

2021 IEEE 11th International Conference “Nanomaterials: Applications & Properties” (NAP – 2021)
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Ministry of Education and Science of Ukraine
Sumy State University
IEEE Nanotechnology Council & IEEE Magnetics Society
International Union for Pure & Applied Physics

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NAN  **materials:**
A  **pplications &**
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ABSTRACTS



Institute of Electrical and Electronics Engineers
2021

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Safety and Antibacterial Effectiveness of Gold/Selenium Core-Shell Nanoparticles

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Development of effective antibacterial materials is an urgent issue due to high rate of multidrug resistant bacteria. Silver nanoparticles are the most well-studied materials with antibacterial properties, but cell toxicity limited their wide application [1]. Selenium and gold nanoparticles have potential for biological application but with minor antibacterial activities.

Se, Au and core-shell Au-Se nanoparticles (NPs) provided by NanoWave (Poalnd) was used in this research. Serial dilution of NPs (25, 12.5, 6.25 and 3.125 $\mu\text{g}/\text{ml}$) used to assess toxicity in experiment with human dermal fibroblasts as describe before [2]. Antibacterial experiment performed with *S.Aureus* and *E.Coli* clinical multiresistant strains in bacteriological laboratory of Biomedical Research Center (Sumy State University).

Figure 1 demonstrate safety of Au and Se NPs in different concentrations during 3 day co-cultivation period. Core-shell Au/Se NPs demonstrate moderate toxicity in concentration of 25 $\mu\text{g}/\text{ml}$. Other concentrations demonstrate safety and could be used as antibacterial agents.

Minimal inhibitory concentrations (MIC) determination demonstrates absent of antibacterial activity in SeNPs and minor activity in AuNPs. 0.05 g/l of AuNPs determines as MIC against *E.Coli* but *S.Aureus* resistant against gold nanoparticles. MIC for Au/Se core-shell NPs determines as 0.0125 g/l against *E.Coli* and 0.025 g/l against *S.Aureus*.

Our results open new perspectives for medical application of Au/Se core-shell nanoparticles as effective antibacterial substance.

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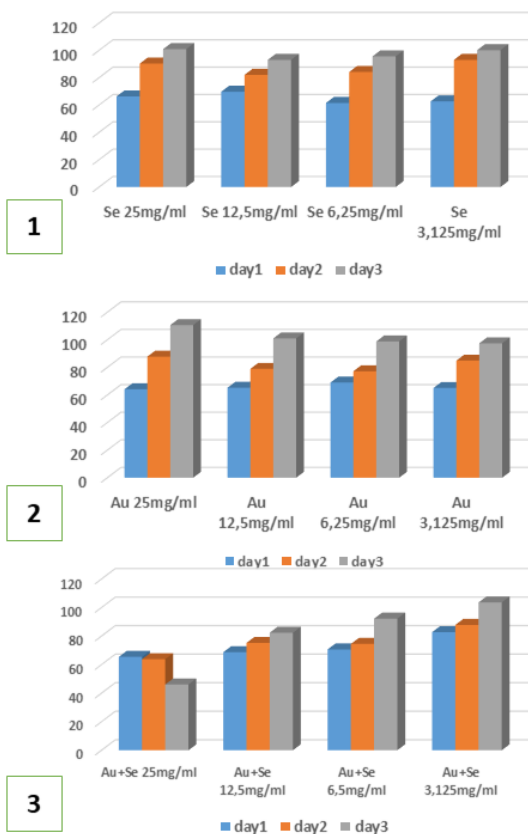


Fig.1. Dynamic of resazuring reduction during 3 days of co-cultivation of fibroblasts with Se (1), Au (2) and Au+Se (3) NPs.