



The Potential Anticancer Activity of 5-Fluorouracil Loaded in Cellulose Fibers Isolated from Rice Straw

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Abstract:

Green-based materials have been increasingly studied to circumvent off-target cytotoxicity and other side-effects from conventional chemotherapy. Herein, cellulose fibers (CF) were isolated from rice straw (RS) waste by using an eco-friendly alkali treatment. The CF network served as an anticancer drug carrier for 5-fluorouracil (5-FU). The physicochemical and thermal properties of CF, pure 5-FU drug, and the 5-FU-loaded CF (CF/5-FU) samples were evaluated. The samples were assessed for in vitro cytotoxicity assays using human colorectal cancer (HCT116) and normal (CCD112) cell lines, along with human nasopharyngeal cancer (HONE-1) and normal (NP 460) cell lines after 72 hours of treatment. XRD and FTIR revealed the successful alkali treatment of RS to isolate CF with high purity and crystallinity. Compared to RS, the alkali-treated CF showed an almost fourfold increase in surface area and zeta potential of up to -33.61 mV. SEM images illustrated the CF network with a rod-shaped structure and comprised of ordered aggregated cellulose. Based on UV spectroscopy measurements for 5-FU loading into CF, drug loading encapsulation efficiency was estimated to be $83 \pm 0.8\%$. The release media at pH 7.4 and pH 1.2 showed a maximum drug release of 79% and 46%, respectively, over 24 hours. In cytotoxicity assays, CF showed high biocompatibility. Impressively, the drug-loaded sample of CF/5-FU at a $250 \mu\text{g}/\text{mL}$ concentration demonstrated a 58% inhibition against colorectal cancer cells, but only a 23% inhibition against normal colorectal cells. Further, a $62.50 \mu\text{g}/\text{mL}$ concentration of CF/5FU eliminated 71% and 39% of nasopharyngeal carcinoma and normal nasopharyngeal cells, respectively.



Biography:

Mostafa Yusefi is a PhD student in Department of Environmental Engineering and Green Technology, Malaysia-Japan International Institute of Technology (MJIIT). He has published seven papers in reputed journals.

Publication of speakers:

1. Evaluating anticancer activity of plant-mediated synthesized iron oxide nanoparticles using Punica Granatum fruit peel extract; M Yusefi, K Shameli, RR Ali, SW Pang, SY Teow.
2. Performance of cow dung reinforced biodegradable poly (Lactic Acid) biocomposites for structural applications; M Yusefi, M Khalid, FM Yasin, LC Abdullah, MR Ketabchi, R Walvekar.
3. Physico-mechanical properties of poly (lactic acid) biocomposites reinforced with cow dung; M Yusefi, M Khalid, FM Yasin, MR Ketabchi, A Hajalilou, LC Abdullah.
4. Analysis on physicochemical properties of cellulose fiber from rice straw waste; KS M Yusefi, R R Ali, E C Abdullah.
5. Analysis on Physicochemical Properties of Cellulose Fiber from Rice Straw Waste; M Yusefi, R Bte Rasit Ali, EC Abdullah, K Shameli.

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