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Behaviour of *Biomphalaria alexandrina* as a bioindicator of metal toxicity

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Heavy metals are common environmental pollutants to the aquatic organisms. Several aquatic species have been used as biomarkers and bio-monitoring subjects for heavy metal pollution. Behavioral changes are sensitive markers of toxicity. The effects of Cd and Mn on the survival, locomotion, attachment and feeding behaviors of the gastropod snail *Biomphalaria alexandrina* were determined. The 96-h LC50 for Cd and Mn were 0.38 and 156.57 mg/l, respectively. Snails were exposed to sub-lethal concentrations of each metal plus a control for chronic exposure period (16-20 days) and the survival curves were determined. Locomotion and feeding behaviors of snails exposed to Cd and Mn at acute (96 h exposure) and chronic exposure (24 days exposure) intervals were recorded. The survival curves showed that long term exposure of snails to ascending concentrations of Cd and Mn caused a gradual decrease in the survival rate of *B. alexandrina* in a dose-dependent manner. Compared to control, a significant decrease was recorded in the feeding and locomotion behaviors of exposed snails. The tendency to feed in *B. alexandrina* was significantly decreased by acute exposure to Cd and completely blocked by Mn exposure. The feeding rate was 4.8±0.68 bites/min. in Cd-exposed snails compared to 16.3±1.7 bites/minute in control. A significant decrease was recorded in the locomotion behavior of exposed snail groups compared to control. The path length of traces was 3351.2±95.3 mm in control compared to 295.3±50 and 1610.5±58.9 mm, respectively for Mn and Cd exposed snails. Thus, sub-lethal metal concentrations affected *B. alexandrina* behaviors, potentially impacting the snail's activity and tendency to feed. The present study also demonstrated *B. alexandrina* as a sensitive bio-indicator and can be used as a model organism to assess heavy metals risk factors for severe toxicity in freshwater ecosystems.

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Biosynthesis of anti-inflammatory immunosuppressive metabolite by *Streptomyces variabilis* ASU319 recovered from rhizosphere of *Triticum vulgaris*

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Most immunosuppressive agents were initially developed as antibiotics produced by the genus *Streptomyces*. This study was devoted to examine the antimicrobial activity of the *Streptomyces variabilis* ASU319 extract and testing the purified active compound of this extract as immunosuppressive agent in rats' blood. Elucidation the chemical structure and optimization of the active compound were studied as well. Antimicrobial activity was conducted using agar-well diffusion and disc diffusion assays. The antimicrobial metabolite was extracted from the fermentation broth by ethyl acetate and purified by TLC and silica gel column chromatography. The pure active compound was then subjected to spectroscopic analyses: 1H NMR, Elemental analysis, IR and Mass spectra. The active antimicrobial compound was tested as an immunosuppressive agent by injection in the rat blood and the complete blood picture (CPC) was determined. The crude extracts of the selected active antagonistic five isolates were tested to prevent the inflammation and proliferation of lymphocytes of the rats' blood. The active antimicrobial compound of *Streptomyces* ASU319 was purified and tested as immunosuppressive agents. The tested compound decreased each of the neutrophils, lymphocytes and monocytes than the positive control. The compound was of molecular weight 458-g/mol and had given the proposed chemical formula C24H46O8. The producer isolate was identified by 16SrRNA sequencing as *Streptomyces* variabilis ASU319 with accession number [GenBank: KC145278]. These results demonstrated that *Streptomyces variabilis* ASU319 is potential microbial isolate for active antimicrobial compound production and has the ability to decrease the proliferation of the lymphocyte cells in the blood and may be a good immunosuppressive agent.

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