta Bhaumik obtained PhD in Organic Chemistry from North Carolina State University, Raleigh, USA in 2007. She carried out NIH postdoctoral fellowship at the Center for Systems Biology and later at the Dept. of Radiation Oncology, Massachusetts General Hospital and Harvard Medical School (2007-2011). Since 2012 she is a Scientist (sponsored by Dept. of Science & Technology, Govt. of India) at the Dept. of Pharmaceutical Technology (Biotechnology), NIPER, Mohali, India and pursuing research in the fields of nanobiotechnology and photomedicine.

Speciation of chromium in medicinal plants from selected farms in the vicinity of ferrochrome

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Chromium (Cr) is one of the most and important trace metals which can be present in two oxidation states: toxic Cr(VI) and non-toxic (Cr III). Cr(III) is an important microelement for plant and animal nutrition and essentials for the maintenance of glucose as well as for the lipid and protein metabolism. With regard to human health, Cr(III) is a required nutrient, with 50–200 μg per day recommended for adults. On the contrary, Cr(VI) is toxic and carcinogenic, leading to lung cancer, skin allergy and probably also to asthma and renal diseases. A toxic effect for the biological systems is attributed to the ability of Cr(VI) to migrate across the cell membrane, thus enhancing the intracellular chromium concentration. Hexavalent chromium is rarely found in nature and is generally man-made, especially in fumes generated during the ferrochrome production. The permissible exposure limit (PEL) of chromium in air is 5 μg m^{-3} measured as Cr(VI). The dust with Cr(VI) could be a source of contamination of medicinal plants. Therefore, it is essential to monitor the concentration of Cr(VI) in the environment, to determine the risk of Cr(VI) to human health, not only from air breathing, but from the dust which settles on agricultural products grown in vicinity of chromium smelters and when into medicinal plants. For these studies, the samples of industrial dust, soil, bark of trees and medicinal plantssamples were collected in the vicinity of chromium smelters and from local market. All measurements were carried out using a Perkin Elmer atomic absorption spectrometer model AAnalyst 600 with Zeeman background correction.

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