Silver Nanoparticles for Enhancement Photodynamic Therapy

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Breast cancer is a heterogeneous and complex disease, early diagnosis is critical to increase the survival of patients, however, mostly are late diagnosed in the late stages of the disease. Photodynamic Therapy (PDT) is a potential method to treat cancer based on the interaction among photosensitizer (FS), light irradiation and molecular oxygen, generating reactive oxygen species (ROS) that induce apoptosis and / or cell death necrosis. Methylene blue (M.B.) belongs to phenothiazines FS group, which has good tissue penetration and high quantum yield, consequently presents tumor cytotoxicity. In an effort to development of a novel PDT agent, increasing your effect for breast cancer treatment, the applying of nanotechnology enhancement of therapeutic agents may be a choice to favor FS efficiency. In this context, the study aimed to investigate the effects of silver nanoparticles (AgNPs) associated of PDT to treat human mammary adenocarcinoma cells. The nanoparticles were synthesized by sodium citrate reduction to nucleation. The cell line MDA-MB-468 was treated with different methylene blue concentrations (2, 4, 6 and 8 µg/mL) in the presence or absence of AgNPs. In addition, the M.B. incorporation time and ROS production were also determined. The synthetized silver nanoparticles showed a UV-visible spectrum with a plasmon resonance band centered at 411 nm, a hydrodiameter around 43 nm and polydispersity index of 0.676 measured by Dynamic Light Scattering technique. The MDA-MB-468 cells treated with nanoparticles exhibited cytotoxicity more than treated by only M.B., improve the efficiency of the tumor cells treatment, which was performed by trypan blue dye exclusion test. The M.B. combined to silver nanoparticles increases ROS production, leading to permanent cells membranes damage, suggesting the association between FS and nanoparticles has great potential as a PDT agent.