IMMUNOLOGY AT THE CONFLUENCE OF MULTIDISCIPLINARY APPROACHES

ABSTRACT BOOK

Institute for Biological Research "Siniša Stanković" National Institute of Republic of Serbia
University of Belgrade

Immunological Society of Serbia

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Poster presentation

GRAPHENE QUANTUM DOTS PROTECT SH-SY5Y CELLS FROM SNP INDUCED APOPTOSIS BY SCAVENGING REACTIVE OXYGEN AND NITROGEN SPECIES

Mihajlo Bosnjak[1], Biljana Ristic[2], Matija Krunic[2], Aleksandar Mircic[1], Nevena Zogovic[3], Gordana Tovilovic Kovacevic[3], Verica Paunovic[2], Vladimir Trajkovic[2], Ljubica Harhaji Trajkovic[3].

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We here investigated protective potential of nanoparticles graphene quantum dots (GQD) against neurotoxicity of sodium nitroprusside (SNP), NO-donor and antihypertensive drug widely used in studies of nitrosative stress-induced neurotoxicity. GQD prevented SNP-induced apoptosis, caspase activation and mitochondrial depolarization in SH-SY5Y neuroblastoma cells. GQD decreased SNP generated nitrite accumulation in supernatants, as well as NO/ONOO- concentrations in cells and cell-free medium. However, ONOO- and NO scavengers only slightly suppressed SNP neurotoxicity. Moreover, light exhausted SNP, incapable of producing NO, was toxic to SH-SY5Y cells, while GQD strongly reduced its neurotoxicity, suggesting that defensive effect of GQD far exceeded their NO scavenging activity. $FeSO_4$ increased death of SH-SY5Y cells, while iron chelators decreased toxicity of iron-containing SNP. GQD neutralized SNP generated reactive oxygen species (ROS) production, particularly O_2•− and •OH in both cells and cell-free condition. Neurotoxicity of SNP was suppressed in the presence of unspecific antioxidants, scavengers of •OH and lipid hydroperoxyl radicals, while it was increased with •OH generating superoxide dismutase (SOD). Intracellular localization of GQD was confirmed by transmission electron microscopy (TEM), while extensive washing of cells preincubated with GQD, only partly reduced their protective activity, suggesting that GQD exerted neuroprotective effect both intra- and extracellularly. Taken together, these results suggested that GQD protected neuroblastoma cells by neutralizing reactive nitrogen species (RNS) and ROS, predominantly •OH formed in Fenton reaction catalyzed by iron derived from SNP. Therefore, GQD might be promising choice for treatment of ROS/RNS-mediated neurodegenerative diseases.