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^{90}Y-loaded MCM-41 silica nanoparticles as a potential therapeutic agent against colorectal cancer

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Colorectal cancer (CRC) is a malignancy that affects large intestine and rectum, and it is the most common malignancy of the gastrointestinal tract, the third most commonly diagnosed type of cancer in the world and the second leading cause of cancer-related death in the United States. Conventional radiotherapy is not an often used approach in the treatment of CRC due to the fact that peristaltic movements hamper the targeting of ionizing radiation. Researches based on the combination of radioisotopes and nanostructured carriers systems have demonstrated significant results in improving the selectivity action as well as reducing the radiation dose into healthy tissues. Thus, the objective of this work is to synthesize and characterize MCM-41 mesoporous silica nanoparticles conjugated with yttrium-90 and evaluate this system as a potential therapeutic agent. The nanoparticles were synthesized via sol-gel method. The sample was characterized using FTIR, SAXS, PCS, Zeta Potential analysis, Thermal analysis, CHN elemental analysis, nitrogen adsorption, scanning and transmission electron microscopy. The ability to incorporate Y^{+3} ion was determined *in vitro* using different ratios (1:1, 1:3, 1:5 v/v) of YCL_3 and silica nanoparticles dispersed in saline, pH 7.4. The non-incorporated Y^{+3} ions were removed by ultracentrifugation procedure and the concentration of ions in the supernatant was determined by ICP-AES. Cell viability was assessed by colorimetric MTT assay in which specific colorectal cancer cells T84 were used. The results showed that the nanoparticles were successfully synthesized, obtaining nanoparticles with spherical morphology, particle size of 400 nm, PDI 0,1, zeta potential of -25, 8 meV, hexagonal arrangement of pores with 3 nm diameters and superficial area of 1400 m2.g-1. Cell viability assay results suggest the use of incorporatd nanoparticles as a potential therapeutic agent.

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