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The effects of biogenic bismuth oxide nanoparticles on radiosensitivity of gastric cancer cells

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Abstract

Gastric cancer is the 5th most common neoplasm and the 3rd most deadly cancer worldwide. In this study, we produced bismuth oxide (Bi_2O_3) and bismuth oxide-zeolite nanocomposites (Bi_2O_3-Z NCs) using *Vibrio* sp. *VLC* bacteria and investigated their effects on radiosensitivity of human gastric cancer cells.

After synthesis of Bi_2O_3 NPs and Bi_2O_3-Z NCs by *Vibrio* sp. *VLC* bacteria, the characterization of NPs were evaluated using UV-visible, FTIR, XRD, DLS, Zeta potential, TEM and FESEM. Then, MKN-45 cells, a human gastric adenocarcinoma cell line, were pretreated with 25 µg/ml Bi_2O_3 NPs (in two forms of heated and non-heated) and Bi_2O_3-Z NCs, while bismuth salt and zeolite were considered as controls. After 24 h, cells were exposed to 200, 400 and 600 centigray (cGy) of X-radiation and recovered for 72 h. At the end, viability of cells was determined by resazurin assay.

Findings of present research indicated that Bi_2O_3 NPs (non-heated) as well as bismuth salt and zeolite pretreatments increased the effects of 200 cGy radiation. Moreover, Bi_2O_3 NPs (heated) significantly (p <0.05) improved the sensitivity of MKN-45 cells to 400 cGy X-ray. More interesting results were observed when 600 cGy radiation was applied, as Bi_2O_3 NPs (heated) and Bi_2O_3-Z NCs significantly (p <0.0001 and p <0.05, respectively) enhanced radiosensitivity of cells.

In conclusion, obtained results revealed that Bi_2O_3 NPs and Bi_2O_3-Z NCs could act as potent radio sensitizers, although more investigation on other gastric cell lines is required to confirm our findings.

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