Enhancing the therapeutic chemosensitivity of hepatocellular carcinoma cells using alpha-solanine

haimaa A. Gouhar¹, Fatma F. Abd Elhameed², Magdi N. Ashour³, Nahla S. Hassan⁴ and Sherien M. El-Daly⁴

¹Medical Biochemistry Department, National Research Centre, Cairo, Egypt
²Department, Faculty of Science, Ain Shams University, Cairo, Egypt
³Biochemistry Department, Faculty of Science, Ain Shams University, Cairo, Egypt
⁴Centre of Excellence for Advanced Sciences, National Research Centre, Cairo, Egypt

Background: Anti-cancer chemotherapy although effective it induces serious adverse effects. In addition, cancer cells can develop resistance to chemotherapy. Aim: The clinical application of cisplatin is limited by severe side effects associated with high applied doses. The synergistic effect of a combination treatment of a low dose of cisplatin with the natural alkaloid α-solanine on human hepatocellular carcinoma cells was evaluated. Materials and Methods: HepG2 cells were exposed to low doses of α-solanine and cisplatin, either independently or in combination. The efficiency of this treatment modality was evaluated by investigating cell growth inhibition, cell cycle arrest, and apoptosis enhancement. Results: α-solanine synergistically potentiated the effect of cisplatin on cell growth inhibition and significantly induced apoptosis. This synergistic effect was mediated by inducing cell cycle arrest at the G2/M phase, enhancing DNA fragmentation and increasing apoptosis through the activation of caspase 3/7 and/or elevating the expression of the death receptors DR4 and DR5. The induced apoptosis from this combination treatment was also mediated by reducing the expression of anti-apoptotic mediators Bcl-2 and survivin, as well as by modulating miR-21 expression. Conclusion: Our study provides strong evidence that a combination treatment of low doses of α-solanine and cisplatin exerts a synergistic anticancer effect and provides an effective treatment strategy against hepatocellular carcinoma.

Keywords: Cisplatin; Bcl-2; HepG2 cells; miR-21; α-solanine

Editor-in-Chief: Prof. M.L. Salem, PhD - Article DOI: 10.21608/JCBR.2021.63663.1179