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The cytotoxicity effect of biologically synthesized bismuth oxide nanoparticles using *Vibrio* sp. VLC on gastric cancer cells

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Abstract

Biosynthesis of nanoparticles (NPs) is an eco-friendly, safe and cost-effective approach, specifically when bacteria are used to produce NPs. In addition, loading of NPs on minerals such as zeolite affects their diffusion in various solutions. Gastric cancer ranks as 5th for incidence and 4th for mortality among all cancer types globally. To introduce novel NPs with toxic effects on gastric cancer cells, we synthesized bismuth oxide (Bi_2O_3) NPs, alone and loaded on zeolite ($\text{Bi}_2\text{O}_3\text{-Z}$) using a bacterium *Vibrio* sp. VLC, and evaluated their cytotoxicity on MKN-45 cells. In this regard, Bi_2O_3 NPs (in two forms of heated and non-heated) and $\text{Bi}_2\text{O}_3\text{-Z}$ nanocomposites (NCs, with 3.35 and 15.56 wt%) were synthesized, while bismuth salt and zeolite were considered as controls. For treatment of cells, 25, 50 and 100 $\mu\text{g/ml}$ of all agents were freshly prepared and after 24 h, alamar Blue assay was carried out to determine cell viability. Results of this study revealed that heated and non-heated Bi_2O_3 NPs induced their cytotoxic effects in a dose-dependent manner. In addition, toxicity of $\text{Bi}_2\text{O}_3\text{-Z}$ NCs (3.35 wt%) was more than $\text{Bi}_2\text{O}_3\text{-Z}$ NCs (15.56 wt%), bismuth salt and zeolite. In conclusion, obtained findings indicated that toxicity of bismuth salt increased when formed as NPs and NCs. Nevertheless, more research is necessary to determine the mechanism of observed actions.

Keywords Bismuth oxide nanoparticles, gastric cancer, cytotoxicity, *Vibrio* sp. VLC.