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ORMOSIL nanoparticles as gene carriers: Synthesis, characterization and assessment of transfection efficiency in cultured breast cancer cells

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Background Due to the ineffective conventional treatment for breast carcinoma, the nonviral gene delivery system has been proved to be an attractive alternative to breast carcinoma therapy.

Methods In this work, we have developed a kind of new self-assembled nanoparticles, which were named as organically modifier silica nanoparticles (ORMOSILNs). Scanning electron microscopy and zeta potential results demonstrated that ORMOSILNs had a diameter of 40-80 nm and positive surface charges of +11.3 mV, respectively.

Result ORMOSIL nanoparticles had been synthesized and incubated along with pCMV plasmid vector construct carrying p53 gene and transfected into the breast carcinoma cells. The confocal and electron microscopic studies further confirmed that the nanoparticles were accumulated in the cytoplasm and the nucleus of the cancer cells transfected with p53 gene. Furthermore, ORMOSILNs could transfer foreign DNA into targeted cells with high transfection efficiency and little cytotoxicity. Agarose gel electrophoresis revealed that the nanoparticles efficiently complex with pCMV- p53 vector. The anti-cancer properties of p53 were demonstrated by assessing the cell survival and growth rate which showed a positive linear correlation in cancer cells.

Conclusion Our results showed the ORMOSILNs, an efficient gene vector, had the potential of gene therapy for breast carcinoma. Have a promising future for use as effective transfection agent for therapeutic manipulation of human cancer.

Keywords ORMOSIL nanoparticles; Gene therapy; pCMV; DNA carrier; *in vitro*