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Enhance Antioxidant Activity of Curcumine- Loaded Mesoporous Silica Via Silver Nanoparticles - Rasoul Bolghar- Azarbayjan Shahid Madani University

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Introduction

The research field of nanoporous materials is an interesting and exciting topic with researchers involved called M41S periodic mesoporous silica were discovered in 1990s. They have high surface areas and longrange ordered pores, which is beneficial for many application of this nanomaterials activity. Mesoporous silica nanoparticles MSN is an ideal nanocarrier for drug delivery system due to non-toxic nature, high pore volume, no concerns with chemical or biological safety, the ability to functionalize the surface, and good biocompatibility. MSN release can be operated by variety of methods such as, ray radiation, exposed to a specific molecule or pH or temperature. Curcumin has many biological activity extends to anti-cancer effects, pancreatic, breast, prostate, multiple myeloma, lung cancer, cancer lesions. Additionally, curcumin has proper effects against inflammation and infection related ailments like inflammatory bowel disease, irritable bowel syndrome, arthritis, uveitis, postoperative inflammation, peptic ulcer. The major limitation of curcumin is low solubility in water. Curcumin administered at 2g/kg in rat resulted in serum concentration of 1.35 ± 0.23 µg/mL. The water solubility is at nano molar concentration. Another weakness of curcumin is instability at pH 7.4 and half-life time for 20 min. The curcumin absorb by cells is limited and lesser concentration of cytoplasm. In this study, we are functionalized curcumin on the mesoporous nanoparticles and then supported Silver nanoparticles on this nanocomposite and investigated its antioxidant properties. Studies have shown that due to the high surface area of mesoporous and the successful modification of curcumin on its surface and synergistic effect of nanoparticles and nanoporous as well as curcumin, it has been shown enhanced antioxidant properties than curcumin. The MSN-CURC-Ag showed a higher DPPH radical-scavenging activity with the lowest 50% inhibitory concentration.

Keywords: curcumin, silica, chitosan, nanoparticles, anti-tumour, antioxidant activity. Introduction

Malignant growth is the subsequent driving reason for mortality on the planet and roughly 1,665,540 individuals in the United States experienced disease by 2014 [1]. A tumour (neoplasm) is an uncontrolled development of cells and turns out to be less receptive to typical development control. Attack and metastasis are the significant highlights of a tumour and is arranged into favourable and harmful tumours. Amiable tumours are non-dangerous and they won't spread to different regions. Dangerous tumours are destructive and can spread to different tissues (metastasis) by means of the circulatory system and lymph hubs [2]. Tumours may happen in any piece of the body including the skin, lungs, bone, digestion tracts, and bosom and so forth. Uncontrolled expansion, acceptance of angiogenesis, dynamic attack, metastasis, everlasting status, and avoidance of development silencers are the significant qualities of destructive cells. Apoptosis is an arranged cell demise instrument including numerous intricate pathways. It is a key component to wipe out harmed cells and control cell multiplication. The procedures of apoptosis include the shrinkage of cells, chromatin buildup, layer blebbing, and deoxyribonucleic corrosive (DNA) fracture. The obstruction of tumour cells happens because of the damaged apoptosis flagging pathway by change. During inception, the oncogene is initiated and the procedures of oncogenesis prompts the development of carcinogenic cells. Much of the time, tumours are related with p53 quality change and it got known as the principal tumour silencer quality connected to apoptosis. The essential preliminary of each chemotherapeutic medication

depends on its likely cytotoxicity towards the malignancy cell lines. A lessening in cell numbers after some time is a significant prerequisite for an in vitro cytotoxicity evaluation. At present, the antitumor medication plans depend on their specific focusing towards tumour cells. This will be accomplished by caspase actuation, phosphatidylserine introduction, and poly (ADP-ribose) polymerase (PARP) cleavage. The ordinary medicines, for example, radiation and chemotherapy have not been generally suggested on account of their reactions.

The development of nanotechnology has changed the ordinary ideas and thoughts of the pharmaceutical fields. Mesoporous silica nanoparticles (MSNs) were first presented by Mobil organization researchers in 1992. They have a remarkable mesoporous structure with high compound security, low poisonousness, high medication stacking limit, controlled discharge, biocompatibility, high surface region, target conveyance, enormous pore volume, and surface usefulness. The latent objective of nanoparticles in malignant growth treatments is accomplished in view of the upgraded porousness and maintenance (EPR) impact of the destructive cells. The weakened lymphatic framework and imperfect vascular design permit the nanoparticles to go into the malignant cells. The MSNs are disguised into the cells by means of phagocytosis and pinocytosis. Polypeptides and polysaccharides are liable for the development of biosilica by means of the rehashed stage division intervened templating system and the collection based component. Chitosan is a cationic polysaccharide having a terminal amino gathering has been demonstrated to encourage silicification through catalyzing the hydrolysis/buildup of the silica source and the resulting collection of silica. An ongoing report indicated a focused on conveyance of calcium leucovorin galactosylated chitosan-functionalized mesoporous silica nanoparticle to treat colon malignant growth. The outside of the MSNs contains an enormous number silanol gatherings, which permit simple functionalization, controlled medication discharge, and medication stacking. Chitosan is acquired from the deacetylation of chitin. It is made out of β-(1,4)- connected glucosamine units (2-amino-2-deoxy-β-d-glucopyranose) and N-acetylglucosamine units (2-acetamino-2-deoxy-β-d-glucopyranose) in various proportions. The amino gathering on chitosan give controlled discharge, penetration upgrade, mucoadhesion, in situ gelation and so forth [14]. PH responsive conveyance of curcumin from chitosan mesoporous silica nanoparticles were accounted for by Nasab et al., 2018. Cytotoxicity examines uncovered IC50 after 72 h treatment with free curcumin and curcumin-stacked nanoparticles on U87MG glioblastoma disease cell line were 15.20 and 5.21 µg/mL ($p < 0.05$). separately.