Antiproliferative and Apoptotic Effects of Vanadyl Sulphate on H-Ras Transformed 5rp7 Cells

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Metal based drugs have successfully been used in the detection and treatment of a variety of diseases [1]. Despite the advantages in early diagnostic and treatment of cancer, there is essential to develop new alternative of drugs. A number of in vitro studies have revealed that vanadium shows its antitumor effects on various cell lines [2]. Moreover, it is shown that vanadium compounds may show cytotoxic effects through DNA cleavage and fragmentation, in vitro [3]. According to these studies, here in we aimed to investigate the cytotoxic and antiproliferative effect of vanadyl sulphate in vitro, also to detect the effect of this agent on H-Ras transformed 5RP7 cells ultrastructure.

For detecting the cytotoxic effects, the stock solution (in distilled water) of vanadyl sulphate, was further diluted with culture medium to 10, 20, 30, 40, 50, 60, 70, 80, 90 and 100μΜ concentrations and applied on H-Ras 5RP7 cells (1x10⁴ cells per well) for 24 hours. The plates were read on ELISA reader (ELX808) at wavelength of 540 nm (n=3). From the Elisa reader results, the 50% inhibition concentration (IC₅₀) of the cells was determined to be 35μΜ.

For ultrastructural changes, H-Ras 5RP7 cells incubated with 35μΜ for 24 hours were fixed with 2,5% glutaraldehyde (in 0,1M phosphate buffer, pH 7.4) and left in buffer overnight at +4 °C. After being embedded in agar and post fixed in %2 osmium tetroxide, the cells were dehydrated in graded ethanol (70%, 90%, 96% and 100%). Dehydrated cells were embedded in EPON 812 epoxy (Germany) and sectioned on ultramicrotome (LEICA UC6, Germany). Structural and ultrastructural changes of these cells were observed on transmission electron microscope (TEM) and photographed.

Our results demonstrated that vanadyl sulphate showed high sitotoxicity on H-Ras transformed 5RP7 cells in low concentrations. Also, in our results it is shown the structure and ultrastructural changes like membrane blebbing and nuclear fragmentation as apoptotic sparks on H-Ras transformed 5RP7 cells caused by vanadyl sulphate via transmission electron microscopy (TEM). According to these sparks, vanadyl sulphate has induced apoptosis in H-Ras transformed 5RP7 cells. Consequently, we can say that vanadyl sulphate with its effects on H-Ras transformed 5RP7 cells may expose well inspiration for designing of pharmaceutical products helpful in cancer treatment.

References:

Figure 1. Transmission electron micrograph of 5rp7 cell treated with IC$_{50}$ value of vanadyl sulphate for 24 hours (10kx).  ➩ Membrane blebbings.

Figure 2. Transmission electron micrograph of 5rp7 cell treated with IC$_{50}$ value of vanadyl sulphate for 24 hours (10kx).  ➩ : Nuclear fragmentations; ➩ Membrane blebbing