

Expression of bcl-2 apoptosis protein in nerve cells induced by silver nanoparticles

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An increased interest in development of medicine that contain nanoparticles in their composition is currently observed. The use of natural or synthetic polymers as nanostabilizing matrices is most interesting for scientists. One of these polymers is poly-1-vinyl-1,2,4-triazole (PVT), which has a set of properties (high hydrophilicity, chemical stability, biocompatibility, heat resistance). PVT can be used in new forms of medicines. Previous histological studies of nanocomposites on PTV matrix with silver nanoparticles (nPVT) indicated the damaging effect of silver nanoparticles upon subacute administration of silver into the brain tissue of albino rats [1]. In this regard, it became necessary to evaluate the intracellular effect of silver nanoparticles on the nervous tissue.

nPVT contains spherically shaped silver nanoparticles with sizes 2-6 nm, silver content in sample was 7.03% [1]. Synthetic polymer PVT is a water-soluble biocompatible polymer which capable of stabilizing silver nanoparticles [1]. 32 white outbred male rats (weight 180-200 g) were used for the investigation. All animals were randomly assigned to four groups. Two groups were exposed to nPVT at a dose 100 $\mu\text{g}/\text{kg}$ (nPVT100) and 500 $\mu\text{g}/\text{kg}$ (nPVT500). One group received an aqueous solution of polymer without silver nanoparticles at a dose 100 $\mu\text{g}/\text{kg}$ (PVT). Animals of control group received distilled water. Solutions were administered orally using an atraumatic probe for 9 days. An immunohistochemical method was used to determine the activity bcl-2 protein. Sections obtained on a microtome were placed on poly-L-lysine coated slides and stained for antibodies to the bcl-2 protein in accordance with the protocol proposed by the manufacturer.

It was found that administration of nanocomposite at both doses led to significant increase in the number of cells with bcl-2 expression in nPVT100 and nPVT500 groups (4,21 and 6,76 times respectively). The same increase in expression (2,74 times) was found in PTV group, which may be associated with the response of neurons to foreign agent introduction. All this indicates that 9-day administration of silver nanocomposites start the apoptotic process, which leads to activation of bcl-2 apoptosis inhibitor protein.

References

- 1) Prozorova G.F., Pozdnyakov A.S., Korzhova S.A., Ermakova T.G., Novikov M.A., Titov E.A., Sosedova L.M. Toxicity evaluation of polyvinyltriazole and a related silver-containing nanocomposite // Russ. Chem. Bull. 2014. Vol. 63. P. 2126–2129.