Nanobioplasmonics: Toxicological implications of plasmonic nanoparticles in aquatic biological models

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This study investigates the toxic effects promoted by AgNPs under plasmonic excitation on the survival and physiology of the crustacean *Daphnia similis*. Two AgNP shapes (spherical and triangular) with plasmon bands absorbing in different spectral regions in the visible range were studied. The organisms were exposed to different AgNP concentrations under five different light conditions. Survival and changes in enzymatic biomarkers of oxidative stress and lipid storage were evaluated. Under LSPR conditions, we observed increased lethality for both AgNP shapes. LSPR effects of AgNPs showed mortality 2.6 and 1.7 times higher than the treatment under dark conditions for spherical and triangular morphologies respectively. The enzymatic assays demonstrated that plasmonic treatments triggered physiological responses. Significantly decreased activities were observed exclusively under LSPR conditions for both AgNP shapes. Considering all treatments, spherical AgNPs showed lower LC_{50} values than triangular ones, indicating their higher toxic potential. Our results demonstrate that LSPR AgNPs can induce biological responses associated with oxidative stress and survival. Therefore, this study highlights the potential risks of environmental contamination by plasmonically active metallic nanomaterials. These materials can enhance their toxicity when light-excited, yet the results also indicate promising opportunities for light-based therapies.

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References
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