

PP5.13

Atmospheric depositions of metals in soil and their bioaccumulation in field and laboratory earthworms

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Introduction: Anthropogenic emissions of metals to atmosphere can contribute to deposition of these compounds in surface soils. Earthworms have demonstrated are useful organisms to identify contaminated soils by metals and other substances. These organisms have the capacity to ingest high quantities of soil and absorbing through their skin many pollutants present in soils. Sometimes earthworms cultured in laboratory are incubated in soil samples to identify polluted soils, metals can be bioaccumulated in these organisms. In recent years one of the most important pollutants identify in Metropolitan Zone of Toluca Valley (MZTV) is Particle Matter, part of the components of these PM are metals and they can be deposited in soils of this zone.

Objective: The aim of this study was to compare the bioaccumulation of metals like Mn, Zn, Cu and Pb in earthworms collected from urban gardens with the bioconcentration in earthworms incubated in samples of soils from the same places in laboratory.

Materials and methods: Soil and adult native earthworm samples were collected from 7 natural areas and urban gardens of MZTV to determine the concentration of metals (Mn, Fe, Cu, Zn and Pb). These concentrations were compared with concentration of metals founded in earthworms (*Eisenia andrei*) incubated in laboratory during 14 days in soils collected from the same areas. Metals were determined by X ray fluorescence. Earthworms collected in field were identified in three different species.

Results: A t student analysis show no differences in content of metals and Enrichment Factor (EF) between field and laboratory soil samples. Significant differences with ANOVA analysis ($p < 0.05$) were observed in metal concentrations (Mn, Fe and Zn) among the different species collected and *Eisenia* cultured in lab. A higher level of Mn and Fe was detected in native earthworms in comparison with *Eisenia* but Zn concentration was low ($p < 0.01$) in *Eisenia* in comparison with native earthworms. There were no differences for Cu and Pb concentrations. Bioconcentration factor to Mn was major in earthworms cultured in lab compared to native earthworms. But to Zn this factor was lower in earthworms incubated in lab.

Conclusions: Although earthworms are very useful to identify polluted soils, our results suggest that is important develop field studies to know with more detail the mechanisms of metal bioconcentration phenomena in these organisms.

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Evaluation of the effect of chlorpyrifos ethyl on survival bullfrog tadpoles “*Lithobates catesbeianus*”

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Introduction: Pesticides are some of the most widely used industrial chemicals in modern society. Chlorpyrifos ethyl is an organophosphate pesticide that is widely used in agriculture because its acetylcholinesterase inhibition of insects. Phosphorylation on acetylcholinesterase by chlorpyrifos is irreversible causing tissue accumulation of acetylcholine in cholinergic synapsis. Tadpoles are aquatic organisms commonly exposed to contaminants from agriculture zones. In this development phase are more vulnerable than others.

Objective: The objective of this study was to evaluate the acute and sub lethal toxicity of ethyl chlorpyrifos and its effects on oxidative stress and acetylcholinesterase activity in bullfrog tadpoles “American Bullfrog”.

Materials and methods: A toxicity evaluation of ethyl chlorpyrifos was conducted to determinate LC50 in tadpoles; an acute toxicity test for 48 h using six different concentrations was performed. The intoxication using sub lethal concentrations (0.1 mg/L for 48 h) to evaluate acetyl cholinesterase activity was performed.

Results: The concentration showing death in half of the exposed population corresponds to 0.1605 mg/L of ethyl chlorpyrifos at 48 h. The tadpoles showed oxidative stress at 12 h of exposure (0.1 mg/L of chlorpyrifos). In addition, it observed an inhibition of acetylcholinesterase activity mostly at 6 h exposure against a decrease of the inhibition at 12 and 24 h.

Conclusions: The pesticide ethyl chlorpyrifos generated oxidative stress and inhibited the acetylcholinesterase activity in sublethal concentration in bullfrog tadpoles.

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Detection of estrogenic and dioxin-like activities in sewage sludge by means of yeast-based assays

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Introduction: Due to the intense and increasing world production of sewage sludge (SS), the final disposal of this waste has been considered one of the main environmental problems. A more sustainable alternative to the destination of SS is its application in agriculture as soil reconditioner. However, the presence of toxic substances, such as estrogenic and dioxin-like ones, can cause serious impacts to the environment and associated organisms, even when present in low concentrations.

Objective: The aim of this study was to verify the biological activity of domestic SS samples regarding the presence of emerging contaminants (endocrine disruptors and dioxin-like compounds), using recombinant yeast assays.

Materials and methods: Aqueous and organic extracts of anaerobic SS from a domestic Wastewater Treatment Plant located in state of São Paulo, Brazil, was evaluated and their respective toxicity was tested for estrogenic and dioxin-like activity by yeast-based bioassays (ER-RYA and AhR-RYA, respectively).

Results: Yeast-based assays showed significant dioxin-like activity in the aqueous extract and a more pronounced activity in the organic extract. The ER-RYA exhibited low values of estrogenicity for aqueous extracts. However, the organic extract was toxic to yeasts, precluding evaluation of an estrogenic response. The disposal of SS without performing a treatment to remove its toxic contaminants can directly contribute to soil contamination, as well as to the dispersion of pollutants to surface and groundwater, since the aqueous extract obtained from SS samples indicated the presence of substances capable of inducing the activation of the AhR.

Conclusions: Our data stresses the need for identification of emerging compounds in SS before its disposal in the environment. Thus, since SS may contain many compounds and a chemical identification of all them is not feasible, the use of biological assays (e.g., yeast-based bioassays) for the detection of biologically active substances can help to better define the potential human and environmental risks associated to SS.

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Perchlorate tolerant bacteria from saline environments at the Caribbean region of Colombia



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Introduction: Perchlorate is widely used in several industrial applications, and is frequently detected in environmental matrices at concentrations relevant to human health, in particular the inhibition of the thyroid hormone synthesis. Perchlorate decontamination of the environment using halophyte bacteria is a promising bioremediation strategy.

Objective: To isolate and characterize halophyte bacteria with potential for perchlorate bioremediation.

Materials and methods: Sediment samples were collected from Galerazamba-Bolívar, Manaure-Guajira and Salamanca-Magdalena, Colombia. Bacterial strains were isolated and inoculated in modified seawater LB. Microscopic identification was carried out using Gram stain and electron microscopy. Strains were genotyped by sequencing of 16S ribosomal gene. NaCl and KClO₄ were employed for susceptibility testing.

Results: Strains BBCOL-023 to BBCOL-033 were isolated. Phylogenetic analysis showed that these strains belong to the genus *Bacillus*, *Vibrio*, *Salinivibrio* and *Nesiotobacter*. BBCOL-023, BBCOL-024, BBCOL-028, BBCOL-029, and BBCOL-033 presented 99% similarity with *Nesiotobacter* sp, *Bacillus vallismortis*, *Bacillus cohnii*, *Bacillus* spp and *Bacillus flexus* respectively; BBCOL-025, BBCOL-026, BBCOL-027 and BBCOL-031 had 99% homology with *Salinivibrio costicola*, *Vibrio alginolyticus*, *Vibrio harveyi* and *Vibrio* sp, respectively.

BBCOL-032 presented 99% similarity to *Staphylococcus* spp. Strains grew up to 7.0% NaCl and optimally at 3.5% NaCl, suggesting that they are moderately halotolerant bacteria. The isolates tolerated pH variations (6.5–10.0), and relatively high KClO₄ concentrations (100–1500 ppm).

Conclusions: Isolated bacteria are moderately halophilic and tolerant to KClO₄, making them promising tools for bioremediation.

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Bioactive triglycerides isolated from white shrimp (*Litopenaeus vannamei*) induce apoptosis in murine lymphoma cells



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Introduction: Cancer is the leading cause of death worldwide and the research efforts are turning to the search of chemopreventive/chemoprotective compounds.

Objective: Assess the apoptosis-induction activity of bioactive triglycerides isolated from white shrimp.

Materials and methods: A bioactive triglyceride was isolated from shrimp muscle by chloroformic extraction followed by solvent partition, RP-HPLC fractioning, and open chromatographic column. M12.C3F6 murine cell line was subjected to the effect of bioactive triglyceride, with an IC₅₀ of 55.02 ± 7.66 µg/mL. The effect of bioactive triglyceride on cell apoptosis was analyzed by flow cytometry and fluorometric caspase analysis where apoptosis induction was observed.

Results: Both, early and late apoptosis signals, had a significant increase from 10.45 ± 4.88 to 17.65 ± 5.02 percent and 9.01 ± 2.12 to 15.05 ± 3.04, respectively. On the other hand, caspase activation was detected in both, executor and initiator groups. The activation of caspase 3 had a significant increase compared to the negative control, and the signaling pathway activated was the extrinsic via caspase 8.

Conclusions: These results suggest that the bioactive triglyceride isolated from chloroformic extract of white shrimp muscle induces the apoptosis of murine cancer cells via caspase activation.

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Arsenic in gulls: A global overview



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Introduction: Gulls are birds that are present in most aquatic and terrestrial ecosystems. These birds are excellent bio-indicators