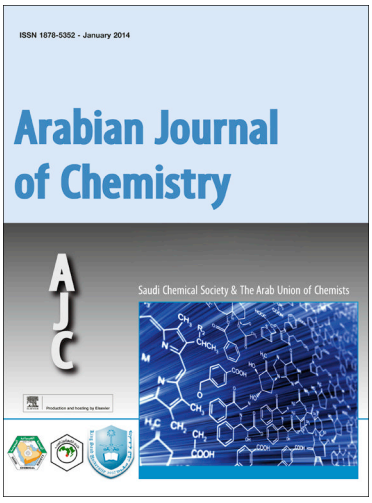


Original article

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# Tailored surface silica nanoparticles for blood-brain barrier penetration: preparation and *in vivo* investigation

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**Abstract**

Surface modified fluorescent silica nanoparticle derivatives (Ru@SNPs), namely, glucose (Glu) and glucose-poly (ethylene glycol) methyl ether amine (Glu-PEG) coated SNPs were designed and tested for their ability to penetrate the blood-brain barrier (BBB) in mice brain. The new obtained nanoparticles were characterized by field emission scanning electron microscope (FE-SEM), dynamic light scattering (DLS) and Fourier transform infrared (FTIR-ATR) analysis. The BBB penetration and distribution of tailored SNPs in mice brain were examined using confocal laser scanning microscopy (CLSM), flow cytometer (FACS) and transmission electron microscopy (TEM). The promising results obtained by *in vivo* experiments, point out that silica nanoparticle derivatives are an efficient permeable delivery vehicle that are able to cross the BBB and reach the brain tissues *via* specific and non-specific mechanisms. These findings will enrich the knowledge to rationally engineer multifunctional nanoparticles, and bring new insights into BBB permeability.

Keywords: blood-brain barrier, silica nanoparticles, glucose, PEG, *in vivo*, brain uptake.

## 1. Introduction

The blood-brain-barrier (BBB), a dynamic and extremely complex interface between the blood and the central nervous system (CNS), is composed mainly of endothelial cells, from the brain capillaries united by tight junctions, luminal glycocalyx, basal lamina and astrocytic foot