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New approaches for targeted cancer therapy: Visible light-sensitive AgNPs embedded in biopolymer nanostructures with anti-cancer potential for localized use perspectives

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The development of new synthesis methods and designing nanostructured colloidal polymeric bioorganic nanomaterials and metal using environmentally friendly methods remains a challenge to the scientific community. This study is focused on the presentation a is a novel multifunctional biocompatible nanocomposite NC-2A with intercalating and encapsulated core-shell morphology structures consisting of positively charged, non-randomly distributed AgNPs with a large contact area and low diameters (average size 8 nm). We have found that aqueous blend of intercalated polysaccharide Nanocomposites (NC) with a reactively functionalized copolymer is sensitive towards a visible light source- white Light Emitted Diode (wLED). AgNPs with a diameter in the range between 2-16 nm has been obtained by the influence of visible light source -wLED during the extremely short time around 10-12 minutes. The unique sizes of these functionalized AgNPs can be controlled by the volume ratio of a biomatrix, organic clay and partner copolymer. We observed this compound exhibits cytotoxicity *in vitro* against two human cancer cell lines- prostate MIA PaCaII and brain U-87. The anticancer properties of this NC can be explained by the following structural factors: NC-2A contains a combination of active chains of the protonated hydroxyl, carboxyl and amine groups, Ag+ cations and ODA-MMT. We suggest this nanocomposite be further explored for anti-cancer testing as novel biomaterial with anticancer and drug delivery potential for targeted cancer therapy in a localized use. Moreover, wLED based activation is an effective and ecofriendly route to obtain AgNPs and this application takes just 10-12 minutes after applying on the local tumor area.

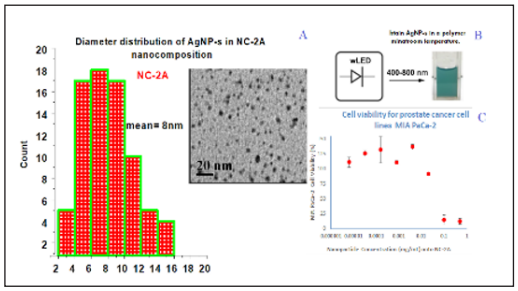

Figure-1: Diameter distribution and TEM image of AgNPs in the multifunctional nanocomposite NC-2A (A). Schematic representation of the targeted treatment applications (B). *In vitro* cell viability test results normalized to the viability to control cells for prostate cancer line (C).

Recent Publications

1. Rzayev Z, Bunyatova U, Sımsek M (2017) Multifunctional colloidal nanofiber composites including dextran and folic acid as electro-active platforms. *Carbohydrate Polymers*; (166): 87-92.
2. Bunyatova U, Rzayev Z, Simsek (2016) Multifunctional e-spun colloidal nanofiber structures from various dispersed blends of PVA/ODA-MMT with PVP/ODA-MMT, poly (VP-alt-MA) and AgNPs incorporated polymer complexes as electro-active platforms. *Express Polymer Letters*; 10(7): 598-616.

Biography

Ulviye Bunyatova is a Professor at Biomedical Engineering Department at Baskent University, Turkey. She is an Independent Researcher in Russia, Turkey, USA. Her current specific interests and expertise includes nano biomaterials with embedded silver nanoparticles, biocompatible inorganic nanoparticles with antibacterial and anticancer potential, visible light sensitive novel biomaterials with AgNPs, innovative approaches in the development of multifunctional smart conductive biomaterials with AgNPs for targeted cancer therapy, targeted inorganic nanoparticles, nanofibers and nanofilms.

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