

Sonodynamic Activity of Porphyrins-SWCNT

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Abstract : In recent years, medical science has improved chemotherapy, radiation therapy and adjuvant therapy and has developed newer targeted therapies as well as refining surgical techniques for removing cancer. However, the chances of surviving the disease depend greatly on the type and location of the cancer and the extent of the disease at the start of treatment. Moreover, mainstream forms of cancer treatment have side effects which range from the unpleasant to the fatal. Therefore, the continuation of progress in anti-cancer therapy may depend on placing emphasis on other existing but less thoroughly investigated therapeutic approaches such as Sonodynamic Therapy (SDT). SDT is based on the local activation of a so called 'sonosensitizer', a molecule able to be excited by ultrasound, the radical production as a consequence of its relaxation processes and cell death due to different mechanisms induced by radical production. The present work deals with synthesis, characterization and preliminary in vitro test of Single Walled Carbon Nanotubes (SWCNT) decorated with porphyrins and biological vectors. The SWCNT's surface was modified exploiting 1, 3-dipolar cycloaddition or Dies Alder reactions. For this purpose, different porphyrins scaffolds were ad-hoc synthesized using also non-conventional techniques. To increase cellular specificity of porphyrin-conjugated SWCNTs and to improve their ability to be suspended in aqueous solution, the modified nano-tubes were grafted with suitable glutamine or hyaluronic acid derivatives. These nano-sized sonosensitizers were characterized by several methodologies and tested in vitro on different cancer cell lines.

Keywords : sonodynamic therapy, porphyrins synthesis and modification, SWCNT grafting, hyaluronic acid, anti-cancer treatment

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