

Antitumoral effect and Mechanisms of action of Silver Nanoparticles on Breast Cancer cells

Posoula Korakianiti^{a,b}, Noemi Formica^b, Cecilia Ancheschi^b, Anna Laurenzana^b, Eleni K. Efthimiadou^a

^a *Inorganic Chemistry Laboratory, Department of Chemistry, National and Kapodistrian University of Athens, 15771 Zografou, Greece*

^b *Pathology Section Laboratory, Department of Experimental and Clinical Biomedical Sciences "Mario Serio", University of Florence, Viale Morgagni, 50 – 50134, Florence*

email:celiakor2000@gmail.com

Breast cancer is a leading cause of mortality among women worldwide since conventional therapies for this type of cancer are often limited due to severe side effects. In this study we synthesised silver nanoparticles (Ag NPs) coated with tannic acid (TA) and explored their effects on two breast cancer cell lines, MDA-MB-231 and BT474. MDA-MB-231 cells are a model of highly invasive and metastatic triple-negative breast cancer (TNBC), while BT474 cells are used to study HER2-positive tumours. The structural characterisation of the Ag NPs was acquired through transmission electron microscopy (TEM) images but were also further analysed by UV spectroscopy and nanosight analysis. The antitumor effects of Ag NPs were evaluated using various biological assays and their mechanisms of action were investigated through Western Blot analysis and real time PCR. The results showed that Ag NPs significantly reduced cell viability in a dose-dependent manner in MDA-MB-231 cells, while in BT474 cells their cytotoxic effect was more moderate. Furthermore, Ag NPs were shown to inhibit angiogenesis and cell migration. Western Blot analysis revealed an increase in oxidative stress, producing reactive oxygen species (ROS) and lipid peroxidation, mediated by the activation of the p38 MAPK signalling pathway.

- [1] Ali, A.; Sattar, M.; Hussain, F.; Tareen, M.H.K.; Militky, J.; Noman, M.T. Single-Step Green Synthesis of Highly Concentrated and Stable Colloidal Dispersion of Core-Shell Silver Nanoparticles and Their Antimicrobial and Ultra-High Catalytic Properties. *Nanomaterials* 2021, 11, 1007. doi: 10.20944/preprints202104.0007.v1
- [2] Martínez-Limón A, Joaquin M, Caballero M, Posas F, de Nadal E. The p38 Pathway: From Biology to Cancer Therapy. *Int J Mol Sci.* 2020 Mar 11;21(6):1913. doi: 10.3390/ijms21061913. PMID: 32168915; PMCID: PMC7139330.