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CH Internship Seminar

Due: Aug 8, 2008

Title: Safe Gardening in Somerville

Question:

Local food advocates and urban gardeners will make an endless list of benefits of eating vegetables and herbs from backyards and community gardens. However, urban soils are often exposed over time to heavy metals and other pollutants. In this paper, I will explore the following questions: how should Somerville residents test their soil for lead and what gardening practices are safe if they receive positive results? I will then provide specific suggestions for Groundwork Somerville, an organization promoting sustainable healthy communities, to improve their policies and programs with regards to lead poisoning and urban gardening.

Background: Groundwork Somerville, Lead Poisoning, and Produce Consumption

Groundwork Somerville (GWS) (2008) is a community-based organization working to "build sustainable communities through joint environmental action." The organization's mission focuses on "promoting sustained regeneration, improvement, and management of the physical environment through development of community based partnerships, which empower people, businesses, and organizations to promote environmental, economic, and social well being." Much recent work focuses on the transformation of school, city, and residential lawns and yards into urban gardens in an effort to promote increased activity and consumption of fresh produce for all residents. As health promotion is the key factor in these efforts, it is crucial to consider the implication of heavy metal contamination in Somerville soils.

According to the U.S. Environmental Protection Agency (2008), "child lead poisoning remains a major environmental health problem in the United States." Children are especially at risk because of play habits and developmental stage, which increases sensitivity to the detrimental effects of lead exposure. Possible results of lead exposure include lower IQ, learning disabilities, and behavior disorders – disadvantages that plague today's school-aged children. Soil around homes can become contaminated from exterior lead paint, use of leaded gas in cars, orchard pesticide use, and nearby industrial pollution. Though today these practices have been dramatically reduced, the lead remains in the environment for hundreds of years (*Lead*).

The presence of lead in the city of Somerville is well established. The Massachusetts Department of Public Health Childhood Lead Poisoning Prevention Program (2005) identifies communities in which children are at high risk for lead poisoning. Based on data from 2000 – 2005, Somerville is highlighted as one of fifteen high-risk communities in the state. Twenty-one new cases of lead poisoning were confirmed within the five-year time period, 78% of the city's households have low or moderate income, and 81% of the city's housing built before 1950. The Centers for Disease Control and Prevention identifies these community variables as useful indicators of high-risk geographic areas (as cited in Hynes, Maxfield, Carroll, & Hillger, 2001, p. 200).

Though direct ingestion of contaminated soil is a main cause of lead poisoning, especially among children, the University of Massachusetts Amherst Department of Plant and Soil Sciences (2004) asserts that "garden produce, which has accumulated lead in its tissue or has soil particles adhering to it, can also be a hazard if eaten." UMass Amherst (2004) defines low levels of lead in soils as less than 500ppm, medium ranging from 500 to 1000ppm, and high ranging from 1000 to 3000ppm. They conclude that "total lead levels higher than 1000ppm are legally hazardous," however; gardeners should be concerned about levels much below this extreme. Children and pregnant women, however, are advised to avoid contact with soil containing lead at a level above 300ppm. Other extension services including that of the University of Maryland (2001) and University of Rhode Island have adopted UMass Amherst's classification system.

Clark (2006) delves deeper into the subject, investigating the contribution of total lead exposure from ingested produce grown in Roxbury and Dorchester, MA. She concludes that though the overall contribution is often minor compared to other possible sources, "equivalent to approximately 10-25% of children's daily exposure from tap water" (2066), this source of lead poisoning is "a quantifiable and nontrivial component of the total Pb exposure pathway" (2073).

Findings: Lead Testing Options for Somerville Residents

UMass Amherst (2004) measures "extractable lead" which measures reactive lead in soil and then provides an estimation of total lead in the soil sample. Their extension service, based on brochures released by other northeast extension services, is respected in the field of soil science and laboratory testing. The standard soil test performed by UMass Amherst costs $9 and unlike most other tests reviewed by Traunfeld and Hengemihle (2008), includes lead testing. Among those tests reviewed, UMass Amherst's service is also the most affordable option for determining lead levels in soil samples. Plant tissue tests to determine lead accumulation in the edible part of a plant can also be performed for $14 per sample. Groundwork Somerville currently provides information regarding UMass Amherst's testing services for those who request information about lead testing.

Further Considerations: Best Practices for Gardening in Contaminated Soils

UMass Amherst (2004) provides a list of "good gardening practices to reduce the lead risk" depending on the level of contamination. When soils have low contamination, it is advised that gardens be located "away from old painted structures and heavily traveled roads," fruiting crops should be planted preferentially compared to leafy crops, organic material such as compost or humus should be incorporated into the soil, outer leaves of vegetables should be removed, root crops should be peeled, and all produce should he washed thoroughly. In addition, soil kept above a pH of 6.5 reduces uptake of lead by produce. Soil surfaces can also be mulched to prevent ingestion or inhalation of soil particles. When soils are contaminated at medium levels, UMass Amherst recommends that children under the age of six should have their blood levels tested, and if positive, leafy green vegetables and root crops should be avoided completely. When soils have high levels of lead, children should have blood tests, only fruiting crops should be grown, depth of contamination can be determined and replaced with clean topsoil if contamination is shallow, or produce can be grown in containers and raised beds lined in plastic.

The Food Project (2008), an organization advocating urban agriculture in Boston, practices several different remediation techniques. Responding to extreme contamination, the top three feet of soil in one small garden was excavated and replaced with clean soil and compost. This proved expensive and labor intensive. Adding compost was advocated in most other situations. The organic matter binds heavy metals and neutralizes the pH of the soil, making them less available to the plants. Raised beds are also commonly built with untreated lumber and lined with landscape fabric to prevent contact with contaminated soil. Experimentation with phytoremediation is in initial stages to determine whether various leafy greens can effectively draw lead into their leaves and be removed, therefore removing lead from the soil.

Though UMass Amherst and the Food Project make recommendations echoing most other educational, governmental, and organizational recommendations on the topic, recent research highlights the complexity of the issue. Clark, Hausladen, and Brabander (2007) acknowledge that raised beds are currently the most common "exposure reduction method used in the communities to promote urban gardening" (312). They examined soil lead levels over time and investigated produce and soil's contribution for overall lead ingestion. Interestingly, it was found that initial lead concentration was below 200ppm in all raised beds, but over four years, levels rose to about 350ppm. By analyzing the soil samples, these researchers concluded that wind-transported particles were responsible for most of the recontamination. Clark et al. demonstrated that simply gardening in raised beds is not a permanent solution without maintenance, and that "consumption of homegrown produce accounts for only 3% of children's daily exposure of lead while ingestion of fine grained soil accounts for 82% of the daily exposure" (312). These new findings are important for groups like GWS who not only advocate urban gardening but also work to promote overall community health through sustainable development and pollution remediation.

Recommendations for Groundwork Somerville:

These findings have implications for GWS's gardening programming as well as its work in pollution remediation. In regards to gardening practices, the organization should actively promote residential soil testing through UMass Amherst at all events relating to garden programming. When lead testing resources are made available, a fact sheet with gardening recommendations similar to those provided by UMass Amherst should be present. This will help home gardeners use advised techniques to reduce exposure to lead through homegrown produce. In addition, best practices should be used in all school gardens and these techniques should be shared with host neighborhoods through press releases and signs posted at the gardens. The school gardens represent a perfect opportunity for GWS to teach by example.

Hynes, Maxfield, Carroll, and Hillger (2001) show that child lead poisoning prevention work is most often focused on indoor sources of lead such as paint and dust. However, much of contaminated dust originates as exterior soil (200). By working to reduce exposure to contaminated urban soils, GWS can increase safety of both outdoor and indoor activities as the organization works to improve general health and safety of communities. Hynes et al's review of the low cost practices of the Dorchester Lead-Safe Yard program provide several simple techniques that could be used by GWS in future lead abatement efforts. It is important to note that although these methods proved less expensive when compared to removing and safely disposing of contaminated soil, they did cost an average of $2,100 per yard.

Options for highly contaminated yards include building framed play, pet, picnic, and garden areas lined with perforated landscape cloth. The cloth can then be covered in mulch, gravel, or clean soil depending on desired land use. Paths of walking stones should be placed in high foot traffic areas and all bare dirt can be seeded and fertilized to encourage complete grass coverage or mulched if unsuitable for grass. Drip-edge boxes lined with landscaping cloth and filled with gravel or mulch can also eliminate areas of bare soil (206). These techniques reduce exposure to contaminated soils with the hopes of decreasing exposure to lead in the outdoor environment as well as preventing it from entering households.

In a time of increased interest in locally grown food and home gardening, GWS has an exciting opportunity to promote better, safer, healthier communities by promoting lead testing and providing guidelines for safe gardening practices. In addition, initiating a program similar to the Dorchester Lead-Safe Yard program should be considered when selecting possible future projects.

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