Lead’s Effects on Learning/Developmental Disabilities in School-Aged Children

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An estimated 3% of neuro-developmental disabilities, i.e. mental retardation, are due to neuronal damage from exposure to neurotoxins while 25% are attributed to exposures that interact with genetic susceptibility (Hood, 2006).
INTRODUCTION

- Lead is a poison by which serious health effects occur, requiring that school-age children receive special education services.
- Children can be exposed to lead by:
  - (1) orally sucking or ingesting lead contaminated objects;
  - (2) inhalation; and
  - (3) through skin contact with lead containing products (Antoniadis & Gilbert, 2005).
Children are also exposed by drinking water from leaded pipes and hobbies involving the use of stain-glassed windows (Centers for Disease Control, 2005).

Recent news media has reported several instances of potentially harmful amounts of lead:
- More Chinese-made toys recalled (CNN, 2007);
- Many more toys tainted with lead (Chicago Tribune, 2007).
Gastrointestinal absorption of lead in children is higher than in adults, causing adverse reactions in their neurological system (Guillard, 2006).

Direct effects of blood lead level on indicators of physical fitness in school age youth are not evident (Ignasiak, et al., 2007).

Such reactions are more prevalent in children than adults because they are physiologically weaker and thereby more susceptible to adverse reactions that cannot be defended by their developing immune system.
The American Academy of Pediatrics Committee on Environmental Health AAPCE (AAPCE, 1998) has made several recommendations regarding the effects of lead, its epidemiological history, and lead poisoning prevention guidelines for U.S. and international pediatric populations from their research and that of the Centers for Disease Control and Prevention (CDC) (CDC, 2005).
What causes lead exposure and how high do blood lead levels (BLLs) have to be to cause adverse effects?

- The aims of this study are to inform healthcare professionals of the: 1) causes of lead exposure; 2) mental and socio-educational effects post-exposure; and 3) some possible solutions to reduce the number of school-aged children exposed to lead.
What is ASHA’s position?

- Commitment to prevention (ASHA, 1998).
- Members should play a significant role in the research on causes related to communication disorders, educating colleagues and the public regarding prevention.
- But how?
A systematic review of the literature from 1950-2007. Articles were included and discussed if they directly addressed one of the three aims of this project:

1) the causes of lead exposure;
2) the mental and socio-educational effects post-exposure; and
3) some possible solutions to reduce the number of school-aged children exposed to lead.
METHODOLOGY, cont.

- Findings were described in a qualitative format with implications to allied and public health practice summarized in the conclusions section.

- A combination of key words, which included lead, prevention, developmental delay, and pediatric, yielded 168 sources.
Causes of Lead Exposure

- A number of documented and undocumented synthetic and industrial chemicals:
  - Pesticides;
  - Flame retardants;
  - Metals;
  - Solvents; and
  - Other pollutants that enter in a human’s blood stream (Harder, 2003).
Mental and Socio-Educational Effects Post-Exposure

- Lower IQ;
- Lower math and reading levels;
- Increased difficulty with attention;
- Executive function;
- Visual-motor integration;
- Social behavior and motor skills; and
- Can lead to ADHD (primary H-1 variant).

How can lead exposure to children be prevented?

- The CDC has found that minority populations are disproportionately susceptible to lead poisoning, specifically African-American children that are almost three times as likely to be exposed to lead (2005).
- Research which examine minority populations as well as the socio-educational and economic factors associated with lead exposure in school-age children.
- In what ways can the needs of these children be addressed to decrease the costs associated with special education and healthcare services?
How can lead exposure to children be prevented?

- Folate and iron deficient children are more susceptible to the negative cognitive effects of lead (Solon, et al., 2008).
- Folate supplementation may be a protective factor against lead exposure (2008).
- New Orleans children are exposed through the soil lead exposure (Mielke, et al., 2007).
What are some possible solutions?

- Findings show that lead exposure should be reported to public health departments, which can inform its communities through prevention programs.

- State and local programs should encourage legislation to fund blood lead screenings as part of the vision and hearing screening programs conducted at the school district level.
CONCLUSION

- At the clinical practice level, professionals should utilize their case history form to inquire about a child’s potential exposure to lead.
- As members within our environmental network, public health and allied health professions must find ways to involve the community as they strive to protect our children from the health threat of lead poisoning.
CONCLUSION

- Community-based health promotion and prevention programs are paramount to increase awareness of the origins and effects of lead poisoning amongst families within that community sector, e.g. workshops on lead poisoning and lead-testing pre-entry to schools by the local health department.

- Second, more research should be conducted on school-aged children as it relates to the onset and perseveration of lead poisoning and on how their caregivers’ outlook on similar health threats has changed in light of their child’s disability.
As Gilbert (2005) proposed, we must take a precautionary approach to this health issue by:

- (1) “taking preventive action in the face of uncertainty;
- (2) shifting the burden of responsibility of demonstrating safety to the proponents of an activity;
- (3) exploring a wide range of alternatives to avoid possibly harmful actions; and
- (4) increasing public participation in decision making (environmental justice) (p. 7).”
CONCLUSION

- Once responsibilities shift and alternatives are generated through public participation, public health entities at federal and local levels can continue to collaborate with community-based facilities to educate and train families on how to identify and reduce the exposure of lead among pediatric populations in the U.S. and abroad.
Figure 1. Distribution of Lead Poisoning Sources

Identified Barriers

- Nutritional Determinants
- Environmental Exposures
- Blood Level Threshold
- Multi-Causality
- Unaccessible

Number of Articles

- 0
- 2
- 4
- 6
- 8
- 10
- 12
Figure 2. Distribution of Methodologies

- Case-Control: 58%
- Randomized Control Trial: 13%
- Databases: 12%
- Cohort: 16%
- Report Guidelines: 4%
- Historical Review: 13%
- Meta-Analysis: 13%
Figure 3. Distribution of Supportive Evidence


REFERENCES

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