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论文

用于体外基因转染的氨基硅烷Fe_3O_4复合纳米粒子的合成及表征

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摘要:

利用2-吡咯烷酮和乙酰丙酮铁为原料制备Fe_3O_4磁性纳米颗粒, 用XRD和TEM对样品进行了表征. 选择偶联剂*γ*-氨丙基三乙氧基硅烷[$NH_2C_3H_6Si(OC_2H_5)_3$]对纳米粒子进行表面修饰, 制得APTTS/Fe_3O_4复合载体材料. 以此复合粒子作为传递载体, 将CD基因转染U251胶质瘤细胞. 采用RT-PCR, Western blot及免疫荧光等方法检测CD基因的表达及功能. 结果表明, 制备的Fe_3O_4颗粒粒径为8~10 nm, 结晶度较高; 经表面修饰后, 粒子表面负载—OH, —NH, —NH_2, —C—O和—C—OH等多种功能基团. DNA结合分析及DNase-I消化结果表明, APTTS/Fe_3O_4粒子能够有效地结合和保护DNA. 体外细胞转染实验证实, 该复合纳米颗粒能够高效地传递CD基因进入U251胶质瘤细胞内, 并进行稳定表达.

关键词: 纳米四氧化三铁; 磁性材料; 体外转染; 基因载体

Synthesis and Characterization of APTTS-Fe_3O_4 Nanoparticles for *in vitro* Transfection as Gene Carriers

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Abstract:

Fe_3O_4 magnetic nanoparticles were prepared *via* thermal decomposition of $Fe(acac)_3$ in 2-pyrrolidone. And 3-aminopropyltriethoxy-silane(APTTS) was used to modify the surface of the nanoparticles. The structure and properties of the samples were characterized by means of XRD, TEM and FTIR. The potency of adsorbing DNA and resisting DNase-I digestion of APTTS/Fe_3O_4 were analyzed *via* agarose gel electrophoresis. Then, APTTS/Fe_3O_4 nanoparticles were evaluated as a kind of plasmid pCMVCD carrier and transferred into human glioma cell line U251 *in vitro*. The mRNA and protein expression of intracellular CD gene were tested by RT-PCR, Western blot and immunofluorescent staining, respectively. The results show that all the Fe_3O_4 nanoparticles are sized 8—10 nm and have a good crystallinity. Displaying functional group of —OH, —NH, —NH_2, —C—O, —C—OH, the amino-silane modified nanoparticles had the ability of binding DNA and resisting DNase-I digestion. Though the cell transfect test, such composite nanoparticles can transfer DNA into U251 cells efficiently and get stable expression.

Keywords: Fe3O4 nanoparticle; Magnetic material; In vitro transfection; Gene carrier

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