THE EFFECT OF HUMIC ACIDS ON THE CYTOTOXICITY OF SILVER NANOPARTICLES TO A NATURAL AQUATIC BACTERIAL ASSEMBLAGE

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Abstract: The effect of a terrestrial humic acid (HA) and a river HA on the cytotoxicity of silver nanoparticles (AgNPs) to natural aquatic bacterial assemblages (0 μM, 2.5 μM & 5 μM) was measured with spread plate counting. The effect of HA (20 and 40 ppm) on the cytotoxicity of AgNPs ranging in size between 15 and 25 nm was tested in the presence and in the absence of natural sunlight. The experimental results were analyzed with a factorial arrangement of treatment in a complete randomized design using General Linear Model by SAS. LSMEANS was used to separate the means or combinations of means. Significant effect on the viability count was observed by all treatment interactions with both terrestrial and river HA treatments except for the exposure to river HA in light. The toxicity to natural aquatic bacterial assemblages appears to be AgNPs concentration dependent between 0 μM and 5 μM. The data indicates that the light exposure inhibited viable count more than the darkness exposure. The HA treatment groups in the presence of light showed greater reduced viability count compared to darkness exposure groups. The inhibition of bacterial viability counts by AgNPs exposure was less in the light treatment groups containing a terrestrial HA compared to that with a river HA. Difference in the extent of reactive oxygen species formation and adsorption/binding of AgNPs was speculated to account for the observed phenomenon.

Keywords: Silver nanoparticles, Cytotoxicity, Terrestrial humic acids, River humic acid, Reactive oxygen species.

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