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Antitumor activity of bimetallic Ag/Au composite nanoparticles

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Nowadays a great scientific and technological interest is addressed towards different gold and silver nanoparticles (Ag/Au NPs). Among the physical parameters affecting Ag/Au NPs biological activity a primary concern relates to their size, shape, composition, charge etc. However the impact of the ratio of NPs components as well as their topological distribution within NPs remains to be further characterized. Our previous study revealed biological activity and low toxicity of bimetallic Ag/Au NPs [1]. In the current study an *in vivo* antitumor activity of composite Ag/Au NPs was tested employing mouse Lewis lung carcinoma (LLC). NPs with different gold and silver molar ratios (Ag/Au 1:1; 1:3; 3:1) and topological distribution ($Au_{core}Ag_{shell}$; $Ag_{core}Au_{shell}$) were used in the current study. Tumor transplantation was performed by intra-muscular injection into a femoral muscle of 0.2 ml 10 % cell suspension in saline (3×10^6 cells/ml). Starting from day five after tumor cell inoculation, the animals were divided into groups receiving daily an intra-peritoneal suspension of 100 μL of the NPs solution at a dose of 500 μg/kg/day daily for 12 days. Based on the morphological parameters of primary tumor growth inhibition, lung metastasis growth inhibition and metastasis inhibition index, it was concluded that the highest antitumor activity was attributed to $Ag_{core}Au_{shell}$ NPs. This was also confirmed by 25-fold decrease of serum lactate dehydrogenase activity compared to untreated mice with LLC. Moreover, $Ag_{core}Au_{shell}$ NPs upon their administration to mice with LLC possessed low *in vivo* cytotoxicity towards untransformed cells as evidenced by single cell DNA comet analysis of primary mouse lymphocytes. The analysis of comet moment distribution revealed that up to 70 % of cell population was characterized with intact integrated nuclear DNA after NPs administration.

Our data suggest that $Ag_{core}Au_{shell}$ NPs used in this study may serve as a suitable prototype to develop anticarcinomatous agent and anticancer drug vehicle.

1. *Shmarakov I.O., Mukha Iu.P., Karavan V.V., Chunikhin O.Yu., Marchenko M.M., Smirnova N.P. and Eremenko A.M.* Tryptophan-Assisted Synthesis Reduces Bimetallic Gold/Silver Nanoparticle Cytotoxicity and Improves Biological Activity // Nanobiomedicine.- 2014.- **1**:6. doi: 10.5772/59684.