Evaluating Urban Lead Exposure: Assessment of Lead Contamination in Detroit Soils and Community Gardens

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IMPACT OF DOC ON COPPER COMPLEXATION AND MOBILITY

Pb IN DETROIT’S SOIL & SEDIMENTS

THE URBAN GARDENING MOVEMENT: POSSIBLE Pb EXPOSURE?
Good understanding of inorganic-metal interactions

Very limited understanding of organic-metal interactions

Dissolved Organic Carbon

Organic carbon that passes through 0.45µm pore size filter

(Sutton and Sposito, 2006)
Why is Organic Carbon important?

Aquatic Food Web

Toxicity

Drinking Water Treatment
- Membrane Fouling
- Disinfection Byproducts (DBPs)

Fate & Transport of Pollutants
- Hydrophobic Organic Compounds
- Trace metals
- Viruses

Pb in the Urban Environment

Blood lead levels
- Soil lead levels
- Dust lead levels
- High traffic areas

Mielke study

Decreasing percentage of children with high blood lead
Soil Lead Concentrations - Detroit Area
Based on Detroit Free Press (Mielke) and MDEQ Studies 2003

Mean Blood Lead Levels - Detroit Area
2000 through April 2009
Lead Exposure & Transport

Hypothesis 1:
Where blood lead has decreased, soil lead concentrations have also decreased

Hypothesis 2:
Pb in street sediment is an indicator of current exposure
Geometric Mean Soil Lead (w/ upper and lower quartile)

Total Pb Concentration (mg/kg)

Mielke (2002)
Bickel (2009)

Tract A | Tract B | Tract C
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Concentrations of Lead in Detroit Soils and Sediment

Mean Gutter Sediment Pb (mg/kg)

Mean Soil Pb (Top 1/2", mg/kg)

Prepared by Environmental Chemistry Research Laboratory (WSU)
THE URBAN GARDENING MOVEMENT: POSSIBLE Pb EXPOSURE?

1. Community driven
2. Student lead

Cross-disciplinary Collaborative Research

Design self-sufficient garden box

Determine pollutant uptake/deposition

Prepared by Environmental Chemistry Research Laboratory (WSU)
Concentration of Pb in Soil (mg/kg)

- Warrior Garden (WSU Campus)
- Community Partner A Kid’s Garden
- Community Partner A Greenhouse
- Community Partner A Near Road
- Community Partner B Near Road

Prepared by Environmental Chemistry Research Laboratory (WSU)
Concentration of Pb in Vegetables (mg/kg)

- Beets
- Broccoli
- Brussel Sprouts
- Cherry Tomatoes
- Collard Greens
- Kale
- Lettuce Greens
- Mustard Greens
- Parsley
- Sage
- Spinach
- Sweet Pepper

Concentration of Pb in Soil (mg/kg)

- Community Partner A (greenhouse)
- Community Partner A
- Community Partner B
- Community Partner B
- St. Andrew’s D-Town
- Warrior D-Town
- Community Partner B
- Community Partner B
- Community Partner A
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- Warrior

Prepared by: Environmental Chemistry Research Laboratory (WSU)
Future Directions

• Bioavailability

• Transport of urban lead (dust/sediment)

• Effectiveness of remediation strategies
  – Demolition
  – Cap/sequestration

• New remediation technologies

Thank You

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