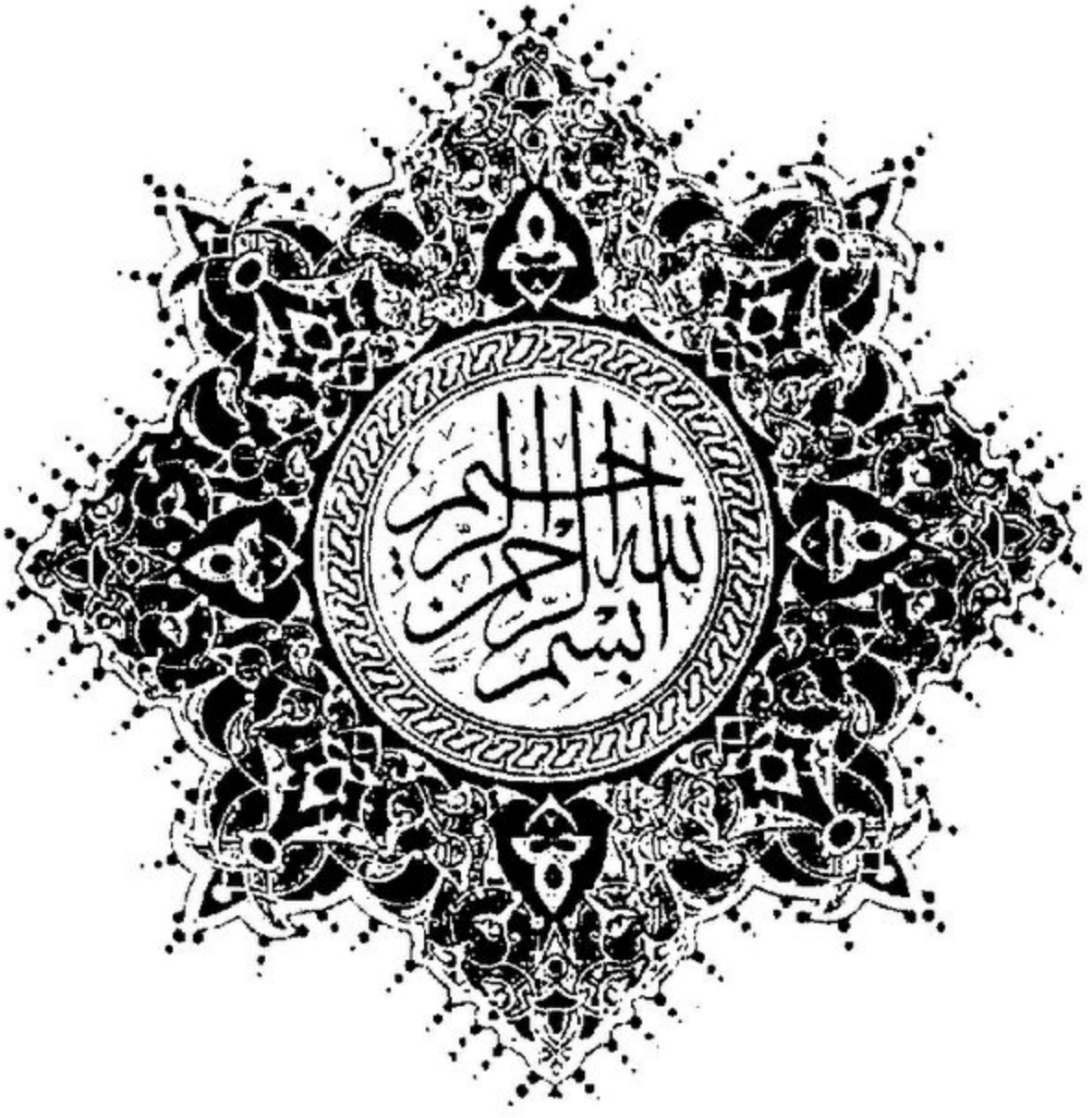
بسم الله الرحمن الرحيم

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عنوان:

سنتز و بررسی اثرات بیوفیزیکال نانو کونژوگه گادولینیوم- PLGA- تریپتوفان به عنوان یک ماده حاجب جدید مولکولی در MRI

استاد راهنما:

دکتر سید اسماعیل سادات ابراهیمی

دکتر مهدی شفیعی اردسیتانی

استاد مشاور:

دکتر مرتضی پیرعلی همدانی

نگارش:

الناز صالحیان

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Abstract

The purpose of this study is to synthesize a novel Nano-conjugate based PLGA-tryptophan and loading Gd^{3+}in it for making novel MR imaging contrast agents. In vitro cell toxicity, cellular uptake and MR imaging parameters of the prepared Nano-conjugate were investigated in vitro. Results showed no in vivo toxicity, good cellular uptake and large longitudinal (r_1). Suitable features of the Nano-probe show that it is a promising agent to use as a MR imaging agent. For this purpose, PLGA was prepared by Sigma Aldrich and tryptophan conjugation was done as describe in method section. The successful synthesis of the PLGA-tryptophan was confirmed by FT-IR and^{1}HNMR spectrums. The existence of peaks at the region of 1.5- 5 ppm indicates the aliphatic section and the peak at 6.5-7.5 ppm is related to the aromatic moiety which approves the presence of tryptophan. Moreover, appreance of carbon-carbon double bond in 1624 cm^{-1} and (C-H) bending bands in 500-600 cm^{-1} in FT-IR spectrum confirmed the presence of tryptophan. Using the standard curve and UV spectrophotometer at 280 nm, amount of tryphtophan in PLGA nano-structure found to be 35 µg/mg. The second claim is to explore the PLGA-tryptophan Gd^{3+} loading potential and produce enough relaxivity. FT-IR spectrum of the PLGA-tryptophan-Gd^{3+} and elevation in the size and zeta potential of the nano conjugate confirm that this step is perfectly done. The morphology of PLGA-Trp-Gd3+ nanostructures were obtained in different scales by scanning electron microscopy (SEM).The PLGA-Trp-Gd^{3+} nanostructures have a similar rod morphology. In figure 6(a), the light contrast can be related to the gadolinium-loaded PLGA-Trp structures. The as-prepared particles size of the PLGA-Trp-Gd^{3+} nanostructures were approximately(600-700) nm. Based on the SEM images and DLS, PLGA-Trp-Gd^{3+}wassuccessfully synthesized for MRI imaging of tumor .Relaxivities were also measured and the result showed that PLGA-tryptophan-Gd^{3+}isa good T_1-weighted contrast agent. This improved of MRI relaxivity related to the availability of water molecules at paramagnetic centers .MTT (in vitro cytotoxicity) assaydisclosed that nontoxic concentration up to 400µg/ml was obtained following interaction of PLGA-tryptophan-$Gd^{3+}$for 48 h with MCF-7 cell line. In contrast to magnevist ,the nano-conjugates showed noteworthy enhancement in the mitochondrial activity of the cells. This means that PLGA-tryptophan-$Gd^{3+}$was less toxic comparted to magnevist. Interestingly, In vitro cellular uptake by ICP-MS directly shows that 58% amount of PLGA-tryptophan-Gd^{3+}could be absorbed into the cells. In comparison to cellular uptake of magnevist (9%), PLGA-tryptophan-Gd^{3+} had more cellular uptake due to the nanostructure of the PLGA-tryptophan-Gd^{3+}. It is obvious that more studies need to be done to understand the whole characteristics of the nano-conjugate. However, these advantages include biocompatibility and biodegradability, no cytotoxicity, high relaxivity, good cellular uptake compared to magnevistare very interesting for the PLGA-tryptophan-Gd^{3+}as a MRI imaging agent.

Key Words : PLGA , Tryptophan , Gadolinium , MRI , Nanoconjugate

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Synthesis and Biological Evaluation of PLGA-tryptophan-Gd^{3+} as a Contrast Agent in MR imaging

Thesis supervisor

Dr.Seyed Esmaeil Sadat Ebrahimi

Dr.Mehdi Shafeie Ardestani

Dr.Morteza PirAli Hamedani

By

Elnaz Salehian

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