

Gallic acid loaded PEO-core/zein-shell nanofibers for chemopreventive action on gallbladder cancer cells

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Coaxial electrospinning was used to develop gallic acid (GA) loaded poly(ethylene oxide)/zein nanofibers in order to improve its chemopreventive action on human gallbladder cancer cells. Using a Plackett-Burman design, the effects of poly(ethylene oxide) and zein concentration and applied voltage on the diameter and morphology index of nanofibers were investigated. Coaxial nanofibers were characterized by scanning electron microscopy (SEM), transmission electron microscopy (TEM), Fourier transform infrared spectroscopy (FTIR), thermogravimetric analysis (TGA) and differential scanning calorimetry (DSC). GA loading efficiency as high as 77% was obtained under optimal process conditions. The coaxial nanofibers controlled GA release in acid and neutral pH medium. Cytotoxicity and reactive oxygen species (ROS) production on gallbladder cancer cell lines GB-d1 and NOZ in the presence of GA-nanofibers were assessed. GA-nanofibers triggered an increase in the cellular cytotoxicity compared with free GA on GB-d1 and NOZ cells. Statistically significant differences were found in ROS levels of GA-nanofibers compared with free GA on NOZ cells. Differently, ROS production on GB-d1 cell line was similar. Based on these results, the coaxial nanofibers obtained in this study under optimized operational conditions offer an alternative for the development of a GA release system with improved chemopreventive action on gallbladder cancer cells. © 2018 Elsevier B.V.

Biopolymers

Coaxial electrospinning

Gallbladder cancer cells

Poly(ethylene oxide)

Reactive oxygen species

Zein

gallic acid

macrogol

nanofiber

reactive oxygen metabolite

zein

antineoplastic agent

gallic acid

macrogol

nanofiber

reactive oxygen metabolite

zein

Article

cancer prevention

conductance

cytotoxicity

dielectric constant

differential scanning calorimetry

electric potential

electrospinning

gallbladder cancer

human

human cell

in vitro study

infrared spectroscopy

pH

priority journal

scanning electron microscopy

surface tension

thermogravimetry

transmission electron microscopy

cell survival

chemistry

chemoprophylaxis

drug effect

drug release

gallbladder tumor

metabolism

tumor cell line

Anticarcinogenic Agents

Antineoplastic Agents

Cell Line, Tumor

Cell Survival

Chemoprevention

Drug Liberation

Gallbladder Neoplasms

Gallic Acid

Humans

Hydrogen-Ion Concentration

Nanofibers

Polyethylene Glycols

Reactive Oxygen Species

Zein